

# Earlier financial literacy and later financial behaviour of college students

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## Keywords

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## Abstract

This study examined the association of earlier financial literacy and later financial behaviour of college students. Financial literacy was measured by both subjective and objective knowledge and financial behaviours were categorized into risky paying and borrowing behaviours. Based on data collected at two time points from a panel of college students at a major state university in the USA, the results showed that the association between earlier knowledge and later financial behaviours differed by the specific type of knowledge (subjective vs. objective), with stronger effect of subjective knowledge, compared with objective knowledge on both composite and individual measures of risky borrowing and paying behaviours. We found that only subjective knowledge was correlated with a reduction in both composite behaviours. Both subjective and objective knowledge, however, reduced some specific risky paying and borrowing behaviours. Finally, we found consistent differences for two of the control variables: higher GPA (Grade Point Average) was associated with fewer risky paying behaviours; and gender (male vs. female) was associated with more of both types of risky behaviours.

## Introduction

Policy makers, practitioners and educators who are concerned about consumer welfare believe that a low level of financial literacy will become a serious liability as American society requires its members to take more individual responsibility for achieving long-term financial well-being (President's Advisory Council on Financial Capability, 2012). As a consequence, a social movement to improve financial literacy has been launched by a coalition of government agencies, business corporations and consumer educators (Fox and Bartholomae, 2008). Most of the current literature concerning financial literacy seeks to raise the aggregate level of financial knowledge, because a number of studies have found that higher levels of financial knowledge are often associated with more desirable financial behaviours, which in turn contribute to higher levels of financial well-being (Hilgert *et al.*, 2003; Hira, 2012; Huston, 2012). However, many of these previous studies relied on cross-sectional data to measure these associations. To better understand financial behaviour requires an examination of these associations across time. In addition, previous research finds that the associations between knowledge and behaviour vary by two knowledge types, which are objective knowledge (content knowledge demonstrated by a test score) and subjective knowledge (self-assessed understanding of content knowledge) (Ellen, 1994; Raju *et al.*, 1995). Thus, to provide consumer financial practitioners and educators with specific information for designing

programmes and interventions, we need a deeper understanding of the association between different types of knowledge and specific financial behaviours.

To examine the prospective association between earlier financial knowledge and later financial behaviour, our study uses a panel data set. Specifically, we focus on a sample of college students to determine the extent to which their various levels of financial knowledge in their first year of college may affect their financial behaviours 3 years later. Using the longitudinal data to examine the relation between financial knowledge and financial behaviours, our study makes unique contributions to the literature. First, longitudinal data enable us to more clearly understand the association between financial knowledge and subsequent financial behaviour. Second, longitudinal data also enable us to rule out early financial behaviours as an explanation for any association between financial knowledge and subsequent financial behaviours.

In addition, the present study considers if type of knowledge plays a differential role in financial behaviours of young adults by examining the separate associations of both subjective knowledge and objective knowledge on financial behaviours. Finally, because growing debt is a concern among young adults, the study examines the associations of both types of knowledge with credit behaviours.

Although national levels of financial literacy are low, levels are much lower among young adults (FINRA Investor Education Foundation, 2013). For example, 52% of young adults are more

likely to utilize costly credit card borrowing methods (paying only minimum payments or late fees) compared with 46% of middle-aged adults and 28% of older adults. Young adults are in the process of shifting from financial dependence on their parents to financial self-sufficiency. Young adults in this transitional stage of life consider financial independence to be one of the main accomplishments that signal attainment of full adult status (Arnett, 2000). Furthermore, these young adults have just reached the legal age that allows them to sign binding contracts in their own names, including credit card and student loan agreements. Unlike young adults who are not in college, college students must also budget the high costs of their education in addition to routine financial decisions associated with independent living. For many young adults, the college years mark the first time in their lives that they are exposed to the consumer credit market and must deal with real-world debt issues (Lyons, 2004; Hayhoe *et al.*, 2005; Wang and Xiao, 2009; Brougham *et al.*, 2011; Xiao *et al.*, 2011b; Lachance, 2012). For these reasons, a collegiate period provides a unique setting for researchers to study how young adults learn to use credit, which will contribute to the literature on the associations between financial knowledge and financial behaviour in general.

