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ORIGINAL PAPER

Does Type of Financial Learning Matter for Young Adults' Objective Financial Knowledge and Financial Behaviors? A Longitudinal and Mediation Analysis

Travis P. Mountain[1] · **Namhoon Kim**[2] · **Joyce Serido**[3] · **Soyeon Shim**[4]

Abstract

We examined whether various types of financial learning activities affect young adults' objective financial knowledge and financial behavior and if so, whether different types of such activities lead to different outcomes. Using three waves of longitudinal data collected from the same participants over 5 years, we assessed financial behaviors as well as associations with objective financial knowledge and various sources of financial learning among 640 young adults. We empirically evaluated direct and mediation effects between financial learning activities and financial behaviors. The results from our multilevel mediation regression model revealed significant differences in financial behaviors depending on the type of financial learning activity a participant experienced. Meeting with a financial advisor; reading personal finance books, magazines, and websites; having parents as financial role models; and gaining objective financial knowledge were all associated with positive financial behaviors. In contrast, attending workshops and seminars was associated with negative financial behaviors. Formal classroom learning in college had no effect on financial behaviors. Our analysis further indicated that financial knowledge played an important role in improving financial behaviors, significantly mediating the association between voluntary learning or nonvoluntary learning activities and financial behaviors.

Keywords Financial education · Type of learning · Financial behavior · Young adults

Introduction

Sufficient financial knowledge plays an essential role in practicing appropriate financial behaviors (Hilgert et al. 2003; Lusardi and Mitchell 2007a; Robb and Sharpe 2009; Robb and Woodyard 2011). However, Americans tend to not be highly knowledgeable financially and are therefore less prepared to make effective financial decisions as compared to citizens of other countries (Klapper et al. 2015; OECD 2016a, 2017). Among young adults (18–24), low levels of financial knowledge are of particular concern (Sinha, Tan, and Zhan 2018). It is during this life stage that individuals make important life decisions (e.g., about college, career, and romantic relationships); many of these decisions have long-term financial ramifications (LeBaron et al. 2018; Scales et al. 2016). Although parental financial socialization plays an important role in the formation of young adults' financial knowledge and behaviors (Gudmunson and Danes 2011; Shim et al. 2010), a more self-directed approach to making financial decisions occurs over time (Serido et al. 2020, 2015). For these reasons, we focus on the various ways young

✉ Travis P. Mountain
travis35@vt.edu

Namhoon Kim
hoonkim@krei.re.kr

Joyce Serido
jserido@umn.edu

[1] Department of Agricultural and Applied Economics, Virginia Tech University, 250 Drillfield Dr, Blacksburg, VA 24061, USA

[2] Department of Agricultural & Rural Policy Research, Korea Rural Economic Institute, 601 Bitgaram-ro, Naju, Jeollanamdo 58321, South Korea

[3] Department of Family Social Science, University of Minnesota, 1985 Buford Ave, St Paul, MN 55108, USA

[4] School of Human Ecology, University of Wisconsin-Madison, 2135 Nancy Nicholas Hall, 1300 Linden Drive, Madison, WI 53706, USA

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adults acquire financial knowledge as the basis for practicing appropriate financial behaviors independently in support of their life decisions. The purpose of this study is twofold: first, we investigate the extent to which different types of financial educational interventions may correlate with financial knowledge and financial behaviors; second, we investigate whether the effects of each type of financial education affect financial behaviors directly or indirectly through objective financial knowledge.

A popular strategy for improving young adults' financial knowledge is to offer formal financial education to high school and college students (Council for Economic Education 2014; Lusardi and Mitchell 2014). Many scholars have evaluated the effects of formal educational interventions on financial knowledge by using test scores gathered from personal finance questionnaires. However, higher test scores do not necessarily guarantee better financial behaviors. Thus, although financial education has been shown to increase an individual's level of financial knowledge, whether these same educational interventions can help improve financial behaviors in the long run remains unknown. Financial knowledge, once acquired through various sources of financial learning, has two dimensions: (1) a stock of knowledge related to personal financial concepts and (2) the confidence and ability to apply such knowledge when engaged in positive financial behaviors and making financial decisions and carrying out behaviors (Huston 2010; OECD 2016b). For the purposes of this paper, when we refer to financial knowledge, we are referring to both of these dimensions; when we refer to financial literacy, we are referring to a broader conceptualization of a process encompassing knowledge acquisition and knowledge application.

Furthermore, even though financial education can improve financial knowledge, formal financial education cannot cover all aspects of the financial decisions that young adults will make, nor can it predict the financial behaviors they will practice. Thus, the effect of formal financial education on financial behavior—while likely important—does not reflect an exact correlation. Because financial choices are dynamic, it would seem reasonable that individuals also seek additional sources of financial knowledge from time to time based on their circumstances and opportunities. We refer to these self-directed endeavors as voluntary learning activities (such as consulting a financial planner, reading personal finance literature, or attending workshops) designed to increase financial knowledge and improve financial behaviors and decision-making. There is some research (Carvalho and West 2011; Ryan and McCabe 1993) to suggest that the individual choice to voluntarily pursue such activities to gain more knowledge may be more effective than classroom learning. However, to our knowledge, the effect of voluntary learning activities has not been examined in tandem with formal financial education.

We relied on survey data collected from a single college cohort at three time points, 2008, 2010, and 2013, from the Arizona Pathways to Life Success for University Students (APLUS) study to examine the effects of formal education and voluntary learning activities on financial knowledge and behaviors from college to career. We created a category of variables—educational interventions—that cast a wide net over the various types of financial education resources consumers have at their disposal. These educational interventions include formal high school and college financial education classes and voluntary learning activities such as meeting with a financial advisor; attending workshops and seminars; reading books, magazines, and websites; and accessing other sources of financial materials.

Literature Review

Formal Financial Education and Financial Literacy

Evaluating the effectiveness of financial education is not a new research endeavor. Social scientists have been focusing on the topic for nearly two decades, and both early and more recent studies have found a positive relation between financial education and financial outcomes (Fox et al. 2005; Lusardi 2003; Meier and Sprenger 2010). One notable meta-analysis of 201 unique studies (Fernandes et al. 2014) examined the effects of financial education and concluded that while financial educational interventions have statistically significant effects on financial behaviors, the size of the effect is quite small and decreases over time. However, not all previous studies reached similar conclusions. Willis (2008), in another notable work, concluded that no reliable empirical evidence existed to suggest that financial education programs are effective, nor was there evidence suggesting that the potential benefits outweighed the cost of financial education programs. Likewise, Mandell and Klein (2007) conducted a matched sample design (based on a school system's records) to determine the impact of financial education on the financial knowledge of high school students and found that students who took financial education courses did not perform any better on financial literacy assessments than those who had not. More specifically, the authors detected no significant impact from financial education on behavior. We also found mild dissent in a study by Carpena et al. (2011) that evaluated a relatively large randomized financial education intervention in India. The authors found that although financial education failed to improve financial decisions that require numeracy, there was an increase in individuals' financial product awareness and attitudes toward making financial decisions. It should be noted that when determining the effectiveness of financial education, outcomes will likely differ based on the quality of the education, the chosen financial topics, the timing of

the education, and the methods of content delivery (Hensley 2015). Taken together, although some studies have shown positive correlations between formal education and financial literacy (i.e., knowledge and behavior), the effects may not be large or long lasting.

