

Financial Knowledge, Confidence, Credit Use, and Financial Satisfaction

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This article investigates associations between confidence about financial knowledge and two outcome variables, financial behaviors and financial satisfaction. On one hand, subjective financial knowledge (confidence) is necessary to make proactive decisions, yet overconfidence has been associated with a range of negative financial behaviors and outcomes. Both types of objective and subjective knowledge may be related to critical financial behaviors and choices such as credit card usage which in turn may be associated with financial satisfaction, an important component of consumer well-being. This article analyzes data from the 2015 National Financial Capability Study to examine how financial knowledge confidence relates to credit card behaviors and financial satisfaction. We use mediation and floodlight analyses to uncover relevant relationships between variables of interest. We find evidence that confidence is associated with healthy credit card use that contributes to financial satisfaction. We also observe strong interactions with knowledge to find that confidence is more strongly associated with credit card use and overall financial satisfaction as knowledge increases. Findings from this study can help financial educators and advisors to deliver the right mix of financial knowledge to better financial choices and behaviors.

Keywords: confidence, consumer credit use, financial behaviors, financial satisfaction, subjective knowledge

The credit card industry in the United States is nearing the \$1 trillion mark in outstanding balances, which represents over \$15,000 in credit card debt per indebted household (Federal Reserve of New York, 2016). The industry as a whole is still growing and evolving new products and contract features. As a result, consumers are faced with a multitude of complex choices beginning with choosing the right credit card issuer and the credit card features that better fit their needs. While this first step is crucial in choosing the right card, consumers are then faced with choices on how to better utilize their cards including how much to pay from the outstanding balance and when to use potentially costly features such as cash advances. These choices involve tradeoffs between availability of funds for immediate purchases and long-term debt, credit rating, and financial satisfaction. For many consumers, credit cards represent their first experience in obtaining consumer credit and also an entry way in developing their credit report.

Costly credit usage habits such as revolving high interest balances and missing payments may lead to misuse of other types of consumer debt and lower credit scores.

A hallmark of household finance research finds that people with higher financial knowledge tend to make better financial decisions (Gutter & Copur, 2011; Lusardi, 2008; Robb, Babiarz, Woodyard, & Seay, 2015; Shim, Xiao, Barber, & Lyons, 2009). However, as credit card accounts involve decisions made by individuals, perhaps individuals' confidence in their financial knowledge—their subjective knowledge (Xiao, Tang, Serido, & Shim, 2011)—explains some credit usage behaviors, with consequence to their financial satisfaction.

Although subjective financial knowledge and financial satisfaction have been explored in the past (Xiao, Chen, & Chen, 2014; Xiao & Porto, 2017), previous research has

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not yet reviewed how subjective financial knowledge (aka confidence) might be associated with credit usage. Allgood and Walstad (2013) examined credit behaviors related to both objective and subjective financial knowledge by age group. The authors found that when both types of financial knowledge are present, credit usage is less costly. In a later article, Allgood and Walstad (2016) employ similar strategies to review the relationship between objective/subjective financial knowledge and a series of financial behaviors. The present research builds on Allgood and Walstad by bringing financial knowledge and credit card behaviors to the forefront of the analysis, while also taking it further by including a financial satisfaction component, a different approach to financial knowledge questions, and a comprehensive scale of credit card behaviors. Additionally, we employ a number of statistical methods to examine the relevant relationships between the variables of interest. The present study also answers a call from Allgood and Walstad to examine the objective and subjective components of financial literacy jointly in reference to financial behaviors. By employing mediation and floodlight techniques, this study was able to further explore the relationships between those important factors of financial literacy and their association with credit card usage.

Previous research found associations between subjective financial knowledge and a range of healthy financial behaviors (Robb & Woodyard, 2011) or the interaction of subjective and objective knowledge on financial behaviors (Porto & Xiao, 2016), but to date no research has specifically explored the interaction of subjective and objective knowledge with credit card behaviors and financial satisfaction. This article tries to fill this gap by addressing not only the interactions between objective (i.e., actual) and subjective knowledge (i.e., financial confidence) with a number of credit card choices, but also the relationship of these constructs to financial satisfaction by using data from a large and nationally representative survey. While credit card behavior such as paying a late fee is considered to be detrimental, this choice can be better understood by also considering financial satisfaction and investigating how confidence and knowledge contribute to subjective financial well-being.

Credit card choices are a useful domain to study financial choices more broadly; they are representative financial choices involving complex tradeoffs between current and

future wealth and utility. While this analysis is limited to credit card usage, findings from this relationship between confidence, knowledge, credit card behaviors, and financial satisfaction can help inform other research in areas of consumer debt, such as auto and home loans. Confidence in financial knowledge and actual financial knowledge are considered to be building blocks of broader concepts such as financial capability or literacy (see Sherraden, 2013 for more details). This study also contributes to the research literature on how financial capability might foster more optimal financial behaviors.

This article reports results from analysis of data from the 2015 National Financial Capability Study (NFCS) to explore how confidence and knowledge together relate with credit card use, and how these predict the overall financial satisfaction. We report floodlight analysis and mediation results providing evidence that confidence in financial knowledge is linked with healthy credit card use and that it interacts with objective financial knowledge to predict overall financial satisfaction. The similar relationship between confidence and both credit use and financial satisfaction helps support the proposition that confidence predicts credit use, rather than the other way around.

We close by discussing these results in the context of the limitations on how confidence is measured in the NFCS study and call for more research understanding the interplay between confidence and knowledge in consumer financial choice.

