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Self-esteem, financial knowledge and financial behavior

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ABSTRACT

Financial knowledge is an important but insufficient driver of responsible financial behavior. Having a positive evaluation of oneself may also be essential for individuals to initiate and persist with the daunting process of financial management. In this study, we distinguish subjective financial knowledge from objective financial knowledge, and we propose that self-esteem relates to financial behavior both directly as well as indirectly through subjective financial knowledge. Results based on a nationally representative dataset of U.S. adults suggest that self-esteem significantly relates to individual financial behavior after controlling for financial knowledge and other socioeconomic factors. The association between self-esteem and financial behavior could be both direct and indirect through subjective financial knowledge. These findings highlight the importance of psychological traits such as self-esteem in explaining financial behavior difference. Its implications are discussed.

1. Introduction

The low level of financial knowledge and capability is widespread among average households in Europe, the United States, Australia, and other countries (Atkinson & Messy, 2012; Lusardi & Mitchell, 2014; OCED, 2005; Van Els, Van Rooij, & Schuit, 2007). The economic impact of such deficiencies has received increasing attention in public policy arenas. In an effort to seek remedy for individual financial behavior inefficiency, numerous studies have investigated the determinants of individual financial decision-making. Early economics literature tended to focus investigations on the link between objective financial knowledge disseminated by financial education and individual financial behavior (Lusardi & Mitchell, 2014). On the other hand, a separate strand of research by psychological economists highlights the importance of considering psychological antecedents to explain financial behavior. Although a number of psychological traits have been linked with financial behavior (e.g., Abreu & Mendes, 2012; Antonides, Groot, & Van Raaij, 2011; Brown & Taylor, 2014; Tang, Baker, & Peter, 2015), self-esteem, the fundamental premises that individuals hold about themselves, has received scant investigation about its association with financial behavior. It is surprising because self-esteem appears to be an important psychological trait and is widely explored in other personality and applied psychology studies (Judge & Bono, 2001; Judge, Erez, &

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Bono, 1998). We combine the two strands of financial behavior literature by investigating both self-esteem and financial knowledge as financial behavior antecedents. We distinguish subjective financial knowledge from objective financial knowledge, and we propose that self-esteem relates to financial behavior both directly and indirectly through subjective financial knowledge.

Conventional wisdom claims that one needs to have a good grasp of financial concepts (objective financial knowledge) before he undertakes responsible financial behavior, although knowing what to do does not ensure optimal behavior (Bandura, 1982). For example, considering the complexities of individual financial decision-making, initiating the process of responsible financial actions can be intimidating, and short-term failures or distractions can undermine responsible long-term financial behaviors. Individuals need to know financial concepts well as well as possess enduring positive self-perception as emotional resources to help motivate behaviors in such a taxing context (Baumeister, Campbell, Krueger, & Vohs, 2003; Owens, 1993). Thus, self-esteem and objective financial knowledge simultaneously play a role in determining financial decisions. However, research is limited on the association between self-esteem and financial behavior. Among the few studies linking self-esteem and financial behavior, objective financial knowledge and other important socioeconomic variables were not incorporated in the model, thus hampering the generalization of their findings (e.g. Yurchisin & Johnson, 2004). Filling this research gap requires a rich dataset that has measures of an individual's psychological traits, financial knowledge, a broad range of financial behavior, and other socioeconomic control variables.

Furthermore, previous studies on the link between financial knowledge and financial behavior ignored the bi-dimensional nature of financial knowledge: what an individual actually knows (objective financial knowledge), and what he believes he knows (subjective financial knowledge). Recent research has demonstrated that an individual with a high level of objective financial knowledge may not necessarily hold a positive self-perception of his knowledge level (i.e., subjective knowledge), and consequently may not take the right move to manage finances (Asaad, 2015; Hadar, Sood, & Fox, 2013; Parker, De Bruin, Yoong, & Willis, 2012). However, there is a dearth of studies investigating the determinants of the mismatch between the two types of financial knowledge.

Using a rich, nationally-representative dataset of U.S. adults, we are able to incorporate both self-esteem and financial knowledge (objective and subjective) in the model to examine the strength of their association with a broad range of financial behaviors regarding saving inside and outside of retirement accounts, investment in risky assets, and credit management. Further, because we explicitly distinguish between objective and subjective financial knowledge, we are also able to investigate the indirect route self-esteem relates to financial behavior through the pathway mediated by subjective financial knowledge. To our knowledge, no previous studies have investigated the role of self-esteem conditional on objective financial knowledge; little is known about how self-esteem could indirectly relate to financial behavior through subjective financial knowledge.

Our results indicate that self-esteem significantly relates to financial management decisions regarding saving outside retirement accounts, investment in risky assets, and credit management, after controlling for financial knowledge and other socioeconomic factors. The association between self-esteem and financial behavior could be direct or indirect through subjective financial knowledge. By distinguishing objective and subjective financial knowledge, we confirm the distinct roles these two financial knowledge measures play in financial behavior, and we add to the literature by showing that self-esteem is a critical determinant of one's self-perception of financial knowledge.

The remainder of the paper is organized as follows: Section 2 provides a literature review and develops the research hypotheses, Section 3 describes our data and measures, Section 4 presents the results and discussions, and the concluding section discusses implications of our research and considers future research opportunities.

2. Literature review and research hypotheses

2.1. Objective financial knowledge and financial behavior

The underlying premise of most financial education programs is that improving someone's objective financial knowledge ought to result in him making improved financial decisions. There is empirical evidence supporting this practice, as objective financial knowledge has been positively linked with responsible financial behavior (e.g. Chen & Volpe, 1998; Lusardi & Mitchell, 2007; Robb & Woodyard, 2011). However, it has also been empirically observed that improved objective financial knowledge does not automatically result in good behavior. That is, objective financial knowledge is an important but insufficient stimulus for producing responsible financial behavior (Borden, Lee, Serido, & Collins, 2008; Johnson & Sherraden, 2007; Jones, 2005).