Alternative Types of Financial Learning and Financial Literacy

One possible explanation for the weak connection between formal financial education and financial literacy may be the lack of opportunity to apply what has been learned. As a potential remedy for this apparent shortcoming, Sherraden (2013) recommended that financial education be paired with experiential learning, such as what might be obtained from the process of opening a savings account (done after teaching a student about various types of liquid accounts) to enable the student to apply his or her new knowledge and create a memorable experience. Friedline and West (2016) argued that millennials need more than just formal financial education to promote positive financial behaviors and suggested that they also need interventions as a remedy. This leads us to explore additional linkages between types of financial learning and financial literacy.

A decade-old Australia and New Zealand Banking Group (ANZ) Survey of Adult Financial Literacy in Australia found that households reporting higher levels of financial knowledge were more likely to rely on informal sources of information such as financial newspapers and magazines, financial sites on the Internet, and consultations with financial advisors. Conversely, those households reporting the lowest financial literacy levels were least likely to read financial newspapers or magazines (ANZ 2008). Van Rooij et al. (2011) conducted a Dutch study that also found that the households relying on financial newspapers; magazines, guides, and books; and information from the Internet were the ones that reported higher levels of basic financial knowledge. Moreover, an analysis of data collected in a two-time longitudinal survey of college students (Shim et al. 2015) revealed that a reliance on informal financial sources (reading a book or a magazine about personal finance, attending a workshop or seminar, or checking a website regarding money management) in addition to formal financial education correlated with healthy financial development. It may be that when individuals seek out information, it is to address a specific problem they are facing, and thus this information is more likely to be relevant and applicable to them (Corporation for Enterprise Development [CFED] 2014).

Financial Knowledge and Financial Behavior

Although many researchers who sought to measure financial knowledge used cross-sectional data, Xiao et al. (2014) examined college students' financial knowledge at two different points in time and found that higher levels of both subjective and objective types of knowledge correlated with a reduction in certain risky credit borrowing and paying behaviors; however, the study also found evidence that the effect was stronger with respect to subjective knowledge. Furthermore, higher levels of financial knowledge are apparently linked to positive credit card behaviors (Allgood and Walstad 2013; Xiao et al. 2011), whereas lower levels of financial knowledge are linked to a greater tendency to resort to higher-cost borrowing options (Robb et al. 2015). Meanwhile, Gerrans et al. (2014) found that financial knowledge accounted for 55% of the variance in financial behavior in males and 44% of this variance in females.

Other studies have found that financial knowledge is positively correlated with future-oriented financial behaviors such as retirement planning, savings accumulation, and wealth accumulation (Hung et al. 2009; Lusardi and Mitchell 2007b, 2011b; Van Rooij et al. 2012; Xiao et al. 2014). In comparison, low levels of financial knowledge correlate with negative financial behaviors such as debt accumulation, high-cost borrowing, mortgage delinquency, poor mortgage choice, and home foreclosure (Gerardi 2010; Lusardi and Tufano 2015; Moore 2003; Stango and Zinman 2009).

The benefits of appropriate financial behavior have been traced to smoothing marginal utility over one's lifetime, which is achieved by maximizing savings and decumulation patterns (Modigliani and Brumberg 1954). These patterns can be extrapolated into two simple periods of saving and portfolio allocation during which higher human capital from the investment in financial knowledge provides access to higher-return assets (Delavande et al. 2008). Jappelli and Padula (2013) extended the two-period model into a multiperiod life cycle model that included financial knowledge and savings behavior. They did so under the assumption that financial literacy and wealth share a strong positive correlation such that increasing financial literacy leads to better financial decision-making behavior, which in turn leads to increased wealth (Jappelli and Padula 2013). In other words, a desire for future wealth motivates consumers to seek ways to improve their financial literacy. However, the authors were not specific as to the type of learning consumers might be motivated to pursue. In the present study, we sought to determine which

specific types of financial-knowledge-seeking activities correlated with objective financial knowledge and financial behaviors.

In summary, we found several studies that linked financial knowledge, both subjective and objective, to financial behaviors. Further, higher levels of financial knowledge typically resulted in positive behaviors, while lower levels of financial knowledge resulted in negative behaviors. Finally, appropriate financial behavior decisions can lead to better consumption smoothing and more wealth and may motivate consumers to seek out additional financial learning.

Financial Learning and the Transition to Adulthood

In the United States, the ability to manage one's finances independently is a key marker of adulthood, and young adults are expected to assume increasing responsibility for their finances (Arnett 2016). Yet, there is a robust literature demonstrating that family financial socialization has a long-term effect on the financial knowledge and behaviors of young adults (Shim et al. 2010; Webley and Nyhus 2006, 2013). Parents represent the main source of early financial learning, as children observe and imitate the financial behaviors practiced by their parents. Indeed, parental modeling of responsible financial behaviors is associated with both higher levels of financial knowledge among college students and the practice of more responsible financial behavior (Friedline and West 2016; Gutter et al. 2010; Shim et al. 2010, 2015). Although parental influence wanes as young adults become more independent (Serido et al. 2015, 2020), we accounted for its potential long term effects on young adults' financial knowledge and behaviors in our analyses.

Current Study

We defined the internal motivation to learn and apply knowledge to relevant conditions in one's life as a developmentally appropriate self-directed effort to learn more about personal finances (Pereira and Coelho 2020) and conceptualized it as taking the form of voluntary financial learning activities such as seeking guidance from a financial advisor, reading financial books and magazines, and attending workshops and seminars. As a young adult transitions into adulthood and makes more independent financial decisions, we believe that voluntary financial learning becomes more important. The voluntary financial learning activities we examined could either enhance or replace early learning acquired from parents depending on if these activities conflict or conform to lessons learned from parents. Further, the types of voluntary learning activities we examined have relatively low barriers of entry and require little or no commitment. When compared to a formal high school or college course, this is quite a contrast. The à la carte nature of these voluntary activities, which have little or no time constraints, may be valuable to some, especially for this age demographic. We believe that comparing the difference in effectiveness between voluntary and nonvoluntary financial learning activities is the next step in reshaping financial education for young adults.

