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ORIGINAL PAPER

Financial Knowledge and Short-Term and Long-Term Financial Behaviors of Millennials in the United States

Kyoung Tae Kim[1] · **Somer G. Anderson**[2] · **Martin C. Seay**[3]

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Abstract
This study investigates the role of financial knowledge in various short-term and long-term financial behaviors among Millennials in the United States. Results from the 2015 National Financial Capability Study (NFCS) indicate that Millennials have lower levels of objective financial knowledge and similar levels of perceived financial knowledge as compared to all households. Consistent multivariate results find financial knowledge to be positively associated with performing positive short-term and long-term financial behaviors. Results are found to be robust across different measurements of financial knowledge and behavior, and the issue of the potential for reverse causality is specifically addressed. This study provides a comprehensive financial profile of Millennials with important insight for policymakers as well as financial practitioners.

Keywords Financial literacy · Financial knowledge · Financial education · Financial behaviors · Millennials

JEL Classification D12 · D14

The Millennial generation is the largest in US history and represents almost one-third of the US population (Mottola 2014). Currently between their early twenties and late thirties, Millennials are in a period of life that is fraught with financial behaviors that will heavily influence lifetime financial well-being. These financial behaviors require Millennials to possess both the financial knowledge to evaluate financial tradeoffs and the capability to apply that knowledge to their specific circumstances. However, evidence has suggested that Millennials' level of financial knowledge is significantly lower than that of previous generations (FINRA 2013; Mottola 2014). Given that Millennials will comprise 75% of the global workforce by the year 2025 (Schawbel 2012), the rising importance of this generation necessitates an assessment of the financial knowledge of Millennials and the role it plays in influencing their financial behaviors.

Broadly defined as Americans born between the early 1980s and 2000s, the Millennial generation encompasses between 70 and 80 million Americans (de Bassa Scheresberg and Lusardi 2014). Demographically, Millennials differ from previous generations in a number of critical ways. They are more diverse, with 43% of Millennials belonging to a minority or ethnic group, as compared to 28% of Baby Boomers (Pew Research Center 2015). Millennials are on track to be the most educated generation in US history (Pew Research Center 2010). The makeup of millennial households is also different from previous generations, with marriage and children being significantly delayed. The percentage of adult Millennials reporting being married in 2010 was roughly half the percentage of that reported by the previous generation in the same period of life (Pew Research Center 2010).

The Millennial generation entered the workforce in the post-great recession economy and is faced with both higher unemployment and lower wages than previous generations at the same life stage. Further, the number and complexity of financial instruments has increased exponentially over the last 20 years, providing a much more complicated market for

✉ Kyoung Tae Kim
ktkim@ches.ua.edu

Somer G. Anderson
sanderson6@maryville.edu

Martin C. Seay
mseay@ksu.edu

[1] Department of Consumer Sciences, University of Alabama, Tuscaloosa, AL 35487, USA

[2] School of Business, Maryville University, St. Louis, MO 63141, USA

[3] School of Family Studies and Human Services, Kansas State University, Manhattan, KS 66502, USA

Millennials to navigate. It is perhaps not surprising then that Millennials tend to exhibit more negative financial behaviors than previous generations. For instance, Millennials report spending more than their income (Mottola 2014), having no savings for a rainy day (Mottola 2014), overdrawing their checking accounts (de Bassa Scheresberg and Lusardi 2014) and borrowing from their retirement accounts (de Bassa Scheresberg and Lusardi 2014) at a greater rate than previous generations. This generation already holds 30% of US consumer debt, as increasing student and auto loan debt outpace a decrease in home mortgages (Hernandez 2017). Another difference between Millennials and other generations is in their use of banks. Millennials rely less on traditional banking arrangements than previous generations, and are more likely to be unbanked, use high-cost alternative financial services such as payday loans, and use prepaid debit cards or mobile payments (Mottola 2014).

The financial behaviors of Millennials are particularly concerning given research that has indicated Millennials possess significantly lower levels of financial knowledge than previous generations. For example, only 27% of young adults in the 2012 National Financial Capability Study could correctly answer questions about inflation, risk diversification, and simple interest rate calculations (Mottola 2014). In the same study, only 24% of Millennials answered four or five financial knowledge quiz questions correctly, compared to 38% of respondents in Generation X, 48% of Baby Boomers, and 55% of the Silent Generation. This difference is critical, as households with lower levels of financial knowledge are less likely to plan for retirement (Lusardi and Mitchell 2014), less likely to have savings (Smith et al. 2010), more likely to default on mortgage payments (Gerardi et al. 2013), and more likely to use high-cost alternative financial services (Robb et al. 2015).

This study expands previous research by investigating the relationship between financial knowledge and financial behaviors among Millennials within two dimensions: long-term and short-term financial behaviors. Data were used from the 2015 National Financial Capability Study (NFCS) to provide a comprehensive financial profile of Millennials, and a series of analyses were conducted to isolate the role of financial knowledge on these various financial behaviors. Results indicated that financial knowledge was related to an increased probability of exhibiting more positive short-term and long-term financial behaviors, as measured on separate financial behavior indices. Results were robust across different measurements of financial knowledge. We also investigated the issue of reverse causality and provided evidence that reverse causality did not explain our results based upon the arguments posed by Allgood and Walstad (2016).

Literature Review

Financial Knowledge and Financial Behaviors

Among the larger US population, financial knowledge has consistently been linked to positive financial behaviors such as paying off credit cards monthly (Allgood and Walstad 2016), planning for retirement (Lusardi and Mitchell 2014), making timely mortgage payments (Gerardi et al. 2013), maintaining lower costs associated with credit cards and mortgage loans (Huston 2012), having precautionary savings (de Bassa Scheresberg 2013), and seeking financial advice (Allgood and Walstad 2016). Moreover, higher levels of objective financial knowledge have been positively associated with earning positive investment returns (Chu et al. 2017), engaging in long-term financial behaviors related to saving and investing (Henager and Cude 2016), and reducing the odds of using high-cost alternative financial services such as pawn shops and tax refund anticipation loans (Robb et al. 2015).