2.2. Direct effect of self-esteem on financial behavior

Self-esteem is defined as an individual's general attitude towards oneself (Rosenberg, Schooler, Schoenbach, & Rosernberg, 1995). It is characterized as a central component of one's overall self-perception, and it is related with a wide range of individual behavior and outcomes such as school performance, occupational success, personal relationship, and delinquency (e.g. Baumeister et al., 2003; de Araujo & Lagos, 2013; Drago, 2011; Onkivisit & Shaw, 1987). Although study on the relationship between self-esteem and financial behavior is limited, there are reasons to expect that high

self-esteem leads to responsible financial behavior. For example, financial management is essentially about goal setting and goal achievement. Di Paula and Campbell (2002) concluded that high self-esteem individuals achieved more goals, engaged in higher levels of goal pursuit behaviors, indicated greater satisfaction with progress toward goals, and ruminated less about failed goals than their low self-esteem counterparts. Responsible financial behavior also requires persistence and coping ability, especially in the face of challenging financial settings. Previous literature provided evidence that individuals with high self-esteem persist more in the face of difficult tasks or failures, while individuals with low self-esteem possess fewer resources for defending against rejection threat (Baumeister et al., 2003; Sommer & Baumeister, 2002). High self-esteem individuals also know when to quit when there is indication that persistence may be a poor strategy (Baumeister et al., 2003). Further, previous study has characterized self-esteem as being comprised in part by an individual's level of self-confidence (Owens, 1993), and high degrees of self-confidence may be essential for someone to initiate the daunting process of financial management.

Taken together, there is reason to believe that high self-esteem operates as a positive emotional resource for individuals to draw upon during various stages of the financial management process. A limited number of empirical studies also support this role of self-esteem on financial behavior. Yurchisin and Johnson (2004) studied undergraduates in a Midwestern university and found that compulsive buying behavior is negatively related to self-esteem. Neymotin (2010) studied individuals taking the Emode or Tickle online test and observed a strong positive relationship between self-esteem and an individual's decision to engage in various forms of financial planning. Although such studies support the role of self-esteem in financial decision making, they may not be definitive on the matter because they did not incorporate financial knowledge in the analysis; many of them were based on non-representative samples (e.g., Yurchisin & Johnson, 2004), and/or did not control respondents' socioeconomic characteristics such as education, income, and net worth (e.g. Neymotin, 2010).

2.3. Indirect effect of self-esteem through subjective financial knowledge

Research by Asaad (2015) and Parker et al. (2012) demonstrated that the two dimensions of financial knowledge, objective and subjective financial knowledge, play distinct roles in influencing one's financial behavior. That is, two individuals with the same level of objective financial knowledge could have different subjective evaluations of their knowledge levels, which lead to different behavior outcomes. In certain cases, subjective financial knowledge is more influential than objective financial knowledge in determining financial behavior (Allgood & Walstad, 2013; Hadar et al., 2013). However, no previous study explained the mismatch between objective and subjective financial knowledge.

We hypothesize that self-esteem plays a role in developing one's subjective financial knowledge, which in turn affects financial behavior. As indicated by Hadar et al. (2013), objective knowledge is more strongly related to one's ability and expertise, whereas subjective knowledge is more strongly related to product-related experience and consumers' confidence in their ability to make effective decisions. Similarly, we propose that self-esteem, as a central component of one's general self-perception, would also influence an individual's subjective evaluation of his own financial knowledge. Furthermore, we propose that individuals with higher levels of subjective financial knowledge will subsequently be more likely to engage in responsible financial practice, even after controlling for their objective financial knowledge and other socio-economic factors. That is, self-esteem has an indirect association with financial behavior through subjective financial knowledge.

Therefore, as depicted in Fig. 1, we hypothesize that:

H1. Self-esteem is directly linked with financial behavior, conditional on objective financial knowledge and other socio-economic factors.

H2. Self-esteem is indirectly linked with financial behavior, through subjective financial knowledge, conditional on objective financial knowledge and other socio-economic factors.

In addition, our research model is consistent with existing research about the relationship between objective financial knowledge with subjective financial knowledge and individual financial behavior. Specifically, higher level of objective financial knowledge is expected to be positively correlated with subjective financial knowledge; higher level of objective financial knowledge also predicts one's engagement in responsible financial behavior.

3. Data

This study uses a longitudinal dataset designed and collected by the U.S. Bureau of Labor Statistics: the 1979 National Longitudinal Survey of Youth (thereafter, NLSY79). NLSY79 selected a nationally reprehensive sample of 12,686 American youth in 1979 in the first wave of survey. The same group of respondents has been followed annually through 1994 and biennially afterwards. Among others, NLSY79 contains extensive information on respondents' demographic, socioeconomic, and psychological characteristics. The NLSY79 also asked respondents about their financial knowledge and behavior in 2012 when they were aged 47–56. Due to NLYS79 participants dropping out over time or not qualifying to answer selected questions, the analyzed sample size for our study varies between 1493 and 5693 depending on which particular outcome measure is being investigated. We describe our measures next and original survey questions adopted to create our main variables are shown in Appendix Table A.

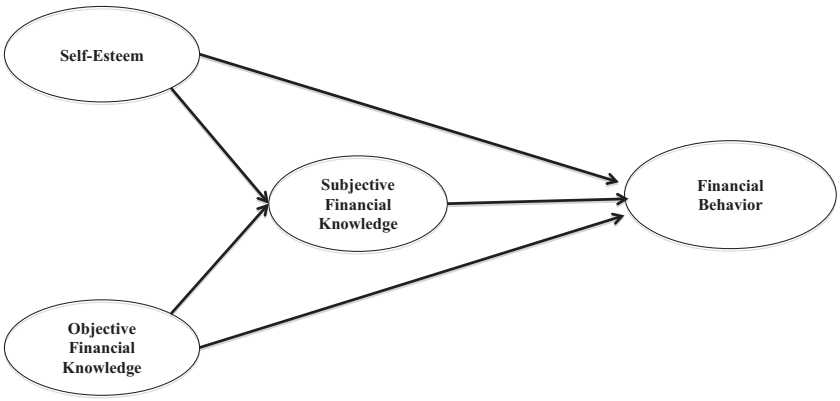

Fig. 1. Self-esteem and financial behavior.