Method

Study Design

The participants in the study all attended the same university in the southwestern United States and completed multiple surveys as part of a longitudinal research initiative. To date, five waves of data have been collected over 8 years from the same participants. Wave 1 is the baseline data collected in spring 2008 (ages 18–21), Wave 1.5 data collected in spring 2009 (ages 19–22), Wave 2 data collected in fall 2010 (ages 20–23), Wave 3 data collected in spring and summer 2013 (ages 22–25), and Wave 4 data collected in spring 2016 (ages 26–30; see Shim et al. 2010 for details about the data collection procedure and study design). After receiving approval from the institutional review board, participants were sent email invitations with a link to the online survey. All participants received a nominal incentive (e.g., $25) for completing the survey. The surveys fielded in each wave were similar in size and scope. For our purposes, we used data obtained from three waves: Wave 1 (W1), Wave 2 (W2), and Wave 3 (W3). We excluded Wave 1.5, collected in 2009, and Wave 4, collected in 2016, because the data gathered in those waves did not include the financial intervention variables deemed relevant to our study.

Analytical Approach and Measures

To compare the direct and indirect effects of both voluntary learning activities and nonvoluntary learning (predictors) on objective financial knowledge (mediator) and

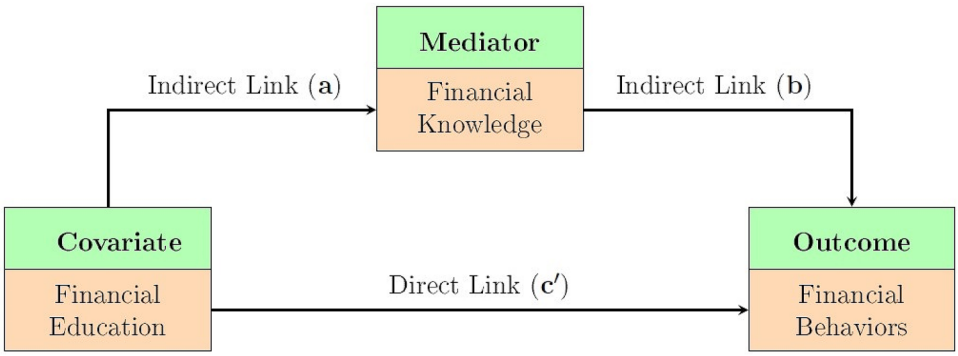

Fig. 1 Structure of mediation model

financial behaviors (outcome), we first considered three relationships: (1) the link between voluntary learning or nonvoluntary learning and the level of objective financial knowledge, (2) the link between the level of objective financial knowledge and appropriate financial behaviors, and (3) the link between voluntary learning or nonvoluntary learning and financial behaviors. Based on our assessment of these links, we evaluated the direct and indirect effects of voluntary learning and nonvoluntary learning that young adults engaged in as shown in Fig. 1. The direct effect evaluates the way in which a voluntary learning activity enhances appropriate financial behaviors, as represented directly by Link c′, while the indirect effect investigates the link between financial learning activities and financial behaviors through financial knowledge by the combination of Links a and b.

Financial behavior

To analyze the direct effect represented by Link c′, we selected 10 of the questions pertaining to positive financial behaviors and three of the questions pertaining to negative financial behaviors that were measured in Waves 1, 2, and 3.

The list of positive financial behaviors is as follows:

- budgeted on a regular basis,
- tracked monthly expenses,
- spent within the budget,
- paid bills on time each month,
- paid off my credit card balance in full every month,
- saved money each month for the future,
- contributed to an investment or retirement account, and
- invested for long-term financial goals regularly.

The list of negative financial behaviors is as follows:

- borrowed money from credit cards,
- maxed out credit card limit, and
- used payday loan services.

Each behavior item was rated on a five-point Likert-type scale (1: Never, 2: Rarely, 3: Sometimes, 4: Often, and 5: Very Often). To evaluate positive financial behaviors, we added the score (1 through 5) for each of the eight positive financial behaviors, giving us a score ranging from 8 to 40 and used it as a dependent variable. Similarly, to evaluate negative financial behaviors, we added the scores of the three negative financial behaviors giving us a range of 3–15 and used this as a second dependent variable.

Objective Financial Knowledge

To analyze the indirect effect between learning activities and objective financial knowledge (Link a) and between objective financial knowledge and financial behaviors (Link b), we constructed a measure of objective financial knowledge as the number of correct answers to 15 true/false personal finance questions (Shim et al. 2010) which is a subset of questions used by Hilgert et al. (2003). We then used this score to evaluate the potential mediating effects of the educational interventions on financial literacy.

For financial activity interventions, we constructed two measures of educational interventions, voluntary learning and formal financial learning classes, that could influence both objective financial knowledge and financial behaviors.

Voluntary Learning Activities

We selected six activities from the following questions for each wave: “Since coming to the University of Arizona did

you engage in any of the following activities?" (Wave 1), "During the past 2 years, did you engage in any of the following activities?" (Wave 2), and "Since leaving college, did you engage in any of the following activities?" (Wave 3). The activities we considered are listed as follows:

- read a book or a magazine about personal finances,
- attended a workshop or seminar about how to manage personal finances,
- checked websites about money management or investment,
- met with a financial advisor or counselor about a future financial plan, and
- obtained new knowledge about personal financial management from various sources.

We dichotomized each item as 1 if the respondent participated in that education type and 0 if the respondent did not, resulting in a set of dummy-coded variables that represented each type of educational intervention.

Formal Classes

We added two types of formal financial education: education in high school and education in college. For the formal classes in high school, as an important time-invariant variable, we considered two survey questions regarding financial education in high school: "While in high school, how many courses did you take related to personal financial management, consumer education, economics, or business?" (formal classes) and "During your high school years, how many seminars, workshops, or after-school programs that taught financial management did you attend?" (after-school classes). The possible answers to these questions were "None," "1 course/seminar/workshop," "2 courses/seminars/workshops," or "3 or more courses/seminars/workshops." We took the summed count of the two variables and conceptualized the variable as a proxy for the effect of early formal financial education. For the formal classes in college or after graduation, we considered the following questions from each wave: "Since coming to the University of Arizona, did you engage in any of the following activities?" (Wave 1), "During the past 2 years, did you engage in any of the following activities?" (Wave 2), and "Since leaving college, did you engage in any of the following activities?" (Wave 3). For these questions, we considered the corresponding response, "Took a personal finance class or general economics classes." We dichotomized this question and response as 1 if the respondent took a financial or economics class in college or after graduation and 0 if the respondent did not.