Background and Hypotheses

In this study, we examine the effect of financial knowledge on credit behavior. Two distinct components of knowledge are recognized in the literature: subjective knowledge, which refers to a person's perception of the amount of information about a product or topic stored in his or her memory (Brucks, 1985), and objective knowledge, which pertains to the actual amount of accurate information stored in his or her memory (Brucks, 1985). In this article, we referred to subjective knowledge as financial confidence, and to objective knowledge as financial knowledge. Objective financial knowledge has also been referred in the literature as financial literacy.

Financial literacy, however, is a concept still ill-defined in most of the literature, often used interchangeably

with financial knowledge (Van Rooij, Lusardi, & Alessie, 2011) or financial capability, but not less frequently considered to be a component of financial capability—or even an umbrella to include financial knowledge and behaviors (Fox, Bartholomae, & Lee, 2005). Huston (2010) provided an excellent review of the issue and its potential implications in the field, while providing an outline for a knowledge and an application dimension to this construct. To alleviate the potential confusion, the present study treats financial literacy as a synonym of objective financial knowledge, measured via a quiz containing five financial questions. Similarly, the literature cited here mostly discusses financial literacy or objective financial knowledge as substitutes.

Financial literacy, or its lack of, has been linked to a number of financial behaviors (Hilgert, Hogarth, & Beverly, 2003; Lusardi & Mitchell, 2014). With regard to credit card use, previous research shows that consumer misunderstanding of statement features results in their misjudging monthly payments (Soll, Keeney, & Larrick, 2013). Additionally, Agarwal, Chomsisengphet, Liu, and Souleles (2015) show that consumers with strong numerical skills are more likely to overcome this bias. Ludlum et al. (2012) found that many cardholding students lack knowledge of important features of their cards such as the interest rate and late payment fees. Lack of financial knowledge has been found to be related to more credit card debt (Norvilitis et al., 2006) and use of cash advances (Yao & Meng, 2018), while higher financial knowledge is related to more responsible credit card use of college students (Robb, 2011; Xiao et al., 2011). Thus, objective financial knowledge is believed to act as a possible remedy to improve credit card usage.

Financial confidence has also been associated with healthy financial behaviors. Allgood and Walstad (2013) found that perceived financial knowledge (i.e., confidence) was a stronger predictor of more positive credit card practices than actual financial knowledge, showing that credit card behaviors were healthiest among those with both types of knowledge. In the same vein, Xiao, Ahn, Serido, and Shim (2014) found that both financial knowledge types decreased risky credit and borrowing behaviors, suggesting that they work in different paths to reduce risk. Kim, Kwon, and Anderson (2005) observed that workplace financial education leads to higher confidence on retirement preparedness. Subjective financial knowledge (confidence) has also been linked to better financial behaviors of young adults

(Henager & Cude, 2016) and soldiers (Carlson, Britt, & Goff, 2015).

Interestingly, financial confidence has also been found to result in poor financial choices, particularly when it exceeds actual knowledge. Overconfidence has been linked with a variety of negative financial behaviors. Those with high subjective financial knowledge are less likely to seek financial advice (Kramer, 2016), trade the most, but perform the worst (Barber & Odean, 2000), and are more likely to start a business that will fail (Camerer & Lovallo, 1999). Due to overconfidence, they fail to ensure against risks, save for the future, and rarely seek appropriate financial advice and education (Barber & Odean, 2000; Camerer & Lovallo, 1999; Kramer, 2016; Menkhoff, Schmeling, & Schmidt, 2013). Consumers who are overconfident about their financial knowledge are also more likely to need debt counseling, an indication of financial stress (Porto & Xiao, 2016). Prior studies showed that when objective and subjective financial knowledge were compared, over half of participants who considered themselves financially knowledgeable were, in fact, lacking the basic financial knowledge (Courchane, 2005). Indeed, in the context of genetically modified foods, Klerck and Sweeney (2007) report a large gap between objective and subjective knowledge, showing that objective knowledge moderates the relationship between subjective knowledge and perceived risk of genetically modified foods. In the context of the present study, these findings suggest a negative relationship between confidence (subjective knowledge) and healthy financial behaviors when knowledge is low, but a positive one when objective knowledge is high. Thus, we posit that

H1: The relationship between confidence in financial knowledge and healthy credit use will strengthen as financial knowledge increases.

Another variable of interest in this study is financial satisfaction. There has been a growing interest in the research of financial satisfaction either as its own construct or as a component of overall subjective well-being or life satisfaction as a whole (Vera-Toscano, Ateca-Amestoy, & Serrano-Del-Rosal, 2006). An earlier exploratory study of Joo and Grable (2004) revealed a number of factors related to financial satisfaction such as financial behaviors and financial knowledge. Xiao, Chen, et al. (2014) uncovered a positive relationship between financial satisfaction and perceived

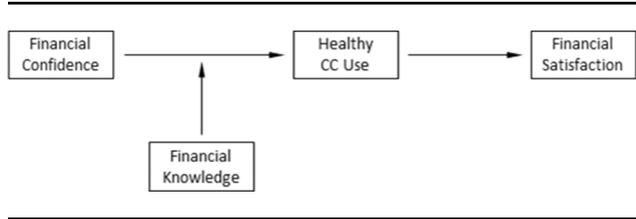
financial capability, a form of financial self-efficacy. Using an earlier wave of the NFCS, Woodyard and Robb (2016) found that subjective knowledge is more strongly correlated to financial satisfaction than objective knowledge. Other factors that have been found to have an association with financial satisfaction include gender differences in financial perceptions (Hira & Mugenda, 2000), income on financial status (Parrotta & Johnson, 1998), risk tolerance (Aboagye & Jung, 2018), debt and financial anxiety (Archuleta, Dale, & Spann, 2013), and perceived income adequacy (Grable, Cupples, Fernatt, & Anderson, 2013).