3.1. Financial behavior

The NLSY79 asked respondents about their financial behavior in 2012. We select eight measures reflecting respondents' financial behavior in saving outside of retirement accounts, investment in risky assets, retirement saving, and credit management. These financial areas are expected to cover the major personal financial management practices, and are widely used by other studies to measure individual's financial behavior (Hilgert, Hogarth, & Beverly, 2003).

3.1.1. Saving

Two measures are included to indicate respondents' financial behavior regarding saving outside of retirement accounts. As shown in Appendix Table A, respondents in 2012 were asked about their total amount of savings outside of retirement accounts such as checking account, savings account, money market account, certificates of deposits, and U.S. government saving bonds. Respondents not having such accounts would have zero as account amount.[1] For the first measure, we create a dummy variable "have savings," which has a value of one if respondent had positive savings in any of these types of accounts. Our second variable, "log (savings amount)", is the logarithm of respondents' total amount of savings (conditional on them having some savings) in these accounts.

3.1.2. Investment in risky assets

We create a variable "invest in risky assets" indicating if respondents had positive investment amount in either stocks or mutual funds. The variable "log (risky assets amount)" is the logarithm of respondents' total amount of investment in stocks and mutual funds (conditional on them having risky assets).

3.1.3. Retirement saving

We also have two measures of retirement savings. In the U.S., there are mainly two types of retirement plans. First is defined-benefit plan in which employees do not make participation or investment decisions. Since define-benefit plans require limited active decision-making by participants, we exclude this type of plans from our retirement savings variables. The second kind of retirement plans are defined-contribution plans in which employees need to decide if they participate in the employer-sponsored tax benefit plans, how much to contribute, and how to invest to accumulate retirement account balance. We create a dummy variable "participate in retirement plans" which has a value of one if the respondent participated in any defined-contribution plans he was eligible for. Conditional on having retirement savings, the second variable, "log (retirement account balance)" measures the logarithm of total assets in all of retirement plans one participated in.

3.1.4. Credit card debt

Last, two variables are created to measure credit management behavior. "Max out credit cards" has a value of one if a respondent owed the maximum amount allowed by the credit card company on any of his credit cards in 2012. Our second measure on credit card behavior "credit card debt/financial assets" indicates the ratio of credit card debt amount to total financial assets. We adjust credit card debt by financial assets to control for the potentially confounding effects of access to credit and consumption smoothing on the relationship between self-esteem and credit card balance.

3.2. Self-esteem

We use the 10-item scale developed by Rosenberg (1965) to assess respondents' level of self-esteem. The Rosenberg scale has been shown to be highly reliable and is the most popular measure of self-esteem among researchers (Baumeister et al.,

[1] Detailed coding for data cleaning and sample selection is available from the authors by request.

2003). We use Rosenberg self-esteem scores obtained in NLSY79 2006 survey; high scores indicate a high level of self-esteem.

3.3. Objective and subjective financial knowledge

The NLSY79 2012 survey asked respondents five financial knowledge questions aimed at testing basic but fundamental financial concepts regarding risk diversification, interest rate, inflation, bond, and mortgage. These questions have been shown to differentiate well between financially knowledgeable and financially naïve respondents, and have been widely used in other national surveys (Lusardi & Mitchell, 2008, 2011; Lusardi, Mitchell, & Curto, 2010). Following standard research practice (e.g. Tang et al., 2015), an individual's measure of objective financial knowledge is the count of the number of questions he answered correctly (range 0–5).

In addition, respondents in NLSY79 2012 survey were asked to self-evaluate their level of financial knowledge. We used their answers to the question as a measure to indicate their subjective financial knowledge.

3.4. Covariates

Control variables include respondents' race, gender, marital status, educational attainment, age, and net worth in 2012. Respondents were asked about their willingness to take risks in financial matters in 2010. Individuals did not respond in 2010 were asked the same question in 2012. We use respondents' answers in 2010 or 2012 as a control for respondents' risk tolerance in financial matters. We also control for income earned in 2011. In the path to investigate self-esteem measured in 2006, we replace educational attainment and marital status controls with measures in 2006 and income controls with 2005 income.

It is possible that a financial windfall may affect individuals' self-esteem (Butler, 2014). In turn, we also include three financial covariates from the 2004 wave of the NLSY79. Specifically, we control for respondents' net worth in 2004, whether or not they had experienced bankruptcy by 2004, and whether they held any risky investments (mutual funds, and/or stocks). These financial measures are selected because they might expose individuals to potential financial windfalls that could influence their self-esteem and subsequent financial behavior (Epley & Gneezy, 2007).

4. Results

4.1. Summary statistics

Summary statistics on all measures as well as covariates are shown in Table 1. A total of 65.41% of respondents had savings. The average savings amount among those who saved was $38,135. About 35.49% of respondents invested in risky assets in 2012, and the average investment amount is $144,307 among them. In the group of respondents eligible to participate in defined-contribute plans, 85.74% chose to participate. Among those who had retirement savings, the average account balance was $110,896. These statistics are consistent with national averages for the age group of 50 s in 2012 (VanDerhei, Holden, Alonso, & Bass, 2013). There were 8.5% respondents maxing out their credit cards in 2012. On average, credit card debt represented 9.13 times of financial assets among those who owed money on credit cards in our sample. Respondents had an average self-esteem score of 23.49 out of 30. Their subjective financial knowledge score averaged at 4.82 out of 7 and objective financial knowledge score averaged at 3.15 out of 5.

The sample includes adults aged 47–56 as of 2012. Males comprised 48.25% of the sample. The breakdown of ethnicities is: Hispanic (19.26%), Black (31.40%), and other (49.34%). The average salary earned in 2011 was $62,916, and the net worth in 2012 (2004) was $260,166 ($189,664). In total, 14.23% declared bankruptcy by 2004, and 39.80% possessed at least one form of risky investment in 2004. A total of 59.31% of respondents were married in 2012. A portion of 52.92% of respondents completed grades in high school or below, while 22.83% finished college or above.