In addition to objective financial knowledge, a number of studies have investigated the effect of subjective financial knowledge on financial behaviors. Perceived financial knowledge has typically been measured through self-assessment questions such as "how would you assess your overall financial knowledge?" (Lusardi and Mitchell 2017) and has been found to explain as much variation in financial behaviors as objective financial knowledge. For instance, Allgood and Walstad (2016) found that perceived financial knowledge was associated with investment behaviors, no matter the level of objective financial knowledge, and that objective financial knowledge was only positively related to good debt behaviors when perceived financial knowledge was low. Further, Henager and Cude (2016) suggested that perceived financial knowledge had a stronger relationship than objective knowledge with short-term financial behaviors related to spending and emergency saving. Finally, Montford and Goldsmith (2016) found that financial self-efficacy, or an individual's belief in their capability to reach their financial goals, was positively related to investment risk taking.

Although some research has found positive association between perceived financial knowledge and financial behaviors, other research has identified the presence of an overconfidence effect. Overconfidence in financial knowledge occurs when an individual's perceived financial knowledge is greater than his or her objective financial knowledge (Chu et al. 2017; Robb et al. 2015). Robb et al. (2015) found that higher levels of overconfidence in financial knowledge was associated with greater odds of high-cost alternative financial services use, even when controlling for objective need for these services. Moreover, Chu et al. (2017) suggested that financially overconfident households were more likely to

directly invest in stocks than to diversify with mutual funds, potentially an indication of risky financial behavior.

A number of studies have investigated the effectiveness of financial education, with results of these studies providing mixed results. Although Gale and Levine (2011) suggested financial education could improve financial outcomes through a review of non-experimental evidence, Hastings et al. (2013) and Fernandes et al. (2014) indicated that unobserved characteristics about individuals who participate in financial education, in the context of non-experimental evidence, could bias this result. Collins and O'Rourke (2010) reviewed evidence from existing evaluations of financial education and counseling programs for adults and found that, although most evaluations reported positive impacts, results were typically small in size and lack randomized design. Miller et al. (2015) conducted a meta-analysis of 188 papers that evaluated financial education interventions across a variety of topics and populations. The authors found that the effectiveness of financial education was domain specific, with more positive results in areas such as increasing savings but less effectiveness in areas such as paying down debt.

Financial Profile of Millennials

Millennials are the largest generation in American history. This generation faces a unique financial challenge because they have the largest amount of student loan debt in US history, earn record-low income in an economy that is still recovering from the great recession, and cannot count on Social Security being available to them in retirement. These financial struggles are apparent when comparing the financial profile of Millennials to that of previous generations. According to Mottola (2014), 65% of millennial households make less than $50,000 per year, nearly half have financial dependents, 23% spend more than their income, and 31% have unpaid medical bills. Millennials tend to possess fewer credit cards than previous generations, but those who do have them engage in costly credit card behaviors like carrying a balance, being charged late or over-the limit fees, paying only the minimum amount, and taking out cash advances (Mottola 2014). These costly credit card behaviors are similar to those of Generation X, but they occur at a rate that is ten percentage points above the Baby Boomers and 20 percentage points above the Silent Generation (Mottola 2014). Millennials are also highly leveraged in terms of long-term debt. According to de Bassa Scheresberg and Lusardi (2014), nearly two-thirds of Millennials have at least one source of outstanding long-term debt and 30% have more than one source. These percentages increase when looking at only college-educated Millennials. Eighty-one percent of college-educated Millennials have at least one source of outstanding debt and 44% have more than one source (de Bassa Scheresberg and Lusardi 2014). Millennials are carrying fewer mortgages than previous generations; however, 24% of millennial mortgage holders have been late with one or more mortgage payment within the past two years (de Bassa Scheresberg and Lusardi 2014).

These financial challenges are causing concern for Millennials. Fifty-five percent of Millennials with student loans have concerns about their ability to pay off their debts (Mottola 2014). Fifty-three percent agree that they have "too much debt right now" and 32% of millennial homeowners believe their home mortgages are under water (de Bassa Scheresberg and Lusardi 2014). Fifty-four percent of Millennials with student loan debt are concerned about their ability to pay them off. These concerns were even present in those with higher income and those who had been out of college for some time. For example, thirty-four percent of Millennials with annual household income above $75,000 and 54% above age 30 expressed doubt that they could repay their student loans (de Bassa Scheresberg and Lusardi 2014). Although Millennials appear to understand and worry about the financial challenges they are facing, they are reluctant to seek financial advice from professionals. Only 41% reported seeking financial advice within the past 5 years; and among those respondents who felt they had too much debt, only 17% sought debt counseling (de Bassa Scheresberg and Lusardi 2014).

Several studies have been undertaken to gain an understanding of millennial financial knowledge and behaviors. Results of these studies suggest that Millennials have lower objective financial knowledge than previous generations. Twenty-four percent of Millennials can answer four out of five objective financial knowledge questions correctly, compared to 55% of the silent generation (Mottola 2014). This trend continues on a per-question basis, but Millennials do much worse on an inflation question than other generations (Mottola 2014). Millennials correctly answer an interest rate question at a higher percentage than the other four questions, but they still answer that question correctly at a much lower rate than other generations (Mottola 2014).

Despite the lower rates of objective financial knowledge, Millennials tend to rate themselves highly on their financial management skills, suggesting that they might be overconfident in their financial capabilities. Seventy-four percent agree that they are good at dealing with day-to-day financial matters like checking accounts, credit and debit cards, and tracking expenses; and 70% feel they have high financial knowledge (de Bassa Scheresberg and Lusardi 2014). A key finding from Henager and Cude's study (2016) suggested that younger cohorts engage in positive financial behaviors when they have the confidence and ability to do so (perceived knowledge), whereas older cohorts tend to rely on actual financial knowledge to perform positive financial behaviors (Henager and Cude 2016).

Previous study results suggested that financial education and financial inclusion were factors in millennial financial behaviors. Millennials were offered financial education at a much higher rate than other generations, but they were less likely to participate when it was offered to them (Mottola 2014). Friedline and West (2016) found that Millennials who are financially capable, defined as having financial education and a savings account, increased the likelihood of affording $2000 of unexpected expenses by 176%. Although Millennials are dealing with financial challenges and appear to be ill-equipped with the financial knowledge and capability necessary to overcome them, millennial financial satisfaction levels are similar to other generations (Mottola 2014), suggesting that Millennials might not fully understand the financial challenges that are facing them or that they are judging their own situations relative to those in their peer group.