On a more comprehensive scale and using cross-national data, Ng and Diener (2014) suggested that financial satisfaction is associated with overall financial well-being and life evaluation. A review of these and other studies shows that financial knowledge, measured using an objective or subjective (confidence) approach, appears to be related to overall financial satisfaction. However, previous studies have not directly examined the relationships among financial knowledge, credit card use behavior, and financial satisfaction. Thus, building on this previous research, we expect the strong relationship between confidence and healthy credit behavior in the context of high knowledge (hypothesized in H1) to extend to financial satisfaction. Additionally, we expect this relationship to mirror people's credit use sufficiently for a moderated mediation relationship. Accordingly

H2: The relationship between confidence in financial knowledge and financial satisfaction attributable to credit use will strengthen with financial knowledge.

Additionally, Hypothesis 2 helps address an important potential counterargument. Perhaps credit behaviors are predicting the increase in confidence, rather than confidence predicting the credit card behaviors. Hypothesis 2 helps reduce the likelihood of this alternate model, as testing for a consistent relationship between confidence with credit card use and financial satisfaction helps increase the likelihood that confidence is not predicted by credit card use alone. While this still leaves open the possibility that some third factor is associated with both confidence and credit use, the testing of this hypothesis provides stronger evidence that confidence has a different relationship with credit use depending on knowledge. Our model presented in Figure 1 proposes that the relationship between financial confidence and financial satisfaction is mediated by healthy credit card

Figure 1. Conceptual model.



use, whose relationship with financial confidence is moderated by financial knowledge.

Methods

Data

This study analyzes the data from 27,564 respondents coming from the state-level 2015 NFCS included in the FINRA IEF 2015 report (Lin et al., 2016). We selected the 2015 NFCS because it contains information about objective and subjective financial knowledge, credit card use, financial satisfaction, and a number of personal and economic controls. In subsequent analyses, we report replications of all analyses on the 2009 NFCS data and include them in the discussion.

Although the 2015 NFCS data set contains weights at the national, divisional, and state levels, we have decided to use unweighted data in our analysis, following the findings of Dew and Xiao (2011) which showed that weighting the data did not significantly impact the results. Further, we do not know how applying the weight is going to accurately sample among confident and unconfident people, and since we are primarily concerned with extracting the multistage relationship between confidence, credit card use, and satisfaction, do not want to risk distorting the data with weights.

Variables

We study credit card decisions because credit use is the most common financial decision-making and a typical gateway to other forms of consumer credit. Fortunately, the 2015 NFCS contained six questions in a survey otherwise limited in financial behaviors. These items include paying credit cards in full, being charged interest for carrying a balance, making a minimum-payment, being charged a late fee, being charged an overdraft fee, and withdrawing cash advances. After reverse-coding all items except paying credit cards in full, we average these measures to form a scale measuring healthy credit card use (Cronbach's $\alpha = .75$). These six

binary items and their coding, along with all main measures, appear in the FINRA IEF 2015 report (Lin et al., 2016). Detailed information about the NFCS data can be obtained by visiting the appropriate links presented in Tables 1–5.

We next examine reliability and consistency of related items in the credit behaviors scale. In particular, paying in full is correlated with making minimum payments ($r = 0.77$), yet there is sufficient variability between the items that having both items in the scale can improve the overall accuracy of the scale. A Principal Component Analysis shows loadings of 0.69 and 0.75 for these two items, supporting the use of both. Based on these results, and on the fact that scales including both “paying in full” and “making minimum payments” items are well established in the field (Lusardi & Tufano, 2015; Robb, Moody, & Abdel-Ghany, 2011), we have decided to retain all six items in our healthy credit card use index. Although the correlation is high, there are no concerns for collinearity because we are not evaluating them as separate predictors of common dependent measures. We conclude that the treatment of credit behaviors as a scale adequately represents respondents’ aggregate credit card behaviors.

We are also interested in self-reported financial confidence, financial knowledge, and financial satisfaction. Knowledge was measured by five questions about financial knowledge, including financial calculations and understanding financial concepts such as diversification and bonds. These five questions, out of which three were proposed by Lusardi and Mitchell (2008), and two were introduced in the NFCS in 2009, have become a foundational standard in several financial literacy surveys in the United States and have now been translated to other countries as well (Lusardi & Mitchell, 2011). When computing the financial knowledge index, we considered “don’t know” and “prefer not to answer” responses as being incorrect, in accordance with the common practice in literature (Lusardi & Tufano, 2015). The Cronbach’s α for the financial knowledge scale is .70. The confidence variable was taken from the survey item “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?” This measure is central for exploring the role of financial confidence (subjective knowledge) with other financial behaviors, but note that the ability to draw conclusions around overconfidence is limited by the limited

graduation of a single measure. Financial satisfaction was measured on a 0 (*not at all satisfied*) to 10 (*extremely satisfied*) scale using the survey question “Overall, thinking of your assets, debts and savings, how satisfied are you with your current personal financial condition?”

Finally, we also considered a variety of demographic and economic controls, based on prior research finding extraneous relationships between these factors and financial behaviors (Robb & Woodyard, 2011). These include age, gender, race, number of dependent children, income, and employment status. Models considering these controls provide an important robustness check as the relationship between confidence, financial knowledge, credit card use, and financial satisfaction is being evaluated.