Table 2 reports both Pearson and partial correlations between financial behavior and self-esteem, subjective, and objective financial knowledge. Self-esteem is significantly correlated with seven out of eight financial behavior measures. High level of self-esteem is related to responsible financial behavior with the exception of "max out credit cards." Self-esteem is negatively associated with the likelihood to max out credit cards, but the correlation is not statistically significant. It is also noted that after controlling for covariates, the correlations between self-esteem and retirement saving behavior and risky assets amount are no longer significant.

Table 2 also shows that both objective and subjective financial knowledge is positively correlated with most responsible financial behavior, with the exception of credit card behavior, participation in retirement plans and risky assets amount. In addition, subjective financial knowledge is positively correlated with self-esteem and objective financial knowledge.

4.2. Direct and indirect effects of self-esteem on financial behavior

Given the empirical support for a relationship between individuals' self-esteem and their financial behavior as shown in Table 2, we proceed to test our research hypotheses by assessing the strength of direct and indirect links between

Table 1
Summary statistics.

	Mean	SD	Min	Max
Financial behavior				
Have savings	65.41%		0	1
Savings amount	$38,135	$99,295	$1	$555,703
Invest in risky assets	35.49%		0	1
Risky assets amount	$144,307	$345,964	$1	$1,517,756
Participate in retirement plans	85.74%		0	1
Retirement account balance	$110,896	$146,263	$9	$1,033,000
Max out credit cards	8.50%		0	1
Credit card debt/fin. assets	9.13	22.82	0.00	100.00
Rosenberg self-esteem	23.49	4.43	5	30
Sub. fin. knowledge	4.82	1.65	1	7
Obj. fin. knowledge	3.15	1.20	0	5
Covariates				
Male	48.25%		0	1
Age in '12	51.33	2.23	47	56
Race				
Hispanic	19.26%		0	1
Black	31.40%		0	1
Other	49.34%		0	1
Income in '11	$62,916	$73,521	$0	$616,125
Net worth in '12	$260,166	$580,639	−$1,949,900	$3,690,789
Married	59.31%		0	1
Highest grade completed in '12	13.34	2.57	0	20
Non-high school	9.68%		0	1
High school	43.24%		0	1
Some college	24.25%		0	1
College	11.96%		0	1
Graduate school	10.87%		0	1
Risk tolerance	3.62	2.78	0	10
Net worth in '04	$189,664	$396,193	−$874,421	$2,569,252
Bankruptcy by '04	14.23%		0	1
Risky investment in '04	39.80%		0	1

Table 2
Correlation coefficients between financial behavior and self-esteem, objective and subjective financial knowledge.

	Saving		Invest in risky assets		Retirement saving		Credit card debt		(9) Sub. fin. knowledge
	(1) Have savings	(2) Log (savings (amount)	(3) Invest in risky assets	(4) Log (risky assets amount)	(5) Participate in retirement plans	(6) log (retirement account balance)	(7) Max out credit cards	(8) Credit card debt/fin. assets	
Pearson correlations									
Self-esteem	.15***	.19***	.14***	.08***	.07**	.08**	−.03	−.11***	.17***
Sub. fin. knowledge	.12***	.16***	.11***	.14***	.08***	.20***	−.02	−.09***	
Obj. fin. knowledge	.28***	.25***	.23***	.15***	.16***	.31***	−.02	−.07***	.14***
Partial correlations (controlling for covariates)									
Self-esteem	.06***	.11***	.03*	.02	.02	.02	−.02	−.08***	.13***
Sub. fin. knowledge	.06***	.09***	.03*	.06**	.03	.11***	−.01	−.06**	
Obj. fin. knowledge	.10***	.06***	.06***	−.02	.05*	.13***	.01	−.01	.07***

*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

self-esteem and financial behavior through a series of eight path models. Each path model's outcome variable corresponds to one of the eight financial behavior measures. The four dichotomous variables – have savings, invest in risky assets, participate in retirement plans, and max out credit cards – are specified to have a logit link with study predictors (self-esteem, objective and subjective financial knowledge, and covariates); while the four continuous variables – log (savings amount), log (risky assets amount), log (retirement account balance), and credit card debt/financial assets – are specified to have a linear link with study predictors. The mediating variable, subjective financial knowledge, is predicted by self-esteem, objective financial knowledge, and the covariates. Self-esteem is also predicted by the covariates which include the three financial status measures in 2004, but we replace educational attainment and marital status controls with measures in 2006 and replace income with that earned in 2005, since self-esteem was measured in 2006. For the two path models involving risky

investments as the outcome of interest (invest in risky assets and the log (risky assets amount)), we do not include the 2004 covariate of risky investment behavior. Regression results of the eight path models are reported in Table 3.

In addition, we test the strength of the total, direct and indirect effects of self-esteem on financial behavior using the KHB method proposed by Karlson, Holm, and Breen (2010) (see their paper for the full proof of the KHB method). The procedure decomposes the total effect of a predictor (in our case, self-esteem) on an outcome (our eight financial behavior measures) into its direct effect (synonymous with the main effect) and the indirect effect (synonymous with the mediation effect) while controlling for covariates. We adopt the KHB method because comparing the coefficients between nonlinear probability models (our four logit models) can be problematic due to the rescaling of the main effect coefficient by adding a mediator variable and simulation studies support the efficacy of the KHB method for estimating mediation effects in nonlinear models (Karlson et al., 2010). The standardized total, direct, and indirect effects estimated by KHB method are reported in Table 4. The reported values can be interpreted as the expected change in the (log odds of) dependent variable to a one standard deviation increase in self-esteem for continuous (dichotomous) outcomes.