The actual questions about financial behavior, financial knowledge, and financial learning activities along with the response rates for each wave are presented in the Appendix.

Parental Financial Socialization

To account for the effects of parental financial socialization, we also considered several variables representing young adults' perception of financial learning from their parents. First, we looked at their perception of their parents as role models (Shim et al. 2010). This variable was a scale computed as the mean of nine items on a five-point scale, ranging from 1 for "Strongly Disagree" to 5 for "Strongly Agree." The scale was centered on the relationships the participants had with their parents in every wave and included the following components: talking about financial security, basing financial decisions off of parents, parents are financial role models for managing finances, parents have positive influence, parents review participant's spending, parents explain establishing credit rating, avoiding parents' financial decisions, parents are role models for financial matters, and parents monitor participant's credit cards. Second, we evaluated the participant's perception of his or her mother's and father's subjective financial knowledge (Shim et al. 2009). These variables were coded in responses to the question asked in Wave 2, "How would you compare your overall knowledge of various financial topics (e.g., college financing, credit card APR and fees, debt management, credit scores, loans, savings, compound interest, mortgaging, stocks, investment, and retirement) to your mother (and father)?" The responses consisted of a five-point Likert scale, ranging from 1 for "Much Less Knowledgeable" to 5 for "Much More Knowledgeable." Since these variables were observed only in Wave 2, we added them as a time-invariant variable.

Control Variables

We also included dichotomous control variables for both the gender (male or female) and race (white or nonwhite) variables given known associations with both financial knowledge and financial behavior (e.g., Fisher and Yao 2017; Gutter et al. 2010).

Table 1 shows the descriptive statistics for the variables we used in these analyses.

Econometric Model

For modeling purposes, we considered two characteristics of the data, the longitudinal structure and the mediation model, in order to investigate the extent to which different educational interventions may correlate with financial knowledge and financial behaviors. For the longitudinal structure of the data set, we used a multilevel model to differentiate individual differences and dynamics that were collected at every wave and those collected at only a single wave. Therefore, we could analyze the correlations of observations including

Table 1 Descriptive statistics for each wave

Variable	Wave 1	Wave 2	Wave 3
Number of observations	640	640	640
Financial behaviors			
Positive behaviors	4.242 (2.019)	3.870 (1.928)	4.228 (2.110)
Negative behaviors	0.547 (0.860)	0.698 (0.860)	0.497 (0.860)
Voluntary learning activities			
Financial advisor	0.089 (0.285)	0.108 (0.310)	0.141 (0.348)
Books and magazines	0.242 (0.429)	0.348 (0.477)	0.305 (0.461)
Workshops and seminars	0.086 (0.281)	0.086 (0.281)	0.101 (0.302)
Websites	0.275 (0.447)	0.330 (0.470)	0.436 (0.496)
Other various sources	0.323 (0.468)	0.334 (0.472)	0.344 (0.475)
High school after-school classes	0.272 (0.445)	—	—
Formal financial learning activities			
College financial classes	0.225 (0.418)	0.483 (0.500)	0.072 (0.258)
High school classes	0.741 (0.438)	—	—
Perception of parents			
Parent as role models	2.929 (0.847)	2.860 (0.960)	2.593 (0.902)
High mother's subjective knowledge	2.734 (1.335)	—	—
High father's subjective knowledge	2.623 (1.448)	—	—
Mediation variable			
Objective financial knowledge	9.652 (2.550)	10.420 (2.487)	11.211 (2.171)
Demographic factors			
Female	0.673 (0.469)	—	—
Nonwhite	0.311 (0.463)	—	—

The values in this table, except for the number of observations, represent the mean (or proportion) of each variable. The subsample we used for this study is a balanced panel. Thus, the number of observations for each wave is 640, and the total sample size by pooling the observations is 1,920. The minimum and maximum values of positive financial behaviors are zero and 10, respectively. Also, the minimum and maximum values of negative financial behaviors are zero and 10, respectively. Formal classes include personal finance and economics

financial learning activities observed across time or at wave 1 only, as well as changes in behavior over time.

For the mediation structure shown in Fig. 1, we used a mediation analysis to estimate the random direct and indirect effects in the multilevel model. A mediator is a variable that explains the effect of independent variables on the outcomes within the regression model, called the mediation model. The mediation model can clarify the relation between the independent and dependent variables.

To consider these two characteristics, we applied a multilevel mediation regression model proposed by Krull and Mackinnon (2001). The multilevel model is used if data has a hierarchical or clustered structure by allowing for residuals at each level in the hierarchy. Our longitudinal data set had a similar data structure used by Krull and Mackinnon (2001). As Fig. 2 shows, some learning activities including participating in formal high school and after-school classes were observed in wave 1 only and individual characteristics including gender and race were time-invariant (level 2). Meanwhile the mediator financial knowledge, financial behaviors, and other learning activities change across waves (level 1). To manage the multilevel structure, we constructed structural equation models for each level and estimated the effects by adding a random intercept in both equations at the individual level (Preacher et al. 2010; StataCorp 2017).

Results

Tables 2 and 3 show the coefficient estimates of the covariates and the mediation variable we used in this study and the corresponding direct and indirect effects.

The mediation variable, objective financial knowledge, was an important factor that correlated with financial behaviors. Participants who had a one-unit-higher level of objective financial knowledge had a 0.165 higher score of having engaged in positive financial behaviors than those who had not. Similarly, participants who had a one-unit-higher level of objective financial knowledge also had a 0.085 lower score of having engaged in negative financial behaviors than those who had not.

For voluntary learning activities, first, the estimation results showed that meeting with a financial advisor was a significant factor that affected positive financial behaviors. The coefficient estimate of financial advising was significant