Sample Characteristics

Table 1 describes a sample of 21,327 respondents out of the 27,564 individuals provided by the 2015 NFCS. Individuals who did not have credit cards (23%) were excluded from analysis. The respondents report a high level of confidence in their financial knowledge (5.4 out of 7), with 83% of participants rating their knowledge as a 5 or higher on the 7-point confidence scale. However, they had moderate actual financial knowledge. A financial knowledge score was computed by assigning “1” if the question was answered correctly and “0” otherwise, and summing the answers for the five questions; hence resulting in a scale midpoint of 2.5. 66% of participants correctly answered 2 to 4 knowledge questions out of 5, with the average being 3.14. Finally, financial satisfaction was measured on a scale of 1 (Not at all satisfied) to 10 (Very satisfied), with the average satisfaction being 6.15; thus slightly higher than the scale midpoint.

Respondents’ credit card use reveals a variety of behaviors. Roughly half (54%) pay their credit card bills in full. 47% were charged interest for carrying a balance, and 31% paid the minimum balance. 13% paid a late fee, while 7% exceeded their credit line and 10% requested cash advances. After reverse-coding all items except “paid in full,” we combined the six credit use behaviors to form a healthy credit use score ($\alpha = .77$).

Otherwise, the 2015 NFCS is a representative sample of the U.S. population (Table 1). Participants ranged in age

TABLE 1. Summary Statistics

	Mean	Standard Deviation	Min	Max	Observations
Confidence	5.26	(1.20)	1	7	21,327
Knowledge	3.18	(1.39)	0	5	21,327
Credit card health index	4.39	(1.65)	0	6	21,327
Financial satisfaction	6.15	(2.62)	1	10	21,327
	Frequencies	Observations			
Gender (female)	53%	21,327			
Race (White)	74%	21,327			
Young (<25)	8%	21,327			
Old (≥65)	21%	21,327			
Single	25%	21,327			
Have dependent child	38%	21,327			
Household size of 2	39%	21,327			
Household size of 3	14%	21,327			
Household size of 4	13%	21,327			
Household size of 5	5%	21,327			
Household size ≥6	2%	21,327			
Low income (<\$25k)	14%	21,327			
High income (≥\$100k)	22%	21,327			
Disabled	3%	21,327			
Temporary unemployed	7%	21,327			
Have a job	68%	21,327			

TABLE 2. Correlations Between Credit Card Health Index, Confidence, Knowledge, and Satisfaction

	CCH Index	Confidence	Knowledge
CCH Index	1		
Confidence	.145 ^a	1	
Knowledge	.253 ^a	.179 ^a	1
Satisfaction	.345 ^a	.408 ^a	.077 ^a

^aCorrelation is significant at the 0.01 level (2-tailed).

from 18 to over 65. A majority of respondents were white (74%), and the gender mix was roughly even (47% male; 53% female). One quarter of respondents were single, 38% had at least one dependent child, and 68% were working. Roughly half of the sample (47%) had annual income between \$25,000 and \$75,000, with 25% being retired or unable to work, and 7% laid off or students.

Data Analyses

Prior to presenting the results, we would like to give a brief explanation of the spotlight and floodlight analyses

which are used in this article. Whereas spotlight analysis helps interpreting the simple effects of a categorical variable at specific levels of a continuous variable in a regression model (Spiller, Fitzsimons, Lynch, & McClelland, 2013), floodlight analysis is used when examining only at a few specific points of the continuous variable may not be enough (Johnson & Neyman, 1936). Specifically, floodlight analysis looks at the entire range of the continuous variable and identifies the point(s) where the simple effect turns from significant to not significant, known as Johnson–Neyman point (Spiller et al., 2013). Floodlight analyses can

TABLE 3. Multivariate Regressions Relating Credit Card Health Index With Knowledge and Confidence

Variables	(1)	(2)	(3)	(4)
	Basic	Demographic	Economic	Comprehensive
Confidence	0.17*** (0.011)	0.16*** (0.011)	0.13*** (0.011)	0.13*** (0.011)
Knowledge	0.27*** (0.008)	0.21*** (0.009)	0.20*** (0.009)	0.18*** (0.009)
Confidence * Knowledge	0.04*** (0.007)	0.03*** (0.007)	0.02*** (0.007)	0.02** (0.007)
Low income (<\$25k)			-0.26*** (0.036)	-0.23*** (0.037)
High income (>\$100k)			0.46*** (0.025)	0.44*** (0.025)
Disabled			-0.83*** (0.070)	-0.65*** (0.072)
Household size of 2			-0.05+ (0.028)	-0.04 (0.032)
Household size of 3			-0.44*** (0.037)	0.02 (0.077)
Household size of 4			-0.50*** (0.040)	-0.04 (0.079)
Household size of 5			-0.65*** (0.055)	-0.19* (0.087)
Household size ≥ 6			-0.90*** (0.080)	-0.43*** (0.105)
Temporary unemployed			-0.52*** (0.052)	-0.28*** (0.058)
Have a job			-0.52*** (0.025)	-0.32*** (0.032)
Young (<25)		0.06 (0.048)		0.09+ (0.050)
Old (≥65)		0.41*** (0.026)		0.24*** (0.032)
Female		-0.07** (0.022)		-0.03 (0.022)
White		0.23*** (0.027)		0.22*** (0.026)
Have dependent child		-0.50*** (0.025)		-0.48*** (0.062)
Single		-0.16*** (0.030)		-0.08* (0.034)
Constant	4.36*** (0.011)	4.37*** (0.032)	4.92*** (0.029)	4.59*** (0.048)
Observations	21,327	21,327	21,327	21,327
R-squared	0.08	0.12	0.13	0.14
Adj. R-squared	0.08	0.12	0.13	0.14

Note. Multivariate OLS regression results; Robust standard errors in parentheses.