4.2.1. Saving

As shown in columns (1) and (2) of Table 3, self-esteem directly relates to individuals' decision on how much to save but not on whether or not they have savings. For example, one unit increase in self-esteem is associated with an estimated increase in the log (savings amount) by .04 ($p < .001$). Table 3 also reports initial evidence of an indirect effect of self-esteem on one's decision to save and savings amount via subjective financial knowledge. For example, as shown in column (2) in Table 3, self-esteem is strongly associated with subjective financial knowledge (.04, $p < .001$), and a one-unit increase in one's subjective financial knowledge is associated with a .10 increase in the log (savings amount) ($p < .001$). The KHB test results reported in Table 4 column (1) and (2) provide support for significant effects of self-esteem on saving behavior: self-esteem has both a positive significant direct and indirect effects on the amount of someone's savings (.18 and .02, respectively, both $p < .001$); Self-esteem also has a significant indirect effect on the log of the odds of someone having savings (.01, $p < .05$).

4.2.2. Invest in risky assets

Self-esteem directly relates to one's decision to invest in risky assets and it is indirectly associated with the amount invested in risky assets. As shown in column (3) of Table 3, an increase in self-esteem increases the odds of investing in risky assets (.02, $p < .01$); results in column (4) also indicate that self-esteem is positively associated with subjective financial knowledge (.04, $p < .001$), which in turn increases log (risky assets amount) (.09, $p < .01$). The KHB test results confirm the significant direct effect of self-esteem on "invest in risky assets" (.09, $p < .01$) and the significant indirect effect of self-esteem on "log (risky assets amount)" (.02, $p < .05$).

4.2.3. Retirement saving

The direct and indirect effects of self-esteem on retirement plan participation and retirement saving amount are not significant ($p > .10$, Table 4 column (5) and column (6)). Although results in Table 3 column (6) indicate a positive relationship between self-esteem and subjective financial knowledge (.02, $p < .05$), and a one unit increase in one's subjective financial knowledge is associated with a .12 increase in log (retirement account balance) ($p < .001$). Taken together, the indirect effect of self-esteem on retirement account balance is insignificant (.01, $p > .10$) as shown in Table 4 column (6).

4.2.4. Credit card debt

Self-esteem does not have significant effect on the log odds of someone maxing out credit cards ($p > .10$ for both direct and indirect effects, Table 4 column (7)). In terms of credit card debt amount as a ratio of financial assets, self-esteem's direct and indirect effects are both negative and statistically significant. First, the direct effect of self-esteem shown in Table 4 column (8) implies that a one standard deviation increase in self-esteem directly reduces one's credit card debt ratio by 1.52 ($p < .001$). Secondly, a one standard deviation increase in self-esteem is associated with an additional expected .14 reduction in credit card debt ratio through the mediator subjective financial knowledge ($p < .05$). Overall, self-esteem exerts a negative total effect on one's credit card debt (-1.65, $p < .001$, Table 4 column (8)).

In summary, the above results partially support H1 and H2. Self-esteem has a significant direct effect on financial behavior regarding saving, investment in risky assets, and credit management. Self-esteem also indirectly relates to three of the four continuous outcomes – savings amount, risky assets amount and credit card debt/financial assets, through subjective financial knowledge, while self-esteem with significantly indirectly related to one of the three dichotomous outcomes – having savings. In addition, as expected, objective financial knowledge is positively related to subjective financial knowledge; objective financial knowledge also is directly associated with responsible financial behavior in terms of savings behaviors, whether to invest in risky assets and the amount of retirement savings.

4.3. Discussion

4.3.1. Role of self-esteem varies across areas of financial practice

Our results indicate that self-esteem relates to financial behaviors; however, the strength of its role differs across areas of financial practice. For example, the effect of self-esteem is significant, directly or indirectly, on saving, investment in risky

Table 3
Path analysis results for direct and indirect effects of self-esteem on financial behavior.