## Previous research and hypotheses

### Financial literacy among college students

Previous research has shown that today's college students in general have a low level of financial literacy. One such early study examining five domains of financial knowledge in a sample of students at an American university concluded that while college students have general knowledge regarding money management principles and practices, they lack specific knowledge (Danes and Hira, 1987). Another financial literacy survey of college students on 14 college campuses found that only 53% of the students answered objective knowledge questions correctly (Chen and Volpe, 1998). In a national survey of financial literacy among college students, participants collectively achieved a mean score of only 62% correct answers (Jump\$tart Coalition, 2008). Data from the National Longitudinal Survey of Youth showed that less than one-third of young adults possess a basic understanding of interest rates, inflation and risk diversification (Lusardi *et al.*, 2010). Taken together, these studies suggest a need for additional financial education at the college level. Such programmes, however, would require a substantial financial investment and, consequently, the need for such programmes must be substantiated. Furthermore, to design effective education and intervention programmes, we must understand the more nuanced associations between financial knowledge and financial behaviour among young adults.

### Financial knowledge and financial behaviour

At least one previous study suggested that prior financial knowledge may affect later financial behaviour. Bernheim *et al.* (2001) surveyed a sample of consumers during their peak earning years (ages 35–49) with results showing that adults who attended schools in states that mandated personal financial education tended to exhibit more responsible financial behaviours compared with adults who did not live in a mandate state. Given the retrospective design of the study, however, it is difficult to deter-

mine whether early education accounted for the association or subsequent financial education and experiences. Several cross-sectional studies have directly examined the association between the financial knowledge and financial behaviours of college students. Chen and Volpe (1998) found that higher financial knowledge was linked to positive financial decisions. Likewise, Robb (2011) found that students with higher scores on a measure of personal financial knowledge were more likely to engage in more responsible credit card behaviour. These studies, however, relied on cross-sectional data collected at a single point in time and did not seek to establish a link between early financial literacy and financial behaviour later on in life.

Since subjective knowledge and objective knowledge may exert different influences on consumer behaviours (Ellen, 1994; Raju *et al.*, 1995), some researchers have begun to examine the separate effects of both types of knowledge. Xiao *et al.* (2011a), for example, found that both objective and subjective financial knowledge reduced risky credit behaviours among first year college students. A subsequent study that used the same data set found that subjective knowledge had a more significant impact than objective knowledge on reducing risky credit behaviour among college students (Xiao *et al.*, 2011b). Another study published in the same year using a national sample of adults was in line with these findings, suggesting that both subjective and objective knowledge were independently associated with higher levels of positive financial behaviours (Robb and Woodyard, 2011). One other study, however, found that financial knowledge was positively related to risky credit behaviour (Robb and Sharpe, 2009). Taken together, these findings suggest that the associations between types of financial knowledge and credit behaviour are more complex and therefore must be examined with specificity.

### The present study

The present study extends previous research on the association between financial knowledge and financial behaviour among college students in several ways to prospectively test whether earlier financial knowledge is associated with later credit behaviour among college students. Further, we examine how specific types of early financial knowledge (objective and subjective) influence financial behaviours, specifically credit behaviours in this study. Finally, using panel data, we compare our findings to findings from prior studies that used cross-sectional and retrospective data. Based on the previous research, we test the following hypotheses:

**H1:** Both subjective and objective financial knowledge in the first year of college will reduce risky credit behaviour in the fourth year of college.

**H2:** Both subjective and objective financial knowledge in the first year of college will reduce risky credit behaviour in the fourth year of college after accounting for T1 risky credit behaviour.

## Method

### Procedure and sample

Baseline (T1) data were collected from first year students enrolled full-time (i.e. 12 or more units) at a major, land-grant university over an 8-week period during spring 2008 (see Shim *et al.*, 2010,

for detailed information about the study design and initial data collection procedure). The sample comprised 2098 first year students representing 32% of the 2007 first year cohort. Time 2 (T2) data were collected in fall 2010. After obtaining the Internal Review Board approval, an email invitation offering a \$25 financial incentive for survey completion was sent via university email addresses obtained during the T1 survey to 1924 students (92%). A series of email reminders, followed by a mailed postcard reminder, were sent to non-respondents (those whose addresses were available) to encourage them to complete the survey. Our concerted efforts resulted in an 81% return rate ( $N = 1563$ ) and 1511 useable surveys. The T2 survey was administered during fall 2010, the students' fourth year of college. The online survey was similar in size and scope to the T1 survey and was posted over a 16-week period.