Theoretical Framework and Hypotheses

This association between financial knowledge and financial behavior is grounded within the theory of bounded rationality (Simon 2000) and has been used in previous studies investigating financial behavior (Kim et al. 2016; Robb et al. 2015; Seay et al. 2017). The theory of bounded rationality indicates that individuals are limited in their ability to evaluate and choose optimal behaviors. While choices may often appear to be contradictory, and potentially irrational, disparate choices are made due to three major challenges experienced by the consumer: (a) the environments they exist in are complex; (b) individuals' mental capacities are limited; and (c) resources, such as time or money, are both finite and scarce (Ibrahim 2009). Within the context of financial behaviors, financial knowledge measures one's ability to understand the financial environment they exist within and their ability to evaluate and determine optimal courses of action. Consequently, individuals with higher financial knowledge would be expected to exhibit consistently more optimal behavior. As indicated above, the literature has consistently established that financial knowledge is positively associated with financial behaviors.

Moreover, previous research has provided evidence that Millennials exhibit lower financial knowledge than previous generations. Given that the Millennial generation is the largest in American history and their financial behaviors will soon drive the US economy, it is important to explore the factors related to those financial behaviors. This study contributes to the existing literature by providing a more comprehensive understanding of the relationship between financial knowledge and financial behaviors among Millennials within two dimensions: short-term and long-term financial behaviors. Based upon the theory of bounded rationality, the following hypotheses were explored.

Hypothesis 1 Financial knowledge is associated with positive short-term financial behaviors of Millennials.

Hypothesis 2 Financial knowledge is associated with positive long-term financial behaviors of Millennials.

Methods

Dataset and Sample Selection

Data from the 2015 National Financial Capability Study (NFCS) State-by-State Survey Instrument were utilized in this study. The NFCS was administered from June through October of 2015 by the Financial Institution Regulatory Authority (FINRA) as part of an effort by the FINRA Investor Education Foundation (FINRA Foundation), who, in consultation with the US Department of the Treasury, commissioned the first NFCS in 2009 with the intent to explore the financial capability of US households and investigate differences associated with demographic, attitude, behavior, and financial literacy characteristics. The survey was administered on a state-by-state basis with approximately 500 observations from each state and the District of Columbia. From the original 27,564 respondents, our analytic sample was limited to 6784 respondents who were within the 18–34[1] age range.

Dependent Variables

Both long-term and short-term financial behaviors served as dependent variables for this study and were measured via previously developed indices (Henager and Cude 2016). The short-term financial behavior index was constructed from four questions that related to the presence of an emergency fund, spending in relation to income, overdrawing a checking account, and use of a budget. The long-term financial behavior index was constructed of four questions related to planning the amount necessary for retirement, ownership of retirement plans, ownership of investments outside of retirement accounts, and setting long-term financial goals. Each answer was coded as a binary variable and responses were summed to construct two indices that ranged from scores of 0 to 4. Specific questions used from the 2015 NFCS can be found in Table 1.

[1] With respect to financial knowledge variables, we dropped cases where the respondent chose "prefer not to say" as the answer to the objective financial knowledge questions and financial behavior questions and where the respondent answered, "prefer not to say" or "don't know" to the perceived financial knowledge question. All other "prefer not to say" responses to the control variables were also excluded.

Table 1 Description of key variables in the 2015 NFCS

Variable	Description
Short-term financial behaviors	
Emergency funds	"Have you set aside emergency or rainy day funds that would cover your expenses for 3 months, in case of sickness, job loss, economic downturn, or other emergencies?" 1. Yes 2. No
Spending	"Over the past year, would you say your spending was less than, more than, or about equal to your income? Please do not include the purchase of a new house or car, or other big investments you may have made." 1. Yes 2. No
Overdrafts	"Do you overdraw your checking account occasionally?" 1. Yes 2. No
Budgeting	"Does your household have a budget? A household budget is used to decide what share of your household income will be used for spending, saving or paying bills." 1. Yes 2. No
Long-term financial behaviors	
Retirement planning (amount needed)	"Have you ever tried to figure out how much you need to save for retirement?" 1. Yes 2. No
Retirement account (ownership)	"Do you have any retirement plans through a current or previous employer, like a pension plan or a 401(k)?" "Do you have any other retirement accounts NOT through an employer, like an IRA, Keogh, SEP, myRA, or any other type of retirement account that you have set up yourself?" 1. Yes 2. No
Investments (ownership)	"Not including retirement accounts, do you have any investments in stocks, bonds, mutual funds, or other securities?" 1. Yes 2. No
Financial goals	"I set long term financial goals and strive to achieve them." 1. Yes 2. No
Objective financial knowledge	
Interest	"Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?" 1. More than $102 2. Exactly $102 3. Less than $102
Inflation	"Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?" 1. More than today 2. Exactly the same 3. Less than today
Bond price	"If interest rates rise, what will typically happen to bond prices?" 1. They will rise 2. They will fall 3. They will stay the same 4. There is no relationship between bond prices and the interest rate
Mortgage	"A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less." 1. True 2. False
Portfolio	"Buying a single company's stock usually provides a safer return than a stock mutual fund." 1. True 2. False

Table 1 (continued)

Variable	Description
Subjective financial knowledge	''On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your overall financial knowledge?''
Financial education	"Was financial education offered by a school or college you attended, or a workplace where you were employed?" 1. Yes, but I did not participate in the financial education offered 2. Yes, and I did participate in the financial education 3. No

Key Independent Variables

The key independent variables for this analysis were levels of objective financial knowledge, perceived financial knowledge, and having completed a financial education course. Objective financial knowledge was based on the five questions created and used by Lusardi and Mitchell (2011, 2017) and it was measured in three ways. First, a financial knowledge index was constructed using the iterated principal factor method. Consistent with Lusardi and Mitchell (2009) and van Rooij et al. (2011), factor loadings were generated using the iterated principal factor method that captured the extent to which each variable contributed to the shared variation among the financial knowledge measures. The Bartlett method was then used to obtain a composite index of financial knowledge. Table 2 presents factor loadings of financial knowledge questions. Second, the number of correct answers were summed, with scores ranging from 0 to 5. Additionally, a binary indicator was created to indicate correctly answering all five questions (1 = yes, 0 = no). Perceived financial knowledge was based on a self-assessment using a Likert-type scale that ranged from 1, very low, to 7, very high. Financial education was based on whether the respondent had reported participating in financial education offered by an educational institution or a workplace (1 = yes, 0 = no). Specific questions used from the 2015 NFCS can be found in Table 1.