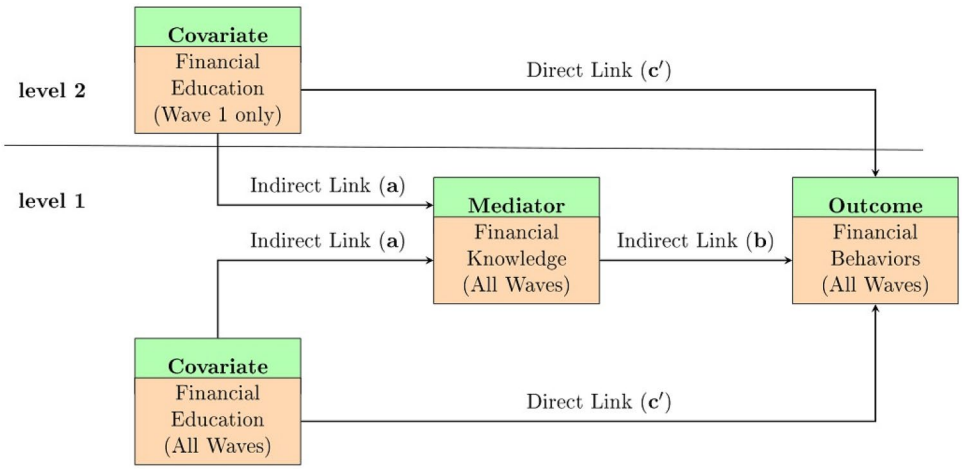

Fig. 2 Structure of mediation model

Table 2 Estimates for positive financial behaviors

	Indirect link		Indirect effect	Direct effect
	Link (a)	Link (b)	(a × b)	Link (c′)
Voluntary learning activities				
Financial advisor	0.122		0.020	1.536***
Books and magazines	0.380**		0.063*	0.906**
Workshops and seminars	− 0.049		− 0.008	0.135
Websites	0.168		0.028	1.065***
Other various sources	0.245*		0.041†	0.800**
High school after-school classes	0.094		0.015	− 0.245
Formal financial learning activities				
College financial classes	0.068		0.011	− 0.296
High school classes	− 0.178		− 0.029†	0.067
Perception of Parents				
Parent as role models	− 0.174**		− 0.029†	1.267***
High mother's subjective knowledge	0.105†		0.017	0.312
High father's subjective knowledge	− 0.137**		− 0.023†	− 0.026
Demographic factors				
Female	− 0.575***		− 0.095*	0.172
Nonwhite	− 0.443**		− 0.073†	− 0.391
Mediation variable				
Objective financial knowledge		0.165*		

***p < 0.001, **p < 0.01, *p < 0.05, †p < 0.1

in increasing positive financial behaviors in a direct way, with a significance level of 0.001, while the effect of financial advising through financial knowledge was not significant. Respondents who had met with a financial advisor or counselor about a future financial plan had a 1.536 higher score of displaying positive financial behaviors directly than those who had not met with a professional. However, this factor did not correlate with negative financial behaviors in either a direct or an indirect way.

Second, reading a book or magazine about personal finance was significantly correlated with the number of positive financial behaviors a respondent reported practicing and how frequently a respondent practiced such positive financial behaviors. The coefficient estimate of this activity was highly significant in increasing positive behaviors as a direct effect. Respondents who had read a book or magazine regarding personal finance had a 0.906 higher score of engaging in positive financial behaviors than those who had not. However, it did not have a significant effect on negative financial behaviors. For the indirect effect, respondents who had read a book or magazine about personal finance had a 0.063 higher score of positive financial behaviors and also had a 0.033 lower score of negative financial behaviors than those who had not done such reading.

Table 3 Estimates for Negative Financial Behaviors

	Indirect link		Indirect effect	Direct effect
	Link (a)	Link (b)	(a × b)	Link (c′)
Voluntary learning activities				
Financial advisor	0.127		− 0.011	0.133
Books and magazines	0.387**		− 0.033*	0.176
Workshops and seminars	− 0.050		0.004	0.802***
Websites	0.172		− 0.015	− 0.156
Other various sources	0.243*		− 0.021†	− 0.062
High school after-school classes	0.093		− 0.008	0.184
Formal financial learning activities				
College financial classes	0.070		− 0.006	− 0.109
High school classes	− 0.179		0.015*	− 0.100
Perception of parents				
Parent as role models	− 0.172**		0.015	− 0.014
High mother's subjective knowledge	0.104†		− 0.009	0.089†
High father's subjective knowledge	− 0.137**		0.012*	0.060
Demographic factors				
Female	− 0.573**		0.049*	− 0.313*
Nonwhite	− 0.444**		0.038*	0.241*
Mediation variable				
Objective financial knowledge		− 0.085**		

***p < 0.001, **p < 0.01, *p < 0.05, †p < 0.1

Last, obtaining information from websites was highly correlated with an increase in positive financial behaviors, while workshops and seminars were highly associated with an increase in negative financial behaviors. Respondents who had used websites for financial knowledge regarding personal finance had a 1.065 higher score of engaging in positive financial behaviors than those who had not. However, respondents who had attended workshops and seminars had a 0.802 higher score of engaging in negative financial behaviors than those who had not.

For the effect of formal classes, first, financial education in college or after graduation did not correlate with any particular level of financial knowledge or any types of behaviors. The estimation results showed that taking general personal finance or economics classes while attending university or after graduation did not influence either positive or negative financial behaviors. Second, formal education in high school had overall nonsignificant effects on positive and negative financial behaviors as a direct effect. However, respondents who took formal financial classes in high school had a positive indirect effect for negative financial behaviors compared to those who had never taken financial classes in high school.

The respondents' perceptions of their parents were also an important factor that affected financial behaviors directly or through financial knowledge. Respondents who perceived their parents as positive role models had a 1.267 higher score of engaging in positive financial behaviors, even though they had lower levels of financial knowledge. However, having parents as positive financial role models was not significant in affecting negative financial behaviors.

In addition, among the set of variables representing a parent's subjective financial knowledge level, only the father's subjective financial knowledge was significant in affecting a young adult's objective financial knowledge and financial behaviors. If respondents evaluated their fathers as being more knowledgeable than they were, they had a 0.023 lower score for positive financial behaviors and an indirect effect of a 0.012 higher score for negative financial behaviors than those who evaluated their fathers as being less knowledgeable than them.

Demographic factors, especially gender and race, generally affected the level of objective financial knowledge indirectly but not directly. A female respondent had a lower probability of being financially knowledgeable than a male, resulting in a female respondent being less likely to engage in positive financial behaviors and more likely to engage in negative financial behaviors than a male respondent. Similarly, nonwhite respondents had a lower probability of having proper financial knowledge than white respondents and were less likely to engage in positive financial behaviors and more likely to engage in negative financial behaviors than nonwhite respondents.

Discussion

Our empirical findings suggest that voluntary, self-directed financial learning activities are the most effective way to improve financial behaviors, while counter to what we had expected, taking formal college and high school personal finance classes are less effective ways. The advantage of voluntary financial learning activities for proper financial behaviors may result from the fact that young adults who seek information from a reputable source of financial knowledge are already interested in the topic and motivated to improve their financial well-being. One reason for this interest and motivation may be a proactive understanding of the need to take personal responsibility for their financial well-being (Pereira and Coelho 2020). Alternatively, it may be a reactive response if they are seeking help when in financial trouble. Thus, we conclude that the voluntary component is a significant factor to improve financial behaviors. This conclusion is consistent with a study that found young adults who have experienced financial difficulties tend to seek out financial professionals (Lim et al. 2014). In that study, the researchers recommended that financial professionals focus on the population most in need of financial services. We find it interesting that those whose parents are good financial role models score higher on positive financial behaviors but do so with lower financial knowledge. These people are seemingly able to mimic the positive behavior of their parents without having a solid financial knowledge grounding.