*** $p < .001$. ** $p < .01$. * $p < .05$. + $p < .10$.

be conducted with the help of complex macros available for existing statistical software, or by running a series of spotlight analyses for several values of the continuous variable. In the latter case, one would observe the values for which the spotlight test fluctuates around the predetermined p -value and repeat the spotlight analyses until pinpointing the Johnson–Neyman point with the desired accuracy (Spiller et al., 2013).

Results

We organize the results as follows. First, because both knowledge and confidence variable have a mean close to the scale mid-point, we mean-center these variables to better capture the main effects of confidence at a representative level of knowledge. Then we relate the six measures of

credit card behaviors with financial confidence and knowledge. We then combine the six items to form a healthy credit card behaviors scale. Next, we relate this scale with financial confidence and knowledge, and add demographic and financial controls. We also consider the overall relationships between financial satisfaction, financial confidence and knowledge, and the credit card index. Finally, we evaluate whether the credit card index mediates the relationship between confidence, knowledge, and financial satisfaction. We used case wise deletion for missing values. Less than 1,000 observations or 5% of the original survey included missing values to the variables of interest and we do not see evidence of nonrandom missing data. To make sure there are no issues of multicollinearity, we looked at the correlation between financial confidence (subjective financial

TABLE 4. Financial Satisfaction by Confidence, Knowledge, and Credit Card Health Index

Variables	(1)	(2)	(3)	(4)	(5)
	Basic	CC Index	Demographic	Economics	Comprehensive
Confidence	0.96*** (0.016)	0.88*** (0.016)	0.83*** (0.016)	0.79*** (0.016)	0.76*** (0.016)
Knowledge	0.01 (0.012)	-0.12*** (0.012)	-0.17*** (0.012)	-0.23*** (0.012)	-0.24*** (0.012)
Confidence*Knowledge	-0.01 (0.010)	-0.03** (0.010)	-0.04*** (0.010)	-0.04*** (0.010)	-0.04*** (0.010)
ccind		0.49*** (0.011)	0.48*** (0.011)	0.43*** (0.011)	0.43*** (0.011)
Low income (<\$25k)				-1.00*** (0.056)	-1.01*** (0.056)
High income >\$100k)				0.73*** (0.035)	0.71*** (0.035)
Disabled				-1.18*** (0.107)	-0.99*** (0.111)
Household size of 2				0.09* (0.041)	0.19*** (0.047)
Household size of 3				0.08 (0.052)	0.37** (0.115)
Household size of 4				0.13* (0.055)	0.44*** (0.117)
Household size of 5				-0.04 (0.078)	0.28* (0.129)
Household size ≥ 6				-0.11 (0.111)	0.22 (0.151)
Temporary unemployed				-1.00*** (0.077)	-1.04*** (0.085)
Have a job				-0.53*** (0.039)	-0.40*** (0.049)
Young (<25)			0.21** (0.064)		0.53*** (0.066)
Old (≥65)			0.49*** (0.042)		0.32*** (0.049)
Female			-0.46*** (0.031)		-0.38*** (0.031)
White			-0.09* (0.037)		-0.12*** (0.036)
Have dependent child			0.18*** (0.036)		-0.17† (0.094)
Single			-0.33*** (0.043)		0.07 (0.049)
Constant	6.02*** (0.017)	3.89*** (0.051)	4.16*** (0.067)	4.53*** (0.070)	4.55*** (0.087)
Observations	21,327	21,327	21,327	21,327	21,327
R-squared	0.17	0.25	0.27	0.31	0.31
Adj. R-squared	0.17	0.25	0.27	0.31	0.31

Note. Multivariate OLS Regression results; Robust standard errors in parentheses.

*** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$.

knowledge) and objective financial knowledge and found a value of 0.179. Table 2 presents these results.

Confidence, Knowledge, and Credit Card Use

Given the generally consistent results across the credit card behaviors, we combined the six items of the healthy credit card use scale (always paying in full, carrying over a balance, making minimum payments, being charged a late fee, being charged an over the limit fee, and getting a cash advance) into a single scale measuring healthy credit card use to draw more general conclusions relating confidence, knowledge, and credit card use. The healthy credit card use scale reverse-coded all items except paying credit card in full, and is internally consistent ($\alpha = .75$).

Table 3 shows OLS regression analysis relating the healthy credit card use scale with confidence, knowledge, and a series of demographic and economic factors. The first model finds that confidence, knowledge, and their interaction each have a positive relationship with healthy credit card use ($p < .001$), in support of H1. These results are largely unchanged in magnitude and significance when considering predictive demographic factors (Model 2) including age (young/old), gender, race, having at least one dependent child, and marital status. These results largely persist when considering economic factors (Model 3) including income (low/high), employment (employed/unemployed), and household size, as well as both economic and demographic factors (Model 4).