Control Variables

A variety of demographic and socioeconomic characteristics have been found to be associated with financial behaviors (Finke et al. 2016; Henager and Cude 2016; Lusardi and Mitchell 2007). Consequently, this study included control variables for household characteristics as follows: age, gender (male, female), race (White, Black, Hispanic, Asian/others), marital status (married, single, separated/divorced/widowed), presence of dependent child(ren) (yes/no), employment status (self-employed, full-time worker, part-time worker, homemaker, student, disabled, unemployed), education (less than high school, high school diploma, some college, bachelor degree, post-bachelor degree), and household income. Lastly, we also controlled for region, using the state of residence variable, to account for the variation in financial behaviors due to the unobserved regional sentiments towards various financial behaviors or differences in state-level policies.

Empirical Specification

Analyses were conducted in two stages. First, a series of eight binary logistic analyses were conducted to investigate each short-term and long-term financial decision individually. To provide a more comprehensive understanding, follow up analyses were conducted to evaluate the short-term and long-term financial behavior indices. Given the ordered nature of these variables, we conducted two ordered logistic regression analyses. These analyses should provide a more comprehensive understanding of the relationship between objective financial knowledge, perceived financial knowledge, financial education, and the financial behaviors of Millennials. The NFCS provides a survey weight to be representative of the national population in terms of age, gender, ethnicity, education and Census Division (with adjustments for the oversampled states for comparability with previous survey years). All of our results were weighted using these normalized weights.

Table 2 Factor loadings corresponding to the five financial knowledge questions, 2015 NFCS

Financial knowledge questions	Factor loadings
Interest	0.6228
Inflation	0.7269
Bond price	0.4918
Mortgage	0.6172
Portfolio	0.6779
Cronbach'sα	0.6187

Table 3 Financial characteristics of millennials and all households, 2015 NFCS

Variable	Percentage	
	Millennials (N = 6784)	All households (N = 23,369)
Short-term behaviors	Mean (S.D.): 2.44*** (1.23)	Mean (S.D.): 2.59 (1.09)
Emergency funds (ownership)	41.17%	47.96%
Spending less than income	76.13%	79.59%
No overdrafts	61.64%	73.87%
Budgeting	60.17%	57.85%
Long-term behaviors	Mean (S.D.): 1.86*** (1.49)	Mean (S.D.): 1.98 (1.36)
Retirement planning (amount needed)	38.77%	43.73%
Retirement account (ownership)	47.43%	62.31%
Investments (ownership)	29.74%	31.94%
Financial goals	69.56%	59.48%
Objective financial knowledge questions		
No. of correct answers (0–5)	Mean (S.D.): 2.47*** (1.58)	Mean (S.D.): 2.93 (1.44)
All correct answers	7.85%***	15.35%
Interest	70.36%	76.51%
Inflation	45.69%	61.14%
Bond price	24.25%	29.79%
Mortgage	66.44%	77.01%
Portfolio	40.80%	47.68%
Perceived financial knowledge (0–7)	Mean (S.D.): 5.29 (1.42)	Mean (S.D.): 5.26 (1.22)
Financial education	29.92%***	23.47%

Weighted results. *p < 0.05, **p < 0.01, ***< 0.001

Results

Descriptive Results

Financial characteristics of Millennials and all households are reported in Table 3 and descriptive sample information is in the "Appendix." As shown in Table 3, the mean of the composite score of short-term financial behaviors was 2.44. In particular, over half of Millennials in the sample exhibited positive behavior in three of the four financial behaviors investigated: spending less than income (76.1%), not experiencing an overdraft (61.6%), and keeping a budget (60.2%); while only 41% had an emergency fund. The mean of the composite score of long-term behaviors was 1.86. Only 38.8% of Millennials had figured out the amount needed for retirement and only 47.4% owned at least one retirement account. About 30% of Millennials owned investments outside of their retirement account while 70% had a plan for long-term financial goals. For both short-term and long-term behaviors, the mean of the composite scores of Millennials was statistically lower than all households.

Millennials had significantly lower levels of objective financial knowledge. The distribution of financial knowledge scores of Millennials and all households is presented in Fig. 1. No significant differences were found related to perceived financial knowledge, as Millennials had a mean score of 5.29 as compared to the mean of 5.26 for all households. In terms of financial education, 29.9% of Millennials had received some form of financial education, significantly higher than the 23.5% of all households. This corresponds to the recent increase in mandatory financial education requirements in many states and institutions.

Logistic Regression Results

Table 4 shows logistic regression results based on the individual short-term and long-term financial behaviors of Millennials. With respect to short-term behaviors, having emergency fund savings (emergency fund), spending less than income (spending), not experiencing an overdraft (no overdrafts), and planning/budgeting for saving and spending (budgeting) were considered positive short-term behaviors for this analysis. Objective and perceived financial knowledge were generally positively related to positive short-term behaviors. A unit increase in objective financial knowledge increased the odds of having an emergency fund, spending less than income, and not experiencing an overdraft

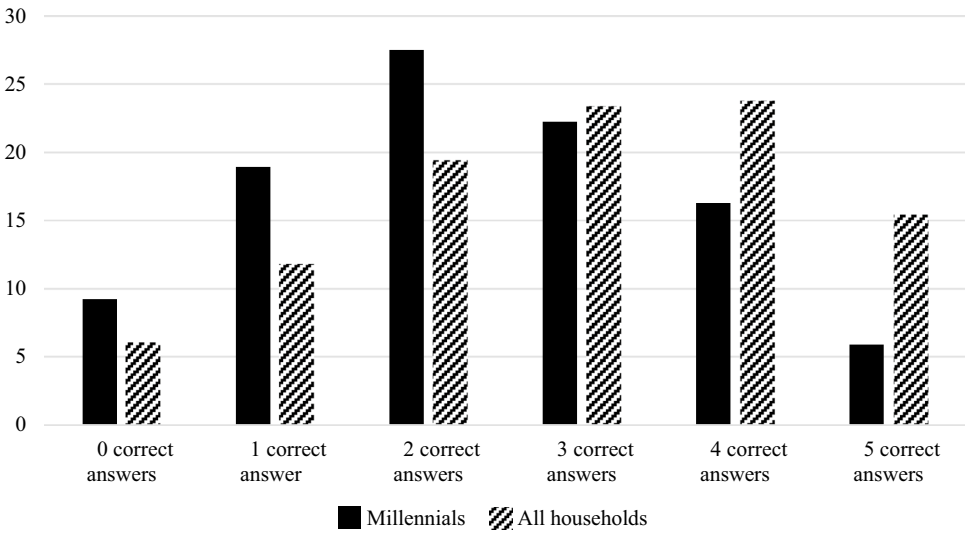

Fig. 1 Distribution of financial knowledge scores, 2015 NFCS. Weighted results

by 10.5%, 23.7% and 42.4%, respectively; while a one unit increase in perceived financial knowledge increased the odds of having an emergency fund and budgeting by 44.2% and 37.0%, respectively. Financial education was negatively related to not experiencing overdraft while positively related to budgeting.