Effects of Voluntary Education Intervention

Financial advising, first, shows that self-directed information seeking matters in proper financial behaviors. Our estimation results indicate that financial advising might well be an effective way to encourage young adults to engage in more positive financial behaviors. Such advising, if effective, would likely increase positive financial behaviors among young adults. The advantage would result from the voluntariness. Thus, regardless of the proactive or reactive reason for seeking this financial advice, raising awareness and increasing motivation to act is important. This voluntary activity could improve young adults' financial behaviors and give them an opportunity to improve their financial knowledge and skills.

Our findings further indicate that reading a book, magazine, or website dedicated to explaining personal finance practices could also help to increase these positive financial behaviors while at the same time increasing negative financial behaviors. It is possible these resources are misinterpreted by the reader or that the information lacks trustworthiness, resulting in negative financial behaviors. However, timing in seeking such information may be a key to effectiveness (United States Treasury 2019). For instance, these sources enable people to obtain information directly related to a specific topic when they need it (e.g., when it is timely, relevant). This is not the case with most formal financial education classes. Someone, for instance, interested in opening a retirement account can find a book, magazine, or website dedicated to this topic. If that same person were to take a general personal finance course in high school or college, retirement planning would be only one topic among many presented. If this individual was not interested in, say, buying a house (and this topic was covered in the course), he or she, being less interested, might not retain much information regarding the home-buying process. In other words, people who seek specific information because they want to apply it would reap more benefit from relying on sources designed to supply that information in discrete form. Also, our finding that obtaining financial knowledge from websites is correlated with positive financial behaviors may suggest that websites can give students the proper financial knowledge they are demanding, and it in turn increases the probability of practicing positive financial behaviors. However, workshops and seminars provided by a college would fail to provide this proper financial knowledge, and they could possibly increase the likelihood of having negative financial behaviors because people leaving armed with a little bit of financial information—due to the finite amount of time available for a workshop or seminar—may wrongly assume they are now fully knowledgeable and able to make proper financial decisions.

Formal Education Classes

We find formal classes are not correlated with financial knowledge and positive financial behaviors. Meanwhile, students who did take personal finance courses in high school were more likely to engage in negative financial behaviors. This inefficiency likely comes from the fact that these courses have been previously designed for a general population and do not satisfy the varied needs of participants in the classes. Formal classes that focus on personal finance alone are unlikely to play a role in improving financial literacy among young adults. That is to say, we found no evidence suggesting that taking these classes in college would improve an individual's objective financial knowledge, nor would doing so alter someone's financial behaviors. Similarly, we found no evidence to suggest that formal financial classes taken in high school are helpful in directly increasing positive financial behaviors or decreasing negative financial behaviors. This runs counter to what many researchers

assert: the idea that formal classes in school are effective in improving financial literacy (Danes et al. 1999; Varcoe et al. 2005; Walstad et al. 2010). It does, however, support the conclusions reached by other researchers whose studies uncovered empirical evidence suggesting that financial education in school has only a short-term effect on financial literacy (Fernandes et al. 2014; Mandell 2006, 2008; Mandell and Klein 2007) and also that only outdated financial education is ineffective (Willis 2008, 2011). This addition to the existing body of knowledge suggests to us that only receiving a formal education is not enough to induce proper financial behavior (e.g., Friedline and West 2016). Part of the problem, as we have said, may be the timing. This is especially true if a student has a myopic viewpoint because then the student may decide that certain pieces of financial information will not matter immediately and therefore are not worth remembering.

Sociodemographic Effects

Moreover, differences in gender and race might matter. The female respondents in our database scored lower on financial knowledge questions than the male respondents, and this shortcoming reduces positive financial behaviors and increases negative financial behaviors. Kim and Mountain (2019) found gender results consistent with this by using the 2015 National Financial Capability Study to examine the financial knowledge of those between the ages of 18 and 24. However, they conclude that this difference is due to females more often answering knowledge questions with a "don't know" or "refuse to answer" response. Such response items were not options in the financial knowledge questions in this study. Also, consistent with Lusardi and Mitchell (2007b), nonwhite respondents achieved lower scores on financial knowledge questions, thus reducing their positive financial behaviors while also increasing their negative financial behaviors.

Mediation Effects

Our analysis assumed that objective financial knowledge would function as a mediator to explain how potential covariates improved financial behaviors. For example, reading books and magazines increases objective financial knowledge and in turn decreases negative financial behaviors even though reading books and magazines does not directly reduce these negative financial behaviors. Some researchers argue that increasing financial knowledge is not an effective strategy to improve financial behaviors among young adults, and that may be the case if one focuses solely on the direct effect. However, they overlook the potential mediating mechanisms of financial learning activities and financial behaviors. If we find potential covariates that increase financial knowledge, it is possible that they improve financial behaviors indirectly, for example, by increasing the positive financial behaviors and/or decreasing negative behaviors, despite the lack of a significant direct effect on either. The effect of the mediator may depend on the significance of link (b) in Figs. 1 and 2 because indirect effects never exist if the mediator is not significant. If it is significant, we can find any significant covariates as sources of indirect effect. In our analysis, financial knowledge plays an important role as a strong mediator because, as noted in Tables 2 and 3, financial knowledge is a statistically significant mediator.

Implications

In our attempt to find relationships between financial learning, financial knowledge, and financial behaviors, we used a subset of financial knowledge questions used by Hilgert et al. (2003) that differed from Lusardi and Mitchell (2011a). The data we used had questions that elicited general financial knowledge and asked the respondents about both positive and negative financial behaviors. The financial knowledge questions we used, acting as a mediation variable, were shown to be statistically significant in determining positive and negative financial behaviors. Thus, it would seem that the scores achieved on the objective financial knowledge questions used in this longitudinal study would be an appropriate measure of financial literacy and of positive and negative financial behaviors in particular.