The data for this study came from the 1100 students (36.3% male and 63.7% female) who responded to both the T1 survey and the T2 survey, who were single, and who had at least one credit card at T2. The predominant ethnic status of the group was White (68.2%), followed by Latino (14.5%), Asian/Asian American/Pacific Island (9.8%), Black (3.6%) and Native American (1.1%), and the remaining 2.8% reporting other or missing. The self-reported average GPA (Grade Point Average) at T1 was 3.22. Socio-economic status (SES), measured as parents' education and income at T1, included 41% lower SES students, 30% middle SES students and 29% higher SES students.

## Measures

### Control variables

To account for the effects of variables found to be significantly related to college students' behaviours (Chen and Volpe, 1998; Lyons, 2004), our models account for gender, parental SES, cognitive ability measured by GPA (Grade Point Average) and credit card holding status. Gender was coded 0 (male) and 1 (female). To measure parental SES, three items were used: father's education, mother's education and parental income (Coleman, 1983). Father and mother's education levels were measured separately according to levels of schooling, ranging from 1 (*less than high school*) to 5 (*graduate school or professional degree*). Parental income was measured by four levels: 1 (*less than \$50 000*), 2 (*\$50 000–\$99 999*), 3 (*\$100 000–\$200 000*) and 4 (*more than \$200 000*). Then following the procedure outlined by Coleman (1983), the numerical values of the three variables were summed to form the parental SES variable. Cronbach's alpha for this composite variable was .67. GPA (Grade Point Average) was self-reported by the students. A dichotomous variable was constructed to separate the students who had a credit card at T1 from those who did not. A new credit card user at T2 was coded as 1 if the student did not have a credit card at T1; otherwise, the student was coded as 0.

### Financial knowledge

Subjective financial knowledge refers to an individual's beliefs about one's own understanding of financial knowledge. At T1, students rated their subjective knowledge on a 5-point scale ranging from 1 (*very low*) to 5 (*very high*) in response to one item: How would you rate your overall understanding of personal finance? The

mean score for the subjective knowledge at T1 was 3.16 ( $SD = .83$ ). Objective financial knowledge, which refers to accurate, stored knowledge regarding credit content, was measured at T1 by summing correct responses to eight credit-related, true-false quiz questions (Hilgert *et al.*, 2003). Possible scores ranged from 0 (*no answer correct*) to 8 (*all answers correct*), with higher scores representing higher levels of objective credit knowledge. The mean score of objective knowledge at T1 was 5.50 ( $SD = 1.62$ ).

### Risky credit behaviour

At T2, respondents were asked to indicate how often they had engaged in risky credit behaviours within the previous 6 months, a measure based on previous research (e.g. Lyons, 2008). Responses were based on a 5-point scale ranging from 1 (*never*) to 5 (*very often*). After exploratory factor analyses, two factors emerged and were labelled *risky paying behaviour* and *risky borrowing behaviour*, respectively. Three items were used to measure risky paying behaviour: paid bills on time; paid credit card balance in full; and paid credit card bill on time. The three variables were reverse coded before data analyses so that higher scores would represent more risky paying behaviours. To measure risky borrowing behaviour, four items were used: borrowed money from credit cards; maxed out credit card limit; used payday loans; and took cash advance from credit card. Higher scores represent more risky borrowing behaviours. Cronbach's alphas for the paying scale and the borrowing scale were .66 and .67, respectively.

### Data analyses

We began with descriptive and correlation analyses to examine associations among variables of interest. We next conducted a series of OLS (Ordinary Least Square) hierarchical regression analyses to test the hypothesized associations between financial knowledge and credit behaviours, first without controlling for T1 credit behaviours and then adding T1 credit behaviours as a control. Finally, we ran the series of OLS (Ordinary Least Square) hierarchical regressions in the same way with individual credit behaviours to gain more insight. For each regression, we estimated the equation in three steps: step 1 accounted for the effects of the control variables (gender, SES, GPA (Grade Point Average) and credit card holding status); step 2 estimated the separate effect of T1 objective financial knowledge; and step 3 estimated the separate effect of T1 subjective financial knowledge.