Variables	Saving		Investment in risky assets		Retirement saving		Credit card debt	
	(1) Have savings	(2) Log (savings amount)	(3) Invest in risky assets	(4) Log (risky assets amount)	(5) Participate in retirement plans	(6) Log (retirement account balance)	(7) Max out credit cards	(8) Credit card debt/fin. assets
Main path (DV: Financial behavior)								
Self-esteem	.01	.04***	.02**	.01	.01	.002	−.01	−.32**
	(.01)	(.01)	(.01)	(.01)	(.02)	(.01)	(.01)	(.09)
Sub. fin. knowledge	.05*	.10***	.04	.09**	.01	.12***	−.01	−.76*
	(.02)	(.02)	(.02)	(.03)	(.05)	(.03)	(.03)	(.29)
Obj. fin. knowledge	.16***	.10**	.15***	−.03	.11	.19***	.06	−.12
	(.03)	(.03)	(.03)	(.04)	(.07)	(.04)	(.05)	(.40)
Male	−.11	.09	−.24***	.05	.15	.38***	−.67***	.44
	(.07)	(.06)	(.06)	(.08)	(.15)	(.08)	(.11)	(.85)
Age	.01	.03*	.01	.02	.03	.04*	.01	−.14
	(.02)	(.01)	(.01)	(.02)	(.03)	(.02)	(.02)	(.18)
Race (Ref. = Hispanic)								
Black	−.57***	−.36***	.27**	−.45**	−.11	−.19	−.39**	2.02
	(.10)	(.10)	(.10)	(.14)	(.20)	(.12)	(.13)	(1.27)
Other	.58***	.19*	.43***	−.40**	−.05	.10	−.63***	1.29
	(.09)	(.08)	(.09)	(.12)	(.19)	(.11)	(.13)	(1.08)
Income ($1000)	.02***	.01***	.003***	.002***	.01***	.01***	.0003	−.03***
	(.001)	(.001)	(.001)	(.001)	(.002)	(.001)	(.001)	(.01)
Net worth ($1000)	.002***	.001***	.002***	.001***	.002***	.0002**	−.002***	−.003**
	(.0003)	(.0001)	(.0001)	(.0001)	(.001)	(.0001)	(.0003)	(.001)
Married	−.05	.19**	.10	.33**	−.06	−.05	.17	−.50
	(.08)	(.07)	(.07)	(.10)	(.16)	(.09)	(.11)	(.93)
Education	.12***	.07***	.08***	.02	.13**	.03	.07**	.38*
	(.02)	(.01)	(.01)	(.02)	(.04)	(.02)	(.02)	(.18)
Risk tolerance	−.01	−.01	.02*	.05**	.02	.04*	.04*	.07
	(.01)	(.01)	(.01)	(.02)	(.03)	(.02)	(.02)	(.17)
Net worth ('04, $1000)	−.001**	.00003	.0002	.0003**	−.0002	.0002	.0002	.001
	(.0002)	(.0001)	(.0001)	(.0001)	(.001)	(.0001)	(.0002)	(.001)
Bankruptcy by '04	−.06	−.71***	−.27**	−.55***	−.19	−.46***	.32**	4.50***
	(.09)	(.09)	(.09)	(.14)	(.18)	(.12)	(.12)	(1.13)
Risky investment in '04	.44***	.64***			.33*	.39***	.08	−6.37***
	(.08)	(.06)			(.15)	(.08)	(.11)	(.85)
Mediation path (DV: Subjective financial knowledge)								
Self-esteem	.05***	.04***	.05***	.04***	.02**	.02*	.05***	.04***
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
Obj. fin. knowledge	.10***	.09***	.10***	.14***	.09**	.14***	.09***	.08**
	(.02)	(.02)	(.02)	(.03)	(.03)	(.03)	(.02)	(.03)
Male	.03	.07	.03	.12	.03	.06	.04	.04
	(.04)	(.05)	(.04)	(.06)	(.06)	(.07)	(.04)	(.05)
Age	−.001	.001	−.001	−.003	−.01	−.0002	−.003	.001
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
Race (Ref. = Hispanic)								
Black	.07	−.02	.07	.04	.03	−.001	.07	.03
	(.06)	(.07)	(.06)	(.10)	(.09)	(.11)	(.06)	(.08)
Other	−.08	−.19**	−.08	−.16	−.06	.02	−.06	−.25***
	(.06)	(.06)	(.06)	(.09)	(.08)	(.09)	(.06)	(.07)
Income ($1000)	.001	.0002	.001	.0004	.0003	.0001	.0004	.0001
	(.0004)	(.0004)	(.0004)	(.0004)	(.001)	(.001)	(.0004)	(.001)
Net worth ($1000)	.0001**	.0001**	.0001**	.0001*	.0001	.0001	.0001**	.0002**
	(.0001)	(.00004)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Married	.05	−.04	.05	.03	.02	−.05	.05	−.03
	(.05)	(.05)	(.05)	(.07)	(.07)	(.08)	(.05)	(.06)
Education	.01	.01	.01	−.01	.02	.002	.01	.01
	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)	(.01)	(.01)
Risk tolerance	.02*	.03**	.02*	.02	.01	.01	.02	.03*
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
Net worth ('04, $1000)	.0002*	.0001*	.0002*	.0001*	.0003*	.0003**	.0002*	.0002*
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Bankruptcy by '04	.01	−.03	.01	.004	−.04	−.08	.01	−.04
	(.06)	(.07)	(.06)	(.10)	(.09)	(.10)	(.06)	(.07)
Risky investment in '04	.11*	.06	.11*	.004	.11	.18*	.11*	.07

(*continued on next page*)

Table 3 (*continued*)

Variables	Saving		Investment in risky assets		Retirement saving		Credit card debt	
	(1) Have savings	(2) Log (savings amount)	(3) Invest in risky assets	(4) Log (risky assets amount)	(5) Participate in retirement plans	(6) Log (retirement account balance)	(7) Max out credit cards	(8) Credit card debt/fin. assets
	(.05)	(.05)	(.05)	(.07)	(.06)	(.07)	(.05)	(.06)
DV: Self-esteem								
Male	.21	.30*	.21	.38*	.21	.39	.22	.55**
	(.11)	(.14)	(.11)	(.18)	(.18)	(.21)	(.11)	(.17)
Age	−.02	−.01	−.02	.02	.04	.03	−.02	−.01
	(.03)	(.03)	(.03)	(.04)	(.04)	(.05)	(.03)	(.04)
Race (Ref. = Hispanic)								
Black	.75***	.93***	.75***	1.03**	.86**	1.27***	.73***	1.11***
	(.17)	(.22)	(.17)	(.31)	(.28)	(.34)	(.17)	(.26)
Other	.05	.01	.05	.37	−.004	.11	.04	.19
	(.16)	(.18)	(.16)	(.27)	(.24)	(.29)	(.16)	(.22)
Income ('05, $1000)	.01***	.01***	.01***	.01***	.004*	.002	.01***	.01***
	(.001)	(.001)	(.001)	(.002)	(.002)	(.002)	(.001)	(.002)
Married ('06)	.47***	.38*	.47***	.39	.55**	.31	.45***	.09
	(.13)	(.16)	(.13)	(.22)	(.21)	(.25)	(.13)	(.19)
Education ('06)	.26***	.17***	.26***	.13**	.18***	.16**	.26***	.14***
	(.03)	(.03)	(.03)	(.04)	(.04)	(.05)	(.03)	(.04)
Risk tolerance	.04	.08**	.04	.05	.10**	.05	.04	.06
	(.02)	(.03)	(.02)	(.04)	(.04)	(.05)	(.02)	(.03)
Net worth ('04, $1000)	−.0001	−.00002	−.0001	−.0001	−.0002	.0001	−.0001	−.00002
	(.0002)	(.0002)	(0.0002)	(.0002)	(.0003)	(.0003)	(.0002)	(.0002)
Bankruptcy by '04	.10	.08	.10	−.28	−.0003	−.13	.10	−.16
	(.16)	(.20)	(.16)	(.30)	(.26)	(.31)	(.16)	(.23)
Risky investment in '04	.67***	.51***	.67***	.64**	.46*	.44	.66***	.48**
	(.12)	(.14)	(.12)	(.21)	(.19)	(.22)	(.12)	(.17)
Observations	5693	3990	5693	2175	2110	1493	5656	2724
Log-likelihood	−29,316	−178,879	−30,020	−97,543	−10,265	−65,551	−28,190	−127,940