Table 5 reports results related to long-term financial behaviors. Planning for retirement (retirement planning), having a retirement account (retirement account), having investments (investments) and setting long-term financial goals (financial goals) were considered long-term financial behaviors for this analysis. Objective and perceived financial knowledge were generally positively related to long-term financial behaviors. Specifically, a one unit increase in objective financial knowledge increased the odds of planning for retirement, having a retirement account, and having investments by 18.3%, 19.3% and 21.5%, respectively. A one unit increase in perceived financial knowledge increased the odds of planning for retirement, having a retirement account, having investments and setting long-term financial goals by 60.0%, 30.6%, 50.3% and 76.5%, respectively. Financial education was positively associated with all long-term financial behaviors.

Ordered Logistic Regression Results

Results from an ordered logistic regression are in Table 6. Results for both short-term and long-term behaviors of Millennials revealed that financial knowledge was related to higher odds of being in a higher level of composite indices of short-term and long-term financial behaviors. In particular, a one unit increase in objective financial knowledge increased the odds of being in a higher level of short-term behaviors by 26.5% and 17.0% for long-term behaviors. A one-unit increase in perceived financial knowledge increased the odds of being in a higher level of short-term behaviors by 30.9% and long-term behaviors by 69.0%. Having financial education increased the odds of being in a higher level of long-term behaviors by 46.1%, but there was no significant effect of financial education on short-term behaviors.

Robustness Check

To check the robustness of results, we conducted similar analyses with two additional measures of objective financial knowledge; (1) total number of correct answers, and (2) a binary indicator of all correct answers. As shown in Table 7, the first three columns report models for short-term financial behaviors and the next three columns report long-term financial behaviors. Results indicated that objective financial knowledge increased the odds of composite indices of short-term and long-term financial behaviors across three measures of financial knowledge. With respect to the magnitude of the effect, a binary indicator of all correct answers had the highest odds of being in a higher level of short-term behaviors (increased by 72.6%) and long-term behaviors (increased by 80.8%), respectively.

Issue of Reverse Causality

Results from the 2015 NFCS dataset indicated that a positive relationship existed between financial knowledge and positive financial behavior, even with two additional measurements of objective financial knowledge. However, it is important to address an issue of reverse causality, which would exist if positive financial behaviors increased the level of financial knowledge as the result of experience with those behaviors. Following the arguments posed by Allgood and Walstad (2016), we addressed the issue of reverse causality in three ways. First, upon a review of previous

Table 4 Logistic regression results of short-term financial behaviors of millennials, 2015 NFCS

Variables	Emergency funds		Spending		No overdrafts		Budgeting	
	Odds ratio	Chi square	Odds ratio	Chi square	Odds ratio	Chi square	Odds ratio	Chi square
Financial knowledge and financial education								
Financial knowledge index	1.1049***	12.4597	1.2374***	48.5313	1.4238***	152.6118	0.9880	0.1851
Perceived financial knowledge	1.4420***	248.3047	1.0213	0.8758	1.0362	2.8332	1.3697***	211.7449
Financial education	1.1116	3.2731	0.9638	0.3296	0.8321**	9.4828	1.2099**	10.1398
Control variables								
Age	0.9728***	16.1745	0.9898	1.9955	1.0234***	11.4888	0.9865*	4.0827
Gender (reference: female)	1.1926**	10.1251	1.1175	3.4761	0.7519***	25.7195	0.8305***	11.3484
Race (reference: White)								
Black	1.0779	0.8631	0.8268*	5.2376	0.6792***	24.1933	0.9317	0.8024
Hispanic	1.1589*	5.3786	1.0507	0.5112	0.9574	0.4632	1.1693*	5.9671
Asian/others	1.3666***	12.9296	1.0481	0.2391	0.9448	0.4023	1.0333	0.1422
Marital status (reference: married)								
Single	0.8990	2.3352	0.9913	0.0131	1.0884	1.4042	0.6449***	38.5364
Separated/divorce/widow	0.5354***	11.9860	0.7400	3.3458	0.7869	2.2425	0.8371	1.1318
Dependent children (reference: No)	0.9116	1.9783	0.7209***	21.3306	0.5110***	100.4354	1.4035***	26.0656
Employed (ref: full-time worker)								
Self-employed	1.0318	0.0802	0.9489	0.1888	0.6333***	17.1115	1.4184**	8.8695
Part-time worker	0.8646	3.1035	1.0296	0.1064	0.8091*	6.4594	0.8829	2.3050
Homemaker	0.7507**	7.5256	1.3719**	7.9882	0.9533	0.2205	1.1654	2.0440
Student	0.8476	3.6276	0.9277	0.6255	0.9908	0.0105	1.0047	0.0030
Disabled	0.3582***	12.7262	1.2984	1.1477	0.5234**	9.1880	1.4729	3.1814
Unemployed	0.6033***	21.6120	0.9359	0.3753	0.5344***	39.0001	1.0799	0.5834
Education (reference: less than high school)								
High school degree	1.0687	0.1545	1.3260	2.9995	1.5914**	8.8870	0.7661	2.7401
Some college	1.0430	0.0624	1.2134	1.4033	2.1891***	25.1117	0.8023	1.8627
Bachelor degree	1.4246	3.9567	1.1688	0.7875	2.5388***	30.5425	0.8111	1.4794
Post-bachelor degree	1.2553	1.4066	1.2339	1.1663	1.8906***	12.0032	0.9175	0.2085
Household income (ref: less than $15,000)								
At least $15,000 but less than $25,000	1.1445	1.9411	1.1459	1.9477	1.1335	1.8688	1.4761***	18.3509
At least $25,000 but less than $35,000	1.3666**	10.5558	0.9528	0.2477	1.1828	3.2522	1.3280**	9.5472
At least $35,000 but less than $50,000	1.4100***	12.7311	1.3279**	7.8211	1.0631	0.4270	1.3647***	11.3637
At least $50,000 but less than $75,000	1.6380***	27.2193	1.3892**	10.6549	1.2452*	5.5036	1.3067**	8.5755
At least $75,000 but less than $100,000	2.3439***	57.3999	1.7491***	19.4042	1.1162	0.9421	1.5465***	14.8191
At least $100,000 but less than $150,000	2.8008***	64.7950	1.6087**	10.8741	1.4363**	7.3414	1.4637**	8.8148
$150,000 or more	3.8114***	47.6852	1.5082	3.8705	1.3094	1.9214	1.2347	1.2678
Regional fixed effect (State of residence)	Yes		Yes		Yes		Yes	
Model fit								
Mean concordant	69.7%		60.1%		67.4%		66.8%	