## Results

### Changes in financial knowledge and behaviour between time 1 and time 2

Table 1 presents the descriptive statistics of changes in financial knowledge and behaviours between the two survey time points from the results of repeated measure analyses. Based on the sample of 1100 students, levels of both objective and subjective knowledge increased on average from T1 to T2.

The average score for objective knowledge increased from 5.50 to 5.84 (6.18% change) and that of subjective knowledge increased from 3.16 to 3.58 (13.30% change). For the sample of 771 students who held credit cards at both T1 and T2, the average score on

**Table 1** Knowledge and behaviour in T1 and T2

Variable	T1	T2	<i>F</i>	<i>P</i>	Sample
	Mean (SD)	Mean (SD)			
Objective credit knowledge	5.50 (1.62)	5.84 (1.50)	33.484	.000	<i>N</i> = 1100
Subjective credit knowledge	3.16 (.83)	3.58 (.85)	234.495	.000	
Risky paying behaviour <sup>a</sup>	1.76 (1.00)	1.82 (.95)	2.098	.148	<i>N</i> = 771
Pay bills on time ( <i>r</i> )	1.60 (1.00)	1.46 (.80)	13.137	.000	
Pay credit card in full ( <i>r</i> )	1.93 (1.29)	2.20 (1.46)	20.343	.000	
Pay credit card bills on time ( <i>r</i> )	–	1.62 (1.09)	–	–	
Risky borrowing behaviour <sup>b</sup>	1.47 (.70)	1.53 (.72)	4.585	.033	
Borrow from credit cards	1.70 (1.09)	1.78 (1.13)	2.946	.087	
Max out credit card limit	1.43 (.90)	1.63 (1.10)	20.757	.000	
Use payday loans	1.27 (.75)	1.19 (.64)	7.271	.007	
Take cash from credit card	–	1.25 (.71)	–	–	

<sup>a</sup>To compare two waves of risky paying behaviour consistently, alternative composite behaviour (pay bills on time and pay credit card in full) was used.

<sup>b</sup>To compare two waves of risky borrowing behaviour consistently, alternative composite behaviour (borrow from credit cards, max out credit card limit and use payday loans) was used.

questions concerning risky paying behaviour did not change significantly. The score associated with the first of the three specific behaviours (paid bills on time, reverse coded) significantly decreased from 1.60 to 1.46 (8.75% change) while the second (paid my credit card balance in full, reverse coded) significantly increased from 1.93 to 2.20 (13.99%). The third (paid credit card bill on time, reverse coded) was not measured at T1.

The average score on questions concerning risky borrowing behaviour significantly increased from 1.47 to 1.53 (4.08% change). On the questions concerning the four specific borrowing behaviours, the score of the first behaviour (borrowed money from credit cards) remained unchanged, the score of the second behaviour (maxed out credit card limit) significantly increased from 1.43 to 1.63 (13.99%), and the score of the third (used payday loans) significantly decreased from 1.27 to 1.19 (6.30%). The fourth behaviour (took cash advance from credit card) was not measured at T1. Overall, after 3 years in college, levels of both subjective and objective knowledge concerning credit increased among students in this sample. In terms of credit behaviours, on average, the level of risky paying behaviour remained unchanged but the level of risky borrowing behaviour increased.

### Correlations between continuous variables

The bivariate correlations among knowledge and behaviour variables generally confirmed the findings in previous studies (Table 2). The correlation between objective knowledge and subjective knowledge was modest but significant. Both objective knowledge and subjective knowledge were negatively correlated with the composite paying behaviours; however, neither was significantly correlated with the composite borrowing behaviour. The composites of risky paying behaviour and risky borrowing behaviour were significant and positively correlated. Objective knowledge was modestly correlated with two specific paying behaviours and two specific borrowing behaviours. Subjective knowledge was modestly correlated with all three specific paying behaviours but none of the specific borrowing behaviours.