*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

assets and credit management behaviors, while it is not significant on financial behavior dealing with retirement saving. Regarding statistically insignificant role of self-esteem and retirement savings, one possible explanation could be that there has been increasing awareness of the investment inefficiency in defined-contribution plans in the U.S. (Agnew, Balduzzi, & Sunden, 2003; Benartzi & Thaler, 2001; Benartzi, Thaler, Utkus, & Sunstein, 2007). Consequently, policy makers and plan sponsors have implemented various education programs and well-designed choice architecture to assist participants better manage their retirement accounts; a carefully selected default option, for example, will be provided to participants who choose not to or who are not capable of making investment choices in retirement accounts (Thaler & Sunstein, 2008). To the extent these programs have reduced the need for someone to possess a positive self-perception to endure the process of retirement planning behavior, self-esteem may logically play a less substantive role. Partly corroborating this explanation, our unreported results indicate that among those who participated in defined contribution plans in 2012, respondents with lower self-esteem were less likely to calculate their retirement needs, consult with financial planners, or read magazines or books on retirement planning. That is, people with low self-esteem are less likely to be actively involved in retirement planning, although they still participate in retirement saving with their counterparts. However, we would like to highlight that we still need more rigorous data to confirm if the difference in self-esteem effect is actually caused by the helpful interventions by plan sponsors.

4.3.2. Direct versus indirect effect of self-esteem

Our results also suggest that self-esteem could relate to one's financial behavior in two ways: directly and indirectly through subjective financial knowledge. While previous studies on the link between self-esteem and financial behavior mainly focused on the direct effect of self-esteem (Neymotin, 2010; Yurchisin & Johnson, 2004), we point out another channel through which self-esteem could be associated with financial behavior. Self-esteem not only relates to financial behavior by serving as a positive emotional resource, it also alters the way one views his financial sophistication. As for why self-esteem is indirectly related to certain financial decisions but not others, additional research is needed. However,

Table 4
Total, direct and indirect effects of self-esteem on financial behavior.

	Saving		Invest in risky assets		Retirement saving		Credit card debt	
	(1) Have savings	(2) Log (savings amount)	(3) Invest in risky assets	(4) Log (risky assets amount)	(5) Participate in retirement plans	(6) Log (retirement account balance)	(7) Max out credit cards	(8) Credit card debt/fin. assets
Total effect	.04	.20***	.09**	.04	.02	.02	−.06	−1.65***
	(.04)	(.03)	(.03)	(.04)	(.07)	(.04)	(.05)	(.41)
Direct effect	.03	.18***	.09**	.03	.02	.01	−.06	−1.52***
	(.04)	(.03)	(.03)	(.04)	(.07)	(.04)	(.05)	(.42)
Indirect effect	.01*	.02***	−.0001	.02*	0.02	.01	−.003	−.14*
	(.004)	(.01)	(.004)	(.01)	(.004)	(.01)	(.01)	(.06)

Note: Standard errors in parentheses.
*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

our results would suggest that the discrepancy in self-esteem indirect effects are mostly due to differences in the relationship between subjective financial knowledge and particular financial behaviors, as the relationship between self-esteem and subjective financial knowledge is significant across all eight models.

4.3.3. Reverse causality and omitted variable bias

Although we did use NLSY79 2004 financial measures (net worth, bankruptcy, and risky investments) as covariates to control for self-esteem being influenced by previous financial behavior, we perform additional empirical assessments of the endogeneity risk of our analysis. We used the 1980 NLSY79 measure of self-esteem as our instrument. In all instances, neither the Wald test for endogeneity nor the Wu–Hausman test for endogeneity was statistically significant ($p > .17$ for all eight models), suggesting there is low endogeneity risk for our self-esteem measure. However, our use of 2004 control variables and the endogeneity empirical tests cannot completely rule out the broader theoretical concern of a reciprocal relationship between self-esteem and financial behavior. For instance, one limitation of the NLSY79 database is that measures of self-esteem immediately before and after major financial behaviors and personal outcomes are not available. It would be valuable for future research to build upon our findings and study the extent such phenomenon may have immediate, albeit non-persistent, effects on someone's self-esteem – which in turn may influence immediate financial decisions.

As for omitted variable bias issue, the richness of the dataset allows us to include a collection of respondents' demographic and financial measures in the model to control for omitted variable bias. Nonetheless, other variables such as financial education and other psychological traits like locus of control could potentially cause omitted variable bias. Future studies can test and expand upon our results by incorporating additional control variables when data is available.

5. Conclusions, implications and future studies

In the past decades, policymakers and educators have initiated various programs to promote responsible financial behavior among average households. While the main focus of such programs has been on disseminating objective financial knowledge, only until recently have we recognized the contribution of psychological traits and non-cognitive skills in explaining individual financial behavior difference. We add to the literature by exploring the role of self-esteem in predicting financial behavior.

We simultaneously investigate the relationship self-esteem and financial knowledge (objective and subjective) have with financial behavior. Results suggest that the link between self-esteem and financial behavior could be direct and indirect through subjective financial knowledge. The role of self-esteem varies among different financial practice. Our results also indicate the difference between objective and subjective financial knowledge, the latter being determined in part by one's self-esteem.

These findings have important implications for policymakers, educators, and government agencies in their efforts to enhance financial management efficiency. With the ultimate goal to improve individuals' financial behavior, financial education programs should not focus solely on delivering objective financial knowledge; development of psychological traits should also be emphasized. Financial literacy courses could provide information about socio-psychological aspects of financial behavior to increase students' awareness of potential hurdle in converting financial knowledge to responsible financial behavior (Hira & Mugenda, 1999); exploring more of the psychological needs will also enhance education program effectiveness in steering people's choice in the directions that will benefit their welfare.

In particular, our results point out the significant association self-esteem and subjective financial knowledge have with financial behavior. Indeed, the well-meaning efforts by educators, financial advisors, and business institutions to increase individuals' objective financial knowledge could harm their feelings of self-worth with inappropriately overwhelming

Table A
Original survey questions for created variables.