We further suggest that as a matter of policy, young adults should be provided financial services or programs that assess not only what they know, but if they know how to apply this knowledge. Such policies could also effectively determine what level of financial knowledge is needed to engage in positive financial behaviors. With a more accurate assessment of their financial situations, they might be motivated to seek financial solutions to address their specific financial difficulties and might feel encouraged to learn about financial activities that are the best fit for their own financial situations. Also, we need to help those who are in need of financial services with one-to-one counseling or personal advisors who are available on campus or in community centers that reach out to young adults. Parents and educators should encourage young adults to seek voluntary learning activities. Educators could make a list of resources available for students who are seeking financial education. For universities, we propose this list should not be tied to a specific department or college but instead posted somewhere all university students would come across. We also propose

the list not be targeted solely toward incoming freshmen or graduating seniors but made available to all class cohorts at the institution. Formal education course offerings could be included as a part of this list. Parents should encourage their children to seek as much financial education as possible and also be positive financial role models and convey to their children that the world of personal finance is constantly changing and that no one source has all of the answers. This may complement the positive money management results found from children participating in experiential learning with their parents (LeBaron et al. 2019).

Limitations and Future Research Directions

In this study, we faced several data and modeling limitations. For one, all our respondents were college students who attended the same university in the southwestern part of the United States. Thus, we cannot apply our findings to young adults who did not attend college or live in the southwest. In addition, we analyzed only Waves 1, 2, and 3 of the data set. For formal education courses, we are unable to distinguish between a personal finance course and an economics course. If we could, we may find more positive results for those who took personal finance courses. Further, we did not consider endogeneity. The marginal effects of several predictors may not be actual causal effects on financial behaviors. For example, whether attending workshops or seminars focused on personal finance directly increases negative financial behaviors likely goes back to the individual's proactive or reactive motivation to learn.

Further, not all voluntary financial learning activities may actually be voluntary. For example, a participant could have regarded attendance to a seminar or workshop to be voluntary when in fact it had been stipulated as a prerequisite. In contrast, meeting with financial advisors, reading books and magazines, and seeking information on the Internet are more likely to be voluntary activities. As noted, we should seek answers to the questions that concern effective financial knowledge because these answers will likely lead to improved financial behaviors in young adults. For this reason, we should analyze the questions proposed by APLUS and verify whether the answers to behavioral questions more effectively explain the effect of financial behaviors than answers about general knowledge. However, two mediation variables did increase the computation time and could generate unreliable results in our model. To remedy this, we would have to focus on the issue in a future research study and apply models that would examine our argument more thoroughly.

Conclusions

We conducted this study as a way to determine whether different financial learning activities would be correlated with objective financial knowledge and financial behaviors. To achieve this purpose, we analyzed the three waves of data collected as part of the APLUS longitudinal data set by applying the panel and mediation regression model. Based on the estimation results of our analysis, we conclude that one's act of seeking voluntary learning activities can effectively improve one's financial behavior and literacy. The reasons for this may be that individuals who are attending voluntary learning activities are more ready to make behavior change than those who are attending a formal financial education course in high school or college. The transtheoretical model of health behavior change (Prochaska and Velicer 1997) would support this notion. Also, we conclude that the behavioral questions included in this data set (as opposed to general financial knowledge questions) can serve as an alternative measure for evaluating financial literacy. We have made policy suggestions and encourage educators and parents to promote a wider net of financial learning activities than what is typically suggested.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.

Appendix

See Table 4

Table 4 Actual questions of financial behavior, financial knowledge, and financial learning activities

Variable	Description				
Financial knowledget	Q1. If you expect to carry a balance on your credit card, the APR is the most important thing to look at when comparing credit card offers				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	40.4%	40.4%	74.7%
	1	True	59.6%	59.4%	25/0%
	Missing		–	0.2%	0.3%
	Q2. Your credit card report includes employment data, your payment history, and any inquiries made by creditors, and any public record information				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	28.3%	19.3%	80.1%
	1	True	71.7%	80.4%	19.7%
	Missing		–	0.3%	0.2%
	Q3. If you have a savings account at a bank, you may have to pay taxes on the interest you earn				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	50.2%	38.5%	68.1%
	1	True	49.8%	61.3%	31.6%
	Missing		–	0.2%	0.3%
	Q4. Mutual funds pay a guaranteed rate of return				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	61.3%	64.8%	31.1%
	1	True	38.7%	34.3%	68.6%
	Missing		–	0.9%	0.3%
	Q5. If you have any negative information on your credit report, a credit repair agency can help you remove that information				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	64.9%	69.4%	35.2%
	1	True	35.1%	29.5%	64.3%
	Missing		–	1.1%	0.5%
	Q6. If the interest rate on an adjustable-rate mortgage loan goes up, your monthly mortgage payments will also go up				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	26.1%	25.0%	76.9%
	1	True	73.8%	74.4%	21.5%
	Missing		0.1%	0.6%	1.6%
	Q7. If you buy certificates of deposit, saving bonds, or Treasury bills, you can earn higher returns than you can earn on a savings account, with little or no adding risks				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	37.3%	28.7%	71.9%
	1	True	62.6%	70.5%	27.0%

Table 4 (continued)

Variable	Description				
	Missing		0.1%	0.8%	1.1%
	Q8. You could save thousands of dollars in interest costs by choosing a 15-year mortgage rather than a 30-year mortgage				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	33.5%	18.6%	86.7%
	1	True	66.5%	80.7%	13.0%
	Missing		–	0.6%	0.3%
	Q9. Making payments late on your bills can make taking out a loan difficult				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	10.4%	6.0%	98.0%
	1	True	89.6%	93.2%	2.0%
	Missing		–	0.8%	–
	Q10. With compound interest, you earn interest on your interest as well as on your principal				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	23.5%	13.3%	91.5%
	1	True	76.3%	85.8%	8.5%
	Missing		0.2%	0.9%	–
	Q11. Your credit rating is not affected by how much you charge on your credit cards				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	71.7%	78.4%	17.4%
	1	True	28.3%	20.7%	82.0%
	Missing		–	0.9%	0.6%
	Q12. A stock mutual fund combines the money of many investors to buy a variety of stocks				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	27.3%	19.7%	85.3%
	1	True	72.7%	79.5%	14.2%
	Missing		–	0.8%	0.5%
	Q13. The finance charge on your credit card statement is what you pay in order to use credit				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	36.8%	39.2%	61.8%
	1	True	63.3%	59.9%	37.4%
	Missing		–	0.9%	0.8%
	Q14. Over the long term, stocks have the highest rate of return on money invested				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	50.5%	48.2%	49.0%
	1	True	49.5%	50.5%	50.2%
	Missing		–	1.3%	0.8%

Table 4 (continued)