### Factors contributing to risky paying behaviour

Table 3 has two panels. The left panel presents the results of the hierarchical regression analysis on risky paying behaviour without controlling for T1 behaviour. A significance level of 5% is used to report significant findings. In model 1, two control variables, parental SES and GPA (Grade Point Average), showed significant negative effects. In model 2, in which we added the objective knowledge variable to the model, higher objective knowledge was associated with decreased risky paying behaviour, as evidenced by the significant coefficient estimate and change in  $R^2$ . In model 3, in which we added the subjective knowledge variable to the model, it also showed that higher subjective knowledge decreased risky paying behaviours further, as evidenced by a significant negative effect and change in  $R^2$ . The effect of objective knowledge decreased somewhat but remained significant. The right panel of Table 3 presents the results of the second set of analyses, which controlled for the T1 paying behaviour with a smaller sample size ( $N = 771$ ; new credit card users were excluded in this analysis). The results showed T1 paying behaviour was significantly associated with T2 paying behaviour. Subjective knowledge continued to show a significant negative effect on risky paying behaviour; however, the effect of objective knowledge was no longer significant.

To explore these associations more thoroughly, we conducted additional analyses designed to examine specific paying behaviours, first without controlling for T1 behaviours and then controlling for T1 behaviours (see Table 4, left and right panels, respectively). Only the results of model 3 are presented in the table. The results of model 3 (Table 4, left panel) showed that as subjective knowledge increased, all (three) risky paying behaviours were significantly reduced, while objective knowledge reduced two out of three specific paying behaviours. After we controlled for T1 behaviours with smaller sample size (those students who held credit cards at both T1 and T2,  $N = 771$ ), two noteworthy changes occurred (Table 4, right panel). The negative effect of objective knowledge on 'not paying bills on time' was no longer significant, but a significant positive effect of objective knowledge on 'not paying credit card balance in full' emerged.

**Table 2** Correlations between predictor and outcome variables

1	2	3	4	5	6	7	8	9	10	11
Objective knowledge	Subjective knowledge	T2 risky paying	Pay bills on time ( <i>t</i> )	Pay credit card in full ( <i>t</i> )	Pay credit card bills on time ( <i>t</i> )	T2 risky borrowing	Borrow from credit cards	Max out credit card limit	Use payday loans	Take cash from credit card
1	.163**	-.099**	-.120**	-.002	-.148**	-.054	-.031	-.009	-.084**	-.069*
2	1	-.125**	-.124**	-.063*	-.126**	-.017	-.024	.008	-.004	-.034
3		1	.717**	.825**	.803**	.341**	.167**	.349**	.202**	.283**
4			1	.350**	.530**	.267**	.110**	.245**	.234**	.236**
5				1	.420**	.269**	.165**	.311**	.059	.195**
6					1	.265**	.100**	.245**	.236**	.243**
7						1	.756**	.748**	.661**	.750**
8							1	.326**	.283**	.391**
9								1	.344**	.411**
10									1	.614**
11										1

\*Correlation is significant at the 0.05 level (two tailed).

\*\*Correlation is significant at the 0.01 level (two tailed).

**Table 3** Results of hierarchical regressions on T2 risky paying behaviour

Variable	N = 1100 (without controlling for T1 behaviour)									
	Model 1					Model 2				
	B	$\beta$	P	B	$\beta$	P	B	$\beta$	P	B
Female (vs. male)	-.068	-.037	.218	-.066	-.036	.234	-.114	-.063	.059	-.113
Parental SES	-.043	-.132	.000	-.046	-.141	.000	-.044	-.140	.000	-.044
GPA	-.290	-.204	.000	-.283	-.199	.000	-.229	-.166	.000	-.228
T1 risky paying behaviour							.279	.313	.000	.276
New credit card user	.023	.012	.691	.006	.003	.924				
T1 objective credit knowledge				-.053	-.096	.001				-.010
T1 subjective credit knowledge										
R <sup>2</sup>	.067			.076			.067			.076
Significant F change				.001						.001

Risky paying behaviour is measured by an average score ranged from 1 to 5, in which 5 means most likely to engage in risky paying behaviour.