TABLE 5. Summary of the Mediation Analyses

	Model 1				Model 2			
	Bootstrapped Beta	St. Err.	95% CI		Bootstrapped Beta	St. Err.	95% CI	
			Low	High			Low	High
Confidence	0.056	0.005	0.047	0.065	0.061	0.005	0.051	0.071
Knowledge	0.078	0.004	0.070	0.086	0.079	0.004	0.071	0.087
Confidence* Knowledge	0.009	0.003	0.003	0.015	0.011	0.003	0.005	0.017
Confidence to Knowledge					0.009	0.001	0.007	0.010
Fin Satisfaction	Coef	St. Err.	z	p(z)	Coef	St. Err.	z	p(z)
Confidence	0.765	0.015	52.65	<0.001	0.765	0.015	52.65	<0.001
Knowledge	-0.236	0.012	-19.77	<0.001	-0.236	0.012	-19.77	<0.001
Confidence* Knowledge	-0.043	0.009	-4.63	<0.001	-0.043	0.009	-4.63	<0.001
ccind	0.432	0.010	44.52	<0.001	0.432	0.010	44.52	<0.001
Young (<25)	0.529	0.062	8.50	<0.001	0.529	0.062	8.50	<0.001
Old (≥65)	0.319	0.051	6.23	<0.001	0.319	0.051	6.23	<0.001
Female	-0.376	0.031	-12.25	<0.001	-0.376	0.031	-12.25	<0.001
White	-0.121	0.035	-3.43	<0.001	-0.121	0.035	-3.43	<0.001
Have dependent child	-0.167	0.085	-1.96	0.05	-0.167	0.085	-1.96	0.05
Single	0.074	0.047	1.58	0.114	0.074	0.047	1.58	0.114
Low income (<\$25k)	-1.012	0.048	-21.07	<0.001	-1.012	0.048	-21.07	<0.001
High income (>\$100k)	0.707	0.039	18.35	<0.001	0.707	0.039	18.35	<0.001
Disabled	-0.992	0.102	-9.76	<0.001	-0.992	0.102	-9.76	<0.001
Household size of 2	0.192	0.046	4.17	<0.001	0.192	0.046	4.17	<0.001
Household size of 3	0.366	0.106	3.45	<0.001	0.366	0.106	3.45	<0.001
Household size of 4	0.444	0.108	4.11	<0.001	0.444	0.108	4.11	<0.001
Household size of 5	0.284	0.120	2.37	0.018	0.284	0.120	2.37	0.018
Household size ≥ 6	0.225	0.140	1.61	0.108	0.225	0.140	1.61	0.108
Temporary unemployed	-1.038	0.078	-13.34	<0.001	-1.038	0.078	-13.34	<0.001
Have job	-0.404	0.050	-8.03	<0.001	-0.404	0.050	-8.03	<0.001
Constant	4.548	0.083	55.13	<0.001	4.548	0.083	55.13	<0.001
R-squared	0.315				0.315			
N	21327				21327			
CCH index	Coef	St. Err.	z	p(z)	Coef	St. Err.	z	p(z)
Confidence	0.130	0.010	12.73	<0.001	0.130	0.010	12.73	<0.001
Knowledge	0.181	0.008	21.80	<0.001	0.181	0.008	21.80	<0.001
Confidence* Knowledge	0.021	0.006	3.29	<0.001	0.021	0.006	3.29	<0.001
Young (<25)	0.091	0.044	2.07	0.039	0.091	0.044	2.07	0.039
Old (≥65)	0.239	0.036	6.62	<0.001	0.239	0.036	6.62	<0.001
Female	-0.027	0.022	-1.26	0.208	-0.027	0.022	-1.26	0.208
White	0.223	0.025	8.98	<0.001	0.223	0.025	8.98	<0.001
Have dependent child	-0.477	0.060	-7.96	<0.001	-0.477	0.060	-7.96	<0.001

(Continued)

TABLE 5. Summary of the Mediation Analyses (Continued)

	Model 1				Model 2			
	Bootstrapped Beta	St. Err.	95% CI		Bootstrapped Beta	St. Err.	95% CI	
			Low	High			Low	High
Single	-0.081	0.033	-2.46	0.014	-0.081	0.033	-2.46	0.014
Low income (<\$25k)	-0.230	0.034	-6.81	<0.001	-0.230	0.034	-6.81	<0.001
High income (>\$100k)	0.437	0.027	16.18	<0.001	0.437	0.027	16.18	<0.001
Disabled	-0.646	0.072	-9.03	<0.001	-0.646	0.072	-9.03	<0.001
Household size of 2	-0.042	0.032	-1.30	0.194	-0.042	0.032	-1.30	0.194
Household size of 3	0.022	0.075	0.30	0.767	0.022	0.075	0.30	0.767
Household size of 4	-0.045	0.076	-0.59	0.556	-0.045	0.076	-0.59	0.556
Household size of 5	-0.188	0.085	-2.22	0.026	-0.188	0.085	-2.22	0.026
Household size ≥ 6	-0.434	0.099	-4.40	<0.001	-0.434	0.099	-4.40	<0.001
Temporary unemployed	-0.284	0.055	-5.19	<0.001	-0.284	0.055	-5.19	<0.001
Have job	-0.315	0.035	-8.91	<0.001	-0.315	0.035	-8.91	<0.001
Constant	4.591	0.049	93.81	<0.001	4.591	0.049	93.81	<0.001
R-squared	0.143				0.143			
N	21327				21327			
Confidence	Coef	St. Err.	z	p(z)	Coef	St. Err.	z	p(z)
Knowledge					0.141	0.005	26.5	<0.001

Note. Model 1: Financial Satisfaction (Confidence, Knowledge, Conf. × Knowl., Healthy CC Use, Controls) + Healthy CC use (Conf., Knowl., Conf. × Knowl., Controls).

Model 2: Financial Satisfaction (Confidence, Knowledge, Conf. × Knowl., Healthy CC Use, Controls) + Healthy CC use (Conf., Knowl., Conf. × Knowl., Controls) + Confidence (Knowledge).