Created variables	RNUM	Original survey questions	Survey year
Financial behavior			
Have savings; savings amount	T4028400	1. Altogether, how much money do you [or] [Spouse/partner's name] have in all of these personal checking, savings and money market accounts?	2012
	T4029500	2. Altogether, how much money would you [or] [Spouse/partner's name] end up with if you cashed in all of these certificates of deposit today?	2012
	T4029800	3. Altogether, how much money would you [or] [Spouse/partner's name] end up with if you cashed in these US savings bonds today?	2012
Invest in risky assets; risky assets amount	T4043600	1. If you sold all of these stock holdings and paid off anything you owed on them, how much money would you [or] [Spouse/partner's name] end up with? (Please do not include any company stock in an ESoPP or stock options.)	2012
	T4030700	2. If you [or] [Spouse/partner's name] were to sell all your mutual fund shares today, how much money would you end up with?	2012
Participate in retirement plans	T3408100-T3408500	1. [Do/Did] you participate in [this plan/(any of) these pension or retirement plans] on your job with [(employer name)]?	2012
	T4032300	2. Do you have any money in a retirement plan through your workplace, such as a 401 K or 403B with an employer for whom you longer work?	2012
Retirement account balance	T3410300–T3411400	1. Roughly how much money is in your account at present? Include both your and your [employer/business]'s contributions and earnings	2012
	T4034000	2. [If you were to pay back (that/these) withdrawal(s) today – altogether what (is/would be)] the total value of (that/those) employer-sponsored retirement plan(s) today?	2012
Max out credit cards	T4092500	On how many credit cards do you [or] [Spouse/partner's name] owe the maximum amount allowed by the credit card company?	2012
Credit card debt	T4088900	After the most recent payment, roughly what was the balance still owed on all of these accounts together? If you paid off all of these accounts, please report $0.00.	2012
Self-esteem	T0899810	Self-esteem score	2006
Sub. fin. knowledge	T4100200	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?	2012
Obj. fin. Knowledge	T4100300	1. Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund	2012
	T4100400	2. Suppose you had $100 in a savings account and the interest rate was 2 percent per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than $102, exactly $102, or less than $102?	2012
	T4100500	3. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?	2012
	T4100600	4. If interest rates rise, what will typically happen to bond prices? They will rise; they will fall; they will stay the same; there is no relationship between bond prices and the interest rate	2012
	T4100700	5. Do you think that the following statement is true or false? 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	2012
Covariates			
Male	R0214800	Sex of respondent (Male/Female)	1979
Age in '12	T4113200	Age of respondent at interview date	2012
Race	R0214700	Respondent's racial/ethnic cohort (Hispanic/Black/Non-Black, Non-Hispanic)	1978 screener
Income in '11	T3977400	1. (Not counting any money you received from your military service) During 2011, how much did you receive from wages, salary, commissions, or tips from all (other) jobs, before deductions for taxes or anything else?	2012
	T3987600	2. (Not counting any money (spouse/partner) received from (his/her) military service) During 2011, how much did [Spouse/partner's name]receive from wages, salary, commissions, or tips from all (other) jobs, before deductions for taxes or anything else?	2012
Net worth in '12	T4045800	Total net worth for family	2012
Married	T4112900	Marital status (never married; married; separated; divorced; widowed)	2012
Highest grade completed in '12	T4113100	Highest grade completed	2012
Risk tolerance	T4094001, T3094901	People can behave differently in different situations. How would you rate your willingness to take risks in the following areas? For each situation, rate your willingness from 0 to 10, where 0 means "unwilling to take any risks" and 10 means "fully prepared to take risks."–in financial matters	2010, 2012
Net worth in '04	R8378701	Total Net Worth for Family	2004
Bankruptcy by '04	R8417700	Have you [or] [Spouse/partner's name] ever declared bankruptcy?	2004

Table A (*continued*)

Created variables	RNUM	Original survey questions	Survey year
Risky investment in '04	R8365400	1. Do you [or] [Spouse/partner's name] own any shares of a mutual fund? Please do not include any pension or 401 K accounts, funds held as a part of a trust or annuity, or assets you have already told me about	2004
	R8376100	2. Do you [or] [Spouse/partner's name] own any shares of stock? Please do not include any company stock given to you [or] [Spouse/partner's name] through an employer and held in an Employee Stock Purchase Plan (ESoPP) or in stock options. Please include any type of stock, whether it is common or preferred or closely-held or publicly traded	2004

Note: RNUM is the reference number for each variable in NLSY79 data. For risk tolerance questions, respondents not interviewed in 2010 were interviewed in 2012. The table listed main questions used to create variables. In certain cases, some other questions not listed were used as well for data cleaning and sample selection. Detailed information and coding is available from the authors by request.

information (Hadar et al., 2013). To provide financial knowledge, it is not necessarily "the more the better." Thus, as suggested by Hadar et al. (2013) effective financial education must focus not only on imparting relevant information and enhancing objective knowledge, but also on promoting higher levels of subjective financial knowledge; financial advisors can be adaptive and sensitive to their client's self-perception when counseling and providing services; business institutions should adjust the mode of financial education presentations in accordance with consumers' cognitive level to avoid paradoxically diminishing consumers' subjective financial knowledge. Both objective and subjective financial knowledge should be considered in attempts to educate individuals to help them manage finance wisely.

Finally, we would also like to highlight some other limitations of this study. The five financial knowledge questions used in the NLSY79 survey mainly focus on evaluating how well respondents grasped concepts about risk diversification, interest rate, inflation, bond, and mortgage. It may not measure the complete set of objective financial knowledge. This is actually part of the larger problem of a lack of rigorous measures of financial literacy for academic research (Schmeiser & Seligman, 2013). A valuable future study could use more rigorous financial knowledge measures to test our model. In addition, we study the impact of self-esteem on individuals' financial behavior regarding saving within and outside of retirement accounts, investment in risky assets and credit card debt. Future studies could broaden the scope of investigated financial behavior such as debt management and budgeting, among others.

Appendix A

See Table A.

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