

Financial literacy: a comparative study across four countries

Gianni Nicolini¹, Brenda J. Cude² and Swarn Chatterjee²

¹University of Rome 'Tor Vergata', Rome, Italy

²University of Georgia, Athens, GA, USA

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Correspondence

Swarn Chatterjee, 106 Housing Research Center, University of Georgia, Athens, GA 30602, USA.

E-mail: swarn@uga.edu

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Abstract

This study analysed differences in financial literacy across four countries: Canada, Italy, the UK and the US. The purpose was to understand whether factors associated with financial literacy in one country can be generalized to other countries as well or whether unique national characteristics make it necessary to examine financial literacy in each country individually. A financial literacy index, based on the number of correct answers to four multiple-choice questions, was used to test the relevance of country of origin to financial literacy. Results suggest significant differences among countries indicating that there are national and cultural differences in what households know and need to know about their personal finances. Policy makers should consider these differences when developing financial literacy assessment tools for their respective countries.

Introduction

Internationally, interest in research about financial literacy is strong and ongoing. However, most research has involved data collection in a single country, often using a survey instrument that is also country specific. In some previous research, financial literacy was the singular focus (Chen and Volpe, 2002; Cude *et al.*, 2006; Huston, 2010); in other research, it was a component of a larger study (Lusardi and Mitchell, 2007, 2008a,b; van Rooij *et al.*, 2011). More often than not, the variables assessed by the research and how they were measured were unique within each study. The lack of cross-national research and the inconsistencies across studies present opportunities as well as challenges. This research examines one opportunity – to assess financial literacy and its influences across countries.

This paper consists of the following four sections. The first is a comprehensive literature review that describes previous studies related to definitions and measurement of financial literacy as well as the relationship between financial literacy and financial behaviours. The methodology section describes the four data sets used in this research as well as the ordered logistic regression models. Results of the regression analyses are described in the next section; regression analyses were used to test two questions: (1) Are there differences in financial literacy across countries? (2) If financial literacy differs between countries, do socio-demographic or financial behaviours or both explain these differences? The paper concludes by proposing a challenge for the future – coordinating data collection related to financial literacy across countries.

Literature review

A definition of financial literacy would seem to be a prerequisite for its measurement. Many scholars have defined financial literacy

but the definitions are inconsistent despite Schuchardt *et al.*'s (2009) call for consistency. Noctor *et al.* (1992) offered this definition more than 20 years ago: 'the ability to make informed judgments and to make effective decisions regarding the use and management of money' (p. 4). This definition centred on consumers' ability and focused on judgment and decisions. Numerous researchers in the past, including ANZ (2008), Beal and Delpachitra (2003), Schagen and