Weighted results. Odds ratios are reported. Total sample size: 6784

*p < 0.05, **p < 0.01, ***< 0.001

literature related to financial knowledge and financial outcomes, we were unable to find articles that supported the issue of reverse causality (e.g., Lusardi and Mitchell 2007; van Rooij et al. 2011). Second, the questions used to measure objective financial knowledge were not designed to be directly related to the eight financial behaviors that were examined in the current study. For example, budgeting, one of the short-term financial behaviors that was included in this analysis, will not provide financial knowledge about bond prices. Third, we tested a possible argument that experience may generate actual financial knowledge. Given the lack of the experience variable in the NFCS dataset, we

Table 5 Logistic regression results of long-term financial behaviors of millennials, 2015 NFCS

Variables	Retirement planning		Retirement account		Investments		Financial goals	
	Odds ratio	Chi square	Odds ratio	Chi square	Odds ratio	Chi square	Odds ratio	Chi square
Financial knowledge and financial education								
Financial knowledge index	1.1832***	30.7854	1.1934***	28.9200	1.2153***	33.2971	0.9873	0.1750
Perceived financial knowledge	1.6002***	323.3821	1.3064***	105.8010	1.5029***	187.9655	1.7647***	530.9369
Financial education	1.2291**	11.0157	1.5017***	34.7701	1.5507***	42.9471	1.1871*	6.8564
Control variables								
Age	1.0116	2.4838	1.0535***	47.1410	0.9778**	7.1435	0.9463***	57.4801
Gender (reference: female)	1.1831**	7.9923	0.9146	1.9168	1.5740***	46.3087	1.1036	2.7196
Race (reference: White)								
Black	1.2616**	7.2646	1.0233	0.0621	0.8734	1.8359	1.6998***	34.3539
Hispanic	1.0825	1.3470	0.9127	1.5719	0.8129**	7.0667	1.0769	1.2035
Asian/others	1.1633	2.5942	0.8926	1.2343	1.3230**	7.7296	1.2050	3.8653
Marital status (reference: married)								
Single	0.8531*	4.7681	0.6433***	33.2199	0.9878	0.0224	0.7584***	13.0714
Separated/divorce/widow	1.1434	0.6255	0.7819	1.9117	1.4124	3.3130	0.5390***	13.3895
Dependent children (reference: No)	1.3678***	20.9282	1.3262***	14.8772	1.4280***	21.4332	1.0433	0.3445
Employed (ref: full-time worker)								
Self-employed	1.0182	0.0248	0.3704***	66.1774	1.3804**	6.8425	0.9622	0.0981
Part-time worker	0.6793***	18.5954	0.4569***	75.3897	0.9704	0.0895	0.9113	1.0826
Homemaker	0.5483***	29.0058	0.4565***	51.9106	0.5603***	17.1327	0.6537***	16.0333
Student	0.6339***	22.5312	0.2827***	157.2746	0.8422	2.5506	0.8993	1.2597
Disabled	0.3816**	9.3706	0.2814***	18.5588	0.4452	3.8369	0.4912**	9.7861
Unemployed	0.6064***	17.0552	0.2518***	111.9557	0.6225**	9.7220	0.6611***	15.2315
Education (reference: less than high school)								
High school degree	0.7382	2.6982	1.7626*	6.4395	1.5947	3.0609	1.0153	0.0083
Some college	0.9141	0.2396	2.3646	15.0703	1.8401**	5.3019	0.9848	0.0084
Bachelor degree	1.0358	0.0334	3.4391***	28.7865	2.5584***	11.9834	1.4477*	4.2449
Post-bachelor degree	1.2094	0.8566	4.1083***	32.4546	3.0557***	15.8650	1.6380*	6.0387
Household income (ref: less than $15,000)								
At least $15,000 but less than $25,000	1.0032	0.0008	1.4670**	10.3376	1.0171	0.0150	1.0960	0.9331
At least $25,000 but less than $35,000	1.4005**	9.8300	2.2490***	49.6213	1.4392**	7.7616	1.3596**	9.8212
At least $35,000 but less than $50,000	1.3473**	7.6909	3.1412***	100.5757	1.5845***	12.8506	1.2769*	6.1819
At least $50,000 but less than $75,000	1.5636***	18.0640	3.8966***	142.6458	2.3298***	47.8407	1.5002***	17.0101
At least $75,000 but less than $100,000	1.8772***	26.8114	5.0344***	139.7114	3.7099***	93.7637	1.6583***	16.6117
At least $100,000 but less than $150,000	2.4589***	43.7411	6.0976***	129.3545	3.4515***	70.0672	2.5211***	36.7377
$150,000 or more	2.3996***	20.6563	5.3666***	51.0355	5.2588***	69.5134	1.6487*	5.2736
Regional fixed effect (State of residence)	Yes		Yes		Yes		Yes	
Model fit								
Mean concordant	74.4%		84.3%		77.0%		73.7%	

Weighted results. Odds ratios are reported. Total sample size: 6784

*p < 0.05, **p < 0.01, ***< 0.001

used age as a proxy for financial experience. If there were an issue of reverse causality, we would expect a stronger relationship between financial knowledge and financial behaviors for those with more experiences proxied by age. We conducted the same ordered logistic regressions for four different age groups divided by the quartile age of the analytic sample[2]. Results showed that there was no steady pattern of the relationship across age groups implying that the relationship between financial knowledge and financial behaviors was not driven by experience, which aligns with the argument of Allgood and Walstad (2016).

[2] Full results are available from the authors upon request.