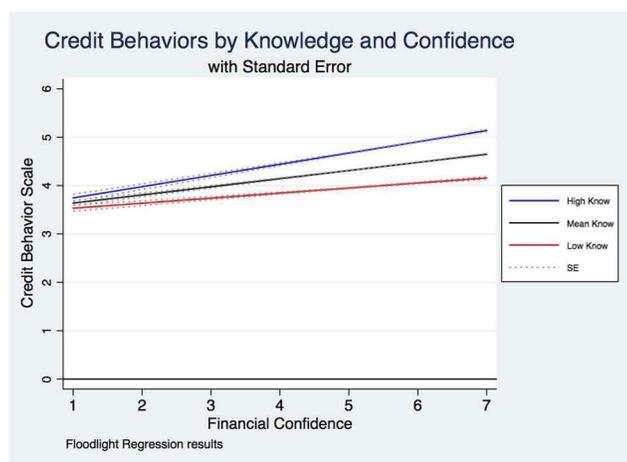
These results suggest that healthy credit card use increases with knowledge and confidence, and also that knowledge strengthens the relationship between confidence and healthy credit use.

In further support of H1, a spotlight analysis reveals that confidence relates to credit use more when knowledge is one standard deviation above the mean knowledge ($B = 0.16, s.e. = 0.02, t = 10.47, p < .001, 95\% \text{ CI } [0.13, 0.19]$) than when knowledge is one standard deviation below mean knowledge ($B = 0.10, s.e. = 0.01, t = 8.50, p < .001, 95\% \text{ CI } [0.08, 0.12]$). Viewed alternately, knowledge relates to credit card use more when confidence is high ($B = 0.21, s.e. = 0.01, t = 19.22, p < .001, 95\% \text{ CI } [0.19, 0.23]$) than when confidence is low ($B = 0.17, s.e. = 0.01, t = 14.59, p < .001, 95\% \text{ CI } [0.14, 0.18]$). It seems that healthy credit card usage increases with confidence and knowledge more strongly when confidence and knowledge appear together.

Figure 2 shows the relationship between confidence and healthy credit behavior at different levels of knowledge through a floodlight analysis. We followed the procedure detailed by Spiller et al. (2013), running 21 new regressions to generate point estimates for credit behavior given at each level of knowledge and spotlight confidence levels. This analysis similarly supports that healthy credit behavior increases with confidence more strongly when objective knowledge is high, supporting Hypothesis 1.

As a robustness check, we examined whether the results are explained by non-normal distribution of the credit card health use variable, due to an excessive number of the endpoints of the scale (0s and 6s). To test whether this explains the focal results, as a robustness check we ran a Tobit regression censoring 0 and 6, and the new results have a similar direction and statistical significance as the prior analysis, providing additional support for Hypothesis 1.

Figure 2. Floodlight analysis of credit behaviors by confidence, at high and low knowledge.



Note. NFCS reports can be accessed by the following links:

https://www.usfinancialcapability.org/downloads/NFCS_2015_Report_Natl_Findings.pdf

https://www.usfinancialcapability.org/downloads/NFCS_2012_Report_Natl_Findings.pdf

https://www.usfinancialcapability.org/downloads/NFCS_2009_Natl_Full_Report.pdf

Knowledge, Confidence, and Financial Satisfaction

Table 4 summarizes OLS models evaluating the relationship between confidence and knowledge with financial satisfaction. The first model finds a direct relationship between confidence and financial satisfaction ($p < .001$), in support of Hypothesis 2. After considering healthy credit use (Model 2), knowledge becomes a significant factor ($p < .001$). The relationship between credit card use and financial satisfaction remains strong and roughly stable after accounting for demographic controls (Model 3), economic factors (Model 4) and both (Model 5). Credit card use is highly predictive of financial satisfaction ($p < .001$).

We then test whether credit card use mediates the relationship between confidence, knowledge, and financial satisfaction. To test for mediation, we simultaneously estimated the models of credit card use and financial satisfaction with all controls (Model 4 of Table 3 and Model 5 of Table 4). For an estimate of the size and statistical significance of the indirect paths between confidence and financial satisfaction through credit card use without further parametric assumptions, we bootstrap with 5,000 replications (Preacher & Hayes, 2008). In particular, we calculated the indirect paths between confidence, knowledge, and their interaction with financial satisfaction, mediated through credit card use.

We find that indirect paths of confidence, knowledge, and the interaction between knowledge and confidence are significant ($p < .001$), and each 95% confidence interval excludes zero (Zhao, Lynch, & Chen, 2010). These results indicate that there is a relationship between confidence and financial satisfaction which is explained by credit use. The results also indicate moderated mediation, in other words, knowledge moderates the relationship between confidence and financial satisfaction due to credit use, further supporting Hypothesis 2. Following Zhao et al. (2010), these mediation models reveal indirect mediation, which has lower susceptibility to omitted variable bias than direct mediation.

Finally, we consider how confidence and knowledge jointly relate with credit card use and financial satisfaction. In particular, we examine how the relationships with confidence depend on knowledge, and how the relationships with knowledge depend on confidence. To do this we adapted the mediation model at one standard deviation above and below the mean values. This is essentially applying a spotlight analysis to the mediation model, to understand the confidence \Rightarrow credit use \Rightarrow financial satisfaction path for high and low knowledge. We find that confidence has a stronger relationship with financial satisfaction through credit card use when knowledge is high ($\text{know}_{\text{high}} = 4.5576$; $\beta_{\text{indirect}} = .07$,

s.e. = 0.01, $z = 10.45$, $p < .001$, 95% CI [0.06, 0.08]) than when knowledge is low ($\text{know}_{\text{low}} = 1.7408$: $\beta_{\text{indirect}} = .04$, *s.e.* = 0.01, $z = 7.14$, $p < .001$, 95% CI [0.03, 0.06]). We also find that knowledge has a stronger relationship with financial satisfaction through credit card use when confidence is high ($\text{conf}_{\text{high}} = 6.5033$: $\beta_{\text{indirect}} = .09$, *s.e.* = 0.01, $z = 17.02$, $p < .001$, 95% CI [0.08, 0.10]) than when confidence is low ($\text{conf}_{\text{low}} = 4.2920$: $\beta_{\text{indirect}} = .07$, *s.e.* = 0.01, $z = 13.29$, $p < .001$, 95% CI [0.06, 0.08]).