**Table 4** Individual risky paying behaviours as dependent variables

Variable	N = 1100 (without controlling for T1 behaviour)						N = 771 (controlling for T1 behaviour)					
	Pay bills on time (t)			Pay credit card in full (t)			Pay bills on time (t)			Pay credit card in full (t)		
	B	$\beta$	P	B	$\beta$	P	B	$\beta$	P	B	$\beta$	P
Female (vs. Male)	-.090	-.053	.090	-.018	-.006	.843	-.190	-.084	.007	-.135	-.083	.022
Parental SES	.005	.016	.605	-.121	-.227	.000	-.022	-.056	.065	.002	.006	.875
GPA	-.143	-.109	.000	-.497	-.214	.000	-.190	-.109	.000	-.136	-.109	.002
T1 Risky paying behaviour										.152	.185	.000
New credit card user	.024	.013	.661	-.055	-.017	.555	.013	.005	.857	.069	.074	.029
T1 Objective credit knowledge	-.043	-.084	.006	.004	.004	.884	-.087	-.127	.000	.030	-.060	.098
T1 Subjective credit knowledge	-.118	-.118	.000	-.115	-.065	.030	-.159	-.119	.000	-.107	-.112	.003
R <sup>2</sup>	.040			.113			.058			.088		
F (P)	7.439 (.000)			22.479 (.000)			10.827 (.000)			11.889 (.000)		
										.194		
										29.675 (.000)		
										.067		
										10.683 (.000)		

### Factors contributing to risky borrowing behaviour

Table 5 has two panels. The left panel presents the results of our analyses of risky borrowing behaviour when controlling for gender, parental SES, GPA (Grade Point Average) and credit card holding status. In model 1, only gender showed a significant difference. Male students were more likely than female students to engage in risky borrowing behaviour. In models 2 and 3, when the objective and subjective knowledge variables were added sequentially to the model, no additional effects were observed, noted by a lack of change in  $R^2$ . Objective knowledge had a weak effect ( $p = 0.062$ ) on risky borrowing behaviour. The right panel of Table 5 presents the results of the analyses when controlling for T1 behaviour in the smaller sample of participants (students who held credit cards at both T1 and T2,  $N = 771$ ). Two changes are noteworthy. First, T1 borrowing behaviour was strongly associated with T2 behaviour. Second, the negative effect of objective knowledge was no longer significant, but T1 subjective knowledge significantly reduced T2 borrowing behaviour. The change in  $R^2$  from model 2 to model 3 was also statistically significant.

To gain more insight, we examined the potential effects of early financial knowledge on specific borrowing behaviours without controlling for T1 behaviours and then controlling for T1 behaviours (see Table 6, left and right panels, respectively). Based on the results of model 3, only two of the eight possible effects (four borrowing behaviours with objective/subjective knowledge), which subjective and objective knowledge had on specific borrowing behaviours (Table 6, left panel), were significant. Higher objective knowledge was associated with decreased 'take cash advance from credit card' behaviour. In addition, objective knowledge had a significant negative effect on 'use payday loans' behaviour. However, neither objective nor subjective knowledge showed any effect on the behaviours of 'borrow from credit cards' or 'max out credit card limits'. In Table 6, right panel, when T1 borrowing behaviour was controlled, the previously mentioned two effects persisted. In addition, as subjective knowledge increased, 'borrow from credit card' behaviour significantly decreased. The results suggest that controlling for T1 borrowing behaviour increases the effects of knowledge variables.

### Discussion

Previous cross-sectional research has found that financial knowledge tends to reduce concurrent risky credit behaviours among college students (Robb, 2011; Xiao *et al.*, 2011b). We sought to extend this literature by prospectively examining the impact of early financial knowledge on subsequent risky credit behaviours of young adults. We further considered if the associations with risky behaviours differed by subjective knowledge and objective knowledge. We used panel data collected at two time points 3 years apart and concerning a sample of college students who had credit cards. We hypothesized that earlier subjective and objective financial knowledge in the first year would reduce later risky credit behaviour (H1), even after controlling for earlier credit card behaviour (H2). Our analysis showed that both objective and subjective knowledge decreased risky credit paying behaviours and borrowing behaviours of college students to different degrees, even after controlling for prior risky credit behaviours, which partially