Variable	Description				
	Q15. Using extra money in a bank savings account to pay off a high interest rate credit card debt is a good idea				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	False	35.7%	25.3%	80.1%
	1	True	64.3%	73.6%	19.0%
	Missing		–	1.1%	0.9%
Positive financial behaviors	Q1. Budgeted on a regular basis				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	6.8%	9.2%	8.2%
	2	Rarely	15.6%	18.2%	17.1%
	3	Sometimes	30.5%	29.2%	30.0%
	4	Often	28.3%	24.3%	19.9%
	5	Very often	18.8%	19.1%	24.8%
	Q2. Tracked monthly expenses				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	3.6%	8.5%	7.4%
	2	Rarely	10.3%	14.9%	13.0%
	3	Sometimes	24.3%	22.6%	22.3%
	4	Often	32.9%	31.6%	25.6%
	5	Very often	28.9%	22.4%	31.7%
	Q3. Spent within the budget				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	1.4%	3.6%	4.1%
	2	Rarely	4.6%	9.2%	9.3%
	3	Sometimes	19.1%	23.8%	28.3%
	4	Often	38.2%	37.3%	29.9%
	5	Very often	36.7%	26.1%	28.4%
	Q4. Paid bills on time each month				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	4.4%	1.0%	0.8%
	2	Rarely	1.7%	1.9%	1.7%
	3	Sometimes	10.3%	4.9%	8.8%
	4	Often	21.0%	18.3%	16.0%
	5	Very often	62.6%	73.9%	72.7%
	Q5. Paid off my credit card balance in full every month				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	72.5%	62.6%	82.0%
	2	Rarely	10.4%	14.7%	7.9%
	3	Sometimes	9.5%	11.5%	5.4%
	4	Often	4.6%	6.8%	2.8%
	5	Very often	3.0%	4.4%	1.9%
	Q6. Saved money each month for the future				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	15.0%	11.7%	14.1%
	2	Rarely	3.3%	8.2%	8.4%
	3	Sometimes	10.7%	12.0%	11.5%
	4	Often	14.2%	13.6%	10.1%
	5	Very often	56.7%	54.5%	55.9%

Table 4 (continued)

Variable	Description				
	Q7. Contributed to an investment or retirement account				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	83.7%	73.6%	73.3%
	2	Rarely	7.1%	11.2%	10.1%
	3	Sometimes	6.6%	7.3%	8.2%
	4	Often	1.9%	5.4%	4.7%
	5	Very often	0.6%	2.5%	3.6%
	Q8. Invested for long-term financial goals				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	10.0%	14.5%	15.3%
	2	Rarely	16.0%	26.7%	19.1%
	3	Sometimes	30.0%	25.6%	21.3%
	4	Often	23.2%	18.3%	16.1%
	5	Very often	20.8%	14.9%	28.1%
Negative financial behaviors	Q1. Borrowed money from credit cards				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	53.7%	62.4%	45.8%
	2	Rarely	15.3%	14.5%	8.5%
	3	Sometimes	14.9%	9.6%	11.4%
	4	Often	9.0%	6.8%	9.0%
	5	Very often	7.1%	6.6%	25.3%
	Q2. Maxed out credit card limit				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	89.1%	94.0%	95.1%
	2	Rarely	3.8%	3.3%	1.1%
	3	Sometimes	5.1%	1.1%	2.4%
	4	Often	1.3%	1.1%	0.5%
	5	Very often	0.8%	0.5%	0.9%
	Q3. Used payday loan services				
	Value	Label	Wave 1	Wave 2	Wave 3
	1	Never	38.5%	46.8%	42.5%
	2	Rarely	14.4%	18.3%	15.5%
	3	Sometimes	22.6%	15.6%	14.2%
	4	Often	14.4%	11.5%	12.5%
	5	Very often	10.1%	7.7%	15.3%
Voluntary/formal financial learning activities	Q. During the past 2 years (since coming to the University of Arizona in wave 1), did you engage in any of the following activities?				
	A1. Read a book or a magazine about personal finance (voluntary)				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	No	76.1%	65.1%	69.3%
	1	Yes	23.9%	34.9%	30.7%
	A2. Attended a workshop(s) or seminar(s) about how to manage personal finance (e.g., Credit-Wise Cats) (voluntary)				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	No	91.5%	91.6%	89.7%
	1	Yes	8.5%	8.4%	10.3%

Table 4 (continued)

Variable	Description				
	A3. Took a personal financial class (formal)				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	No	77.6%	51.7%	92.7%
	1	Yes	22.4%	48.3%	7.3%
	A4. Checked websites about money management or investment (voluntary)				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	No	72.7%	67.3%	56.4%
	1	Yes	27.3%	32.7%	43.6%
	A5. Met with a financial advisor or counselor about a future financial plan (voluntary)				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	No	91.0%	89.7%	86.1%
	1	Yes	9.0%	10.3%	13.9%
	A6. Obtained new knowledge about personal financial management from various sources (voluntary)				
	Value	Label	Wave 1	Wave 2	Wave 3
	0	No	68.1%	66.7%	65.6%
	1	Yes	31.9%	33.3%	34.4%
	Q. During your high school years, how many seminars, workshops, or after- school programs that taught financial management did you attend? (voluntary)				
	Value	Label	Wave 1		
	1	None	72.8%		
	2	1 seminar/workshop	18.0%		
	3	2 seminar/workshop	5.9%		
	4	3 or more	3.3%		
	Q. While in high school, how many courses did you take related to personal financial management, consumer education, economics or business? (formal)				
	Value	Label	Wave 1		
	1	None	25.8%		
	2	1 course	48.3%		
	3	2 courses	20.7%		
	4	3 or more	5.2%		

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Travis P. Mountain Assistant Professor and Extension Specialist in the Agricultural and Applied Economics Department at Virginia Tech. His research interests include efficacy of financial education, applications of behavioral economics, and household financial behavior. He earned his Ph.D. in Family Resource Management from The Ohio State University.

Namhoon Kim Research Fellow at Korea Rural Economic Institute in South Korea. His research interests include consumer economics, health economics, and applied econometrics. He earned his Ph.D. in Economics from the Virginia Tech.

Joyce Serido Associate Professor/Extension Specialist in Family Social Science at the University of Minnesota, studies financial behavior at the intersection of family processes and personal well-being, focusing on youth and young adults. Dr. Serido holds an MBA in finance from Seton Hall University and a Ph.D. in Family Studies and Human Development from the University of Arizona. She is the principal investigator for *Arizona Pathways to Life Success for University Students (APLUS),* a longitudinal research study.

Soyeon Shim Dean and Ted Kellner-Bascom Professor in the School of Human Ecology at the University of Wisconsin, Madison. Dr. Shim has authored or co-authored over 100 scholarly articles in refereed journals on research topics regarding consumer decision-making and young adults' financial behaviors. She has received numerous teaching, research, development, and leadership awards. She received her Ph.D. from the University of Tennessee, Knoxville in 1986.