Table 6 Ordered logistic regression results of short-term and long-term financial behaviors of millennials, 2015 NFCS

Variables	Short-term behaviors		Long-term behaviors	
	Odds ratio	Chi square	Odds ratio	Chi square
Financial knowledge and financial education				
Financial knowledge index	1.2649***	97.8032	1.1698***	42.1856
Perceived financial knowledge	1.3092***	221.6038	1.6898***	711.4836
Financial education	1.0426	0.7010	1.4605***	56.3484
Control variables				
Age	0.9901	3.0463	0.9944	0.9452
Gender (reference: female)	0.9204	3.1855	1.1779***	11.9491
Race (reference: White)				
Black	0.8226**	8.4293	1.2348**	9.4561
Hispanic	1.1267*	4.9897	0.9631	0.4778
Asian/others	1.1261	2.6105	1.1305	2.7001
Marital status (reference: married)				
Single	0.8379**	9.0042	0.7201***	30.3933
Separated/divorce/widow	0.6200***	12.1005	0.8160	2.1086
Dependent children (reference: No)	0.7620***	23.9659	1.3509	28.7061
Employed (ref: full-time worker)				
Self-employed	0.9131	0.9267	0.7725**	7.3342
Part-time worker	0.8349**	6.6724	0.6347***	40.9248
Homemaker	1.0221	0.0646	0.4487***	82.8878
Student	0.8687	3.6446	0.5442***	65.4441
Disabled	0.7265	3.0001	0.2914***	37.2376
Unemployed	0.6746***	20.9192	0.4104***	97.4171
Education (reference: less than high school)				
High school degree	1.2537	2.8464	1.0950	0.4144
Some college	1.3853*	5.8896	1.2914	3.2902
Bachelor degree	1.6195***	11.3250	1.9480***	19.8973
Post-bachelor degree	1.4560*	5.8212	2.2821***	26.0308
Household income (ref: less than $15,000)				
At least $15,000 but less than $25,000	1.2938**	10.9529	1.0764	0.8237
At least $25,000 but less than $35,000	1.2831**	10.0234	1.6670***	39.4231
At least $35,000 but less than $50,000	1.4279***	20.2384	1.8851***	60.2378
At least $50,000 but less than $75,000	1.5770***	33.7044	2.4695***	125.0693
At least $75,000 but less than $100,000	1.9828***	52.1618	3.5128***	168.4958
At least $100,000 but less than $150,000	2.2703***	57.5139	4.1858***	169.3349
$150,000 or more	2.1834***	24.8128	4.3150***	84.2779
Regional fixed effect (State of residence)	Yes	Yes	Yes	Yes
Model fit				
Mean concordant	64.5%		76.5%	

Weighted results. Odds ratios are reported. Total sample size: 6784

*p < 0.05, **p < 0.01, ***< 0.001

Discussion

This study examined the effect of financial knowledge on short-term and long-term financial behaviors of Millennials in the US. This study is conducted through the lens of the theory of bounded rationality, which indicates that individuals with higher levels of financial knowledge would be better equipped to make optimal financial choices. Descriptive results revealed that Millennials had more financial education than all households in the 2015 NFCS, yet they exhibited significantly lower objective financial knowledge over three separate measurements. Despite their lower objective financial knowledge, Millennials rated themselves similarly on perceived financial knowledge to all households indicating the presence of

Table 7 Ordered logistic regression results of short-term and long-term financial behaviors of millennials, robustness check, 2015 NFCS

Variables	Short-term behaviors			Long-term behaviors		
	(1)	(2)	(3)	(1)	(2)	(3)
Objective financial literacy						
Financial knowledge index	1.265***	–	–	1.170***	–	–
All five correct	–	1.726***	–	–	1.808***	–
Total number correct	–	–	1.184***	–	–	1.128***
Control variables[a]	Yes	Yes	Yes	Yes	Yes	Yes
Regional fixed effect (State of residence)	Yes	Yes	Yes	Yes	Yes	Yes
Model fit						
Mean concordant	64.5%	63.9%	64.5%	76.5%	76.3%	76.5%

Weighted results. Odds ratios are reported. Total sample size: 6784

*p < 0.05, **p < 0.01, ***< 0.001

[a]Control variables are the same as Table 4

overconfidence in their financial knowledge. These results align with de Bassa Scheresberg and Lusardi's (2014) and indicate that Millennials might be at risk for the poor financial decision-making that has been associated with overconfidence in financial knowledge (Chu et al. 2017; Robb et al. 2015).

Results from the logistic regression analyses of individual financial behaviors provided significant support for Hypothesis 1, that financial knowledge will be positively associated with short-term financial behaviors. Specifically, objective financial knowledge was positively associated with all short-term behaviors (emergency fund, spending less than income, no overdrafts), with the exception of budgeting. Similarly, significant support was found for Hypothesis 2, that financial knowledge will be positively associated with long-term financial behaviors, as financial knowledge was positively associated with all long-term behaviors (retirement planning, retirement account, investments), with the exception of setting financial goals. Because both budgeting and setting long-term goals could be viewed as more task-oriented than the other behaviors, these results may suggest that behavioral or psychological factors beyond knowledge better explain the consistent effort needed to carry out these behaviors. Perceived financial knowledge was positively related to all long-term financial behaviors but only some short-term behaviors (emergency fund and budgeting). These results are consistent with Henager and Cude's (2016) finding that younger cohorts engage in positive financial behaviors when they have the confidence and ability to do so and to Allgood and Walstad's (2016) conclusion that perceived financial knowledge is related to investment behaviors no matter the level of objective financial knowledge.

Results from the ordered logistic analyses of Millennials indicated that both objective and perceived financial knowledge are related to higher-levels of short-term and long-term financial behaviors; however, objective financial knowledge is a slightly better predictor for short-term behaviors whereas perceived financial knowledge is a much better predictor of long-term behaviors. These results support Huston's (2010) conclusion that individuals need both objective and perceived financial knowledge to be financially literate. The results indicate that these two ingredients are each important components of financial literacy.

The relationship between financial education and Millennials' financial behaviors was also examined in this study. Results revealed that financial education was positively related to all long-term financial decisions and to the short-term budgeting decision. Apart from one short-term decision (having an emergency fund), financial education and perceived financial knowledge were positively related to the same short-term and long-term behaviors; a possible indication that the effect of financial education is not captured solely through objective financial knowledge but is instead equipping students with the financial confidence and ability necessary to perform positive financial behaviors. These results align with Friedline and West's (2016) suggestion that Millennials who have financial education and are financially included, as measured by having a savings account, exhibit better financial behaviors. However, it is important to acknowledge that, in non-experimental surveys, there is the possibility for unobserved variable bias related to financial education (Fernandes et al. 2014; Hastings et al. 2013).