**Table 5** Results of hierarchical regressions on T2 risky borrowing behaviour

Variable	N = 1100 (without controlling for T1 behaviour)						N = 771 (controlling for T1 behaviour)					
	Model 1			Model 2			Model 3			Model 1		
	B	$\beta$	P	B	$\beta$	P	B	$\beta$	P	B	$\beta$	P
Female (vs. male)	-.131	-.097	.002	-.130	-.096	.002	-.136	-.101	.001	-.154	-.114	.001
Parental SES	-.013	-.054	.080	-.014	-.059	.055	-.014	-.060	.054	-.013	-.054	.123
GPA	-.058	-.057	.066	-.056	-.054	.080	-.055	-.053	.086	-.028	-.026	.452
T1 risky borrowing behaviour										.268	.282	.000
New credit card user	-.024	-.017	.574	-.032	-.023	.462	-.034	-.024	.439			
T1 objective credit knowledge				-.023	-.057	.062	-.023	-.029	.358	-.019	-.044	.211
T1 subjective credit knowledge							-.023	-.029	.358			
R <sup>2</sup>	.078			.078			.078			.105		
Significant F change				.682			.453			.211		

Risky borrowing behaviour is measured by an average score ranged from 1 to 5, in which 5 means most likely to engage in risky borrowing behaviour.

**Table 6** Individual risky borrowing behaviours as dependent variables

Variable	N = 1100 (without controlling for T1 behaviour)						N = 771 (controlling for T1 behaviour)					
	Borrow from credit cards			Use payday loans			Take cash from credit card			Max out credit card limit		
	B	$\beta$	P	B	$\beta$	P	B	$\beta$	P	B	$\beta$	P
Female (vs. male)	-.101	-.042	.185	-.133	-.047	.133	-.184	-.132	.000	-.151	-.066	.072
Parental SES	-.025	-.060	.055	-.047	-.047	.127	-.012	-.050	.108	-.028	-.070	.051
GPA	-.006	-.003	.916	-.198	-.116	.000	.013	.014	.659	.041	.023	.514
T1 risky borrowing behaviour										.269	.261	.000
New credit card user	.092	.036	.246	-.099	-.042	.170	-.065	-.050	.104	-.015	-.020	.571
T1 objective credit knowledge	-.019	-.026	.399	-.008	-.012	.705	-.032	-.086	.006	-.034	-.038	.010
T1 subjective credit knowledge	-.043	-.030	.340	.003	.002	.937	-.008	-.011	.713	-.044	-.054	.083
R <sup>2</sup>	.008			.022			.030			.089		
F (P)	1.350 (0.219)			3.950 (0.001)			5.418 (.000)			12.983 (.000)		

support H1 and H2. The results suggest that objective and subjective knowledge worked in different ways to reduce risky credit behaviours.

Our analysis found that more knowledge about personal finance reduced risky paying behaviour. This particular finding extends previous retrospective research that found early-life financial education to have an effect on later life financial well-being (Bernheim *et al.*, 2001). Furthermore, we found that the association differentiated by type of financial knowledge. Specifically, findings show that the effect of subjective knowledge on risky paying behaviour is stronger than that of objective knowledge. To gain additional insight about the differences in effect, we probed more deeply into these differences by examining the association at the specific behaviour level. This additional probing revealed that the effect of subjective knowledge was particularly robust on each of the three paying behaviours even after controlling for previous financial behaviour. By comparison, objective knowledge shows a significant but weaker association with two of the risky paying behaviours (i.e. paying bills on time and paying credit card bills on time), and no association with paying credit card balances in full each month. It may be that subjective knowledge represents self-confidence, a sense of personal agency that emerges from experience (Jorgensen and Savla, 2010). In this sense, subjective knowledge is tapping into internal self-regulation, whereas objective knowledge may tap into young adults' cognitive understanding of money management that may not yet seem relevant to them (Serido *et al.*, 2013).