As a robustness check, we investigated if the results are explained by the relationship between knowledge and confidence. Perhaps objective knowledge increases with confidence, which is associated with healthy credit card use, which predicts financial satisfaction. We estimated a multiple-mediation model considering both the alternate explanation and the hypothesized mediation that confidence predicts credit card use and financial satisfaction, controlling for knowledge. As shown in Table 5, there is evidence that both paths exist, suggesting that objective knowledge is associated with subjective knowledge and that aspects of subjective knowledge are not well explained by objective knowledge, and that both of these relate to credit card use and resulting financial satisfaction. In other words, objective knowledge alone does not predict the impact of confidence in healthy credit card use.

These results support two conclusions: first, we find that confidence has a positive relationship with healthy credit card use and financial satisfaction even when knowledge is low, and a similar result for the return on knowledge when confidence is low. Additionally, as the return on confidence increases with knowledge and the return on knowledge increases with confidence, we conclude that knowledge and confidence are complements to increased healthy credit card use and financial satisfaction. These results support Hypothesis 2 and help increase our confidence that the earlier relationship between financial confidence and healthy credit card use is not predicted by the effect of credit use on confidence.

Discussions, Limitations, and Implications

Discussions

Across the analyses, we find support for Hypothesis 1, that knowledge has a predictive effect on the relationship between confidence and healthy credit card use. This relationship persists in models including several significant

controls, and we also find a similar pattern for financial satisfaction. The results support Hypothesis 2, that credit use mediates the predictive effect of knowledge in the relationship between confidence and financial satisfaction. We interpret these results to support the idea that knowledge predicts how confidence impacts credit card choice and this contributes to financial satisfaction.

Past research found that an increase in confidence and knowledge from -1 SD below the mean to $+1$ SD above the mean results in decreasing the probability of making minimum payments with 7% and 6%, respectively (Allgood and Walstad, 2016). Our results maintain this directionality, showing that 1-point increase in confidence and knowledge is associated with a decrease of 16% and 18%, respectively, in the probability of making minimum payments.

Extant literature recognizes financial education as an important and rather singular way of boosting users' financial confidence, thus leading to healthy financial behaviors (Brown, Grigsby, van der Klaauw, Wen, & Zafar, 2016; Xiao & O'Neill 2016; Xiao & Porto 2017). However, Xiao et al. (2011) found that confidence has a bigger impact in reducing poor financial behavior than financial knowledge. As Bandura (1997) showed in his work, self-efficacy (or confidence) is a personal belief that a subject can successfully complete a certain task. Our findings suggest that boosting people's self-efficacy may help their ability to engage in healthy behaviors by helping them gain and preserve the capability to be in charge of their personal finances. Similar results have been found in recent research that linked financial self-efficacy with preretirement savings (Asebedo & Seay, 2018). Nonetheless, financial knowledge and financial confidence must be balanced in order to avoid overconfidence or under confidence, which both lead to nonoptimal financial behaviors.

As one robustness check in an alternate economic climate, we replicated the analysis on equivalent measures in the 2009 NFCS dataset. In that replication, financial satisfaction was lower, and unhealthy credit behaviors were more prevalent, potentially reflecting the effects of the recent financial crisis experienced by the respondents. We replicate nearly all results with roughly similar relationships. Some notable departures in credit use are that, in 2009, confidence was related with a lower likelihood of late fees and exceeding limits, and knowledge had no relationship with paying in

full. When combined to become the credit use scale, the relationships match in direction and significance. Turning to financial satisfaction, in 2009 confidence and knowledge jointly relate with financial satisfaction ($b = 0.03, p < .001$), a relationship that is accounted for by credit card use, and, as the main mediation and spotlight results persist, it indicates direct mediation in the 2009 data set, and indirect-only mediation in the 2015 data set (results are not shown here but are available upon requests).

Limitations and Future Research

The general conclusions must be tempered by the fact that this analysis considers survey data, so while the results are suggestive of a causal relationship, the results are correlational. One possibility is that people are more confident if they have better credit, or that more financially satisfied people use their credit in more healthy ways. However, these alternate explanations would have a more difficult time explaining the unique relationships identified relating confidence and knowledge with credit card use. Our further analyses using floodlight and mediation provide evidence against a potential issue of reverse causality between the variables of interest.

One other limitation in this research is that confidence is measured with a single question, and financial knowledge with five fact-based questions. These crude approximations for knowledge and confidence interfere with the ability to reliably identify overconfident individuals, when the relationship between confidence and financial behavior may differ. Future research should experimentally manipulate confidence to understand overconfidence and credit use. Similarly, we hope future research will explore how manipulated financial knowledge (i.e., through financial education) relates with confidence and financial behaviors. This is potentially important given past studies suggesting that the relationship between measured knowledge and financial behaviors is stronger than the impact of financial education interventions on financial behaviors (Fernandes, Lynch, & Netemeyer, 2014).

Implications for Practitioners

For financial managers and policymakers, the results serve as a reminder that in order for financial knowledge to be applied to behaviors such as credit card use, individuals must be sufficiently confident in that knowledge. In other words, they must subjectively know that they have high

financial knowledge. As such, financial education interventions aimed at improving financial behaviors should include components to foster participants' self-efficacy and confidence on their knowledge. Similarly, financial counselors could cultivate their clients' best financial practices by helping those clients trust their own knowledge and ability to navigate the complexities of the financial arena.

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