Although this study contributes to the literature in various ways, there are some limitations to be noted. First, given the cross-sectional design of the NFCS dataset, it is difficult to address a causal relationship between financial knowledge and financial behaviors. Although we discussed the issue of reverse causality to infer the relation, future researchers might conduct similar analyses using a longitudinal dataset to account for the causal inference. Another limitation is the measurement of financial knowledge. In

this study, we utilized three different indicators of financial knowledge widely used in the existing literature, but there is not a standardized measure of financial knowledge due to many barriers, e.g., the lack of interpretation and conceptualization of financial knowledge and literacy (Huston 2010). A well-designed financial knowledge measure will help researchers improve the assessment of one's financial knowledge and identify the effect of financial knowledge more accurately. Regardless of these limitations, however, this study opens important avenues for future research on financial knowledge and the financial behaviors of Millennials.

Implications

Millennials are entering adulthood in a period where financial markets and financial products have become increasingly complex. This increased environmental complexity significantly increases the difficulty of evaluating financial behaviors and determining the optimal choices. Despite clear and consistent evidence that financial knowledge is an important tool in overcoming these complexities, Millennials have demonstrably lower levels of financial knowledge and appear to be ill equipped to both understand and evaluate the implications of their current financial behaviors on their short- and long-term financial well-being. Importantly, our follow up analysis indicated that age, a potential measure of financial experience, did not fully account for these lower levels of financial knowledge or mitigate the link between financial knowledge and financial behaviors.

In relation to policy recommendations, the theory of bounded rationality indicates there are three major challenges Millennials face: (a) complex financial markets, (b) limited financial capability, and (c) limited time and economic resources (Ibrahim 2009). Consequently, there are three policy lenses to explore: (a) alleviate market complexities in the decision-making process, (b) improve individuals' capacity to evaluate financial behaviors, and/or (c) increase availability and access to products that support positive financial behavior. From a market perspective, the increasing number of financial counseling, financial planning, and financial coaching professionals, as well as the increasing availability of low cost financial advice, may serve to provide consumers with paths to filter through this market complexity and increase access to financial products that support positive financial behavior. With general trends to higher standards of ethical care for these professionals, whether it be the through the now-vacated Department of Labor's Conflict of Interest Rule (Bergman 2018; Federal Register 2017), the Security and Exchange Commission's Best Interest Proposal (Securities and Exchange Commission 2018), or the CFP Board of Standard's new code of ethics (CFP Board 2017), there is increasing movement to financial advice that serves the consumers interest first. Policy initiatives to invest in the number, quality, and availability of these professionals to serve all markets and economic statuses would be well advised.

The more traditional path is to invest in financial literacy directly. As related to financial education, the most direct avenue to increase financial literacy is to incorporate financial education in the primary, secondary, and post-secondary education school systems. Brown et al. (2018) provided recent evidence of the success of state mandated financial education in high schools on improved credit behavior, but noted that well-funded and trained teachers are necessary for positive results. However, the majority of Millennials have completed their structured education and would not receive the benefits of this education. Further, evidence remains mixed on the long-term effectiveness of financial education efforts among the young (Fernandes et al. 2014; Hastings et al. 2013). To address older Millennials, support of financial education in the workplace may be beneficial. Among adult populations, there is general evidence of effectiveness of financial education (Prawitz and Cohart 2014), although Miller et al. (2015) indicate the most effective financial education has been targeted in approach to specific financial behaviors, with the most effective education tied to savings behavior. In implementing workplace financial education, there is some concern as to whether Millennials would participate, as, despite being offered education at a higher rate than previous generations, Millennials have relatively low participation rates (Mottola 2014). Educators may collaborate with employers for employer-sponsored events (e.g., brown bags, lunch & learns, etc.) as a way to engage more Millennials. Regardless of the approach, Millennials will continue to struggle to make financial decisions into the future without policy intervention to improve financial behaviors.

Compliance with Ethical Standards

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

Research Involving Human and Animal Participants This article does not contain any studies with human participants or animals performed by any of the authors.

Appendix: Sample Characteristics in the 2015 NFCS

Variables	Millennials (N = 6784)	All households (N = 23,369)
Mean (median) age	26.1 (26.0)	46.2 (47.0)
Gender		
Male	48.88	49.44
Female	51.12	50.56
Race		
White	50.46	65.47
Black	13.85	11.71
Hispanic	25.01	15.21
Asian/others	10.67	7.62
Marital status		
Married	35.48	52.78
Single	61.84	31.13
Separated/divorce/widow	2.68	16.09
Dependent children	39.64	36.79
Employed		
Full-time worker	43.31	38.54
Self-employed	6.07	7.04
Part-time worker	14.54	9.84
Homemaker	9.36	8.41
Student	16.10	5.37
Disabled	1.47	4.49
Unemployed	9.15	26.32
Education		
Less than high school	2.85	2.39
High school degree	28.50	26.08
Some college	42.60	43.24
Bachelor degree	17.57	17.37
Post-bachelor degree	8.48	10.93
Household income		
Less than $15,000	18.80	12.16
At least $15,000 but less than $25,000	13.78	11.41
At least $25,000 but less than $35,000	14.13	11.06
At least $35,000 but less than $50,000	15.31	14.92
At least $50,000 but less than $75,000	19.10	20.22
At least $75,000 but less than $100,000	9.93	12.97
At least $100,000 but less than $150,000	6.53	11.74
$150,000 or more	2.42	5.51

Weighted results

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Kyoung Tae Kim is an Assistant Professor in Department of Consumer Sciences at University of Alabama. He received a Bachelor's degrees in economics and PhD in consumer sciences from The Ohio State University, and a Master degree in economics from Purdue University. He has published in Applied Economics Letters, Economics Letters, Family and Consumer Sciences Research Journal, Financial Services Review, Journal of Family and Economic Issues, Journal of Financial Counseling and Planning, and Journal of Poverty.

Somer G. Anderson is an Assistant Professor of Accounting and Assistant Dean in the John E. Simon School of Business at Maryville University. She received Bachelor's and Master's degrees in Accountancy from the University of Missouri-Columbia and is a Ph.D. candidate in Personal Financial Planning at Kansas State University. Her research has been published in the Journal of Financial Planning and the Journal of Financial Counseling and Planning.

Martin C. Seay is Program Director and Associate Professor in Personal Financial Planning at Kansas State University. He serves on the board of directors for the Financial Planning Association and the Academy of Financial Services. His work has been published in Economics Letters, Family and Consumer Sciences Research Journal, Journal of Financial Counseling and Planning, Financial Services Review, Journal of Consumer Affairs, Journal of Behavioral Finance, and Journal of Family and Economic Issues. He received his Ph.D. at the University of Georgia.