Our findings suggest that prior financial knowledge has less impact on borrowing behaviour. This finding might suggest a unique characteristic of college students' financial development at this particular stage of life: borrowing may be a relatively new financial behaviour and one they learn as they make the transition from financial dependence to independence. It stands to reason that, in the hierarchy of the financial behaviour acquisition spectrum, students may be more familiar with paying behaviour since paying behaviour can be viewed as a combination of cash management behaviour (a more preliminary financial behaviour) and credit management behaviour (a more advanced financial behaviour) (Xiao, 2008). In this sense, objective knowledge may play a stronger role in reducing the more extreme risky borrowing behaviours (using payday loans, cash advance from credit card). The results may also suggest that students may not have adequate financial resources to fund college education and resort to borrowing. Because they do not understand the full consequences of such actions, students may resort to riskier borrowing behaviours such as borrowing from credit cards or high-interest loans instead of less risky funding alternatives such as using government educational loans or having part-time jobs.

Finally, it is worth noting the consistent effects of the control variables on risky behaviours. Specifically, lower GPAs were associated with higher levels of composite risky paying behaviour as well as higher levels in each of the three individual risky paying behaviours, suggesting that college students' academic achievements (i.e. GPA), whether a proxy for cognitive ability or self-discipline, may signal higher levels of financial-related knowledge and fewer risky paying behaviours. Regarding gender, men were more likely to engage in both risky borrowing and paying behaviours. A look at the three individual paying behaviours suggests that the gender difference may reflect timeliness, with men less

likely to pay their bills on time. The significant difference regarding parental SES and risky paying behaviour may reflect students' access to financial resources, as the effect remains significant in only one behaviour: paying credit card bills in full.

The strength of the gender effect on borrowing behaviour is somewhat stronger than that of paying behaviour ( $\beta = -.128$ ,  $p = 0.000$  vs.  $\beta = -.086$ ,  $p = 0.012$ ). A closer look at the individual risky borrowing behaviours reveals a significant difference in three of the four behaviours after controlling for T1 behaviour. Although the pattern of differences is not as clear as that of risky paying behaviours, it is possible that men may be overconfident about their knowledge of personal finance (e.g. Lusardi *et al.*, 2010) and thus engage in more risky borrowing compared with women.

## Limitations and conclusion

Although this study adds to the literature on the relation between financial knowledge and financial behaviours among young adults, caution is warranted in applying and interpreting our findings. First, our study focuses on the behaviours of an emerging adult sample in college. Thus, it is possible that both the financial behaviours and the opportunities to practice these behaviours differ in systematic ways among emerging adults who are not in college. Future research should examine the relationship between financial knowledge and financial behaviours among the large number of youth who do not attend college to confirm or refute the findings obtained in this study. In addition, data on the participants' financial behaviours come from retrospective self-reports. It is possible that the data are subject to a recall bias, or social comparison bias, and do not accurately portray participants' actual behaviours. It would be interesting to examine these associations using an alternative data collection method, for example, a daily diary study or experience sampling approach. Such approaches would reduce the potential for bias inherent in the current sample. A third limitation relates to our focus on socio-demographic (i.e. gender, parental SES) and academic achievements (i.e. GPA) in examining emerging adults' risky financial behaviours. While these associations are significant, it is likely that the addition of other contextual variables would increase the amount of variance explained in the models. Attitudes regarding financial matters, financial resources (or lack of resources) and even parental expectations may play an important role in the financial behaviours of young adults (Shim *et al.*, 2010; Xiao *et al.*, 2011b). Further testing of these associations is warranted to understand the behaviours practised by emerging adults and the factors that contribute to those behaviours. Our study suggests that prior financial knowledge – both objective and subjective – in the first year of college might play a minor role in reducing young adults' risky financial behaviours in the fourth year of college. The finding means that financial education programmes perhaps should focus on more than enhancing objective financial knowledge among young adults. A variety of teaching approaches might be used to enhance students' subjective knowledge (i.e. one's confidence or ability to apply objective knowledge), although the findings here do not necessarily indicate that such enhanced financial literacy education will ensure that students develop desirable financial behaviours. Educators should keep in mind limitations of content knowledge and incorporate more action-oriented education



programmes to encourage students to engage in positive financial behaviours during the educational process. Relevant behaviour science theories can be used in developing action-oriented education programme (Xiao *et al.*, 2004). In addition, integrating fundamental values to promote sustainable financial behaviours should be also considered in consumer financial education programme development (Hira, 2012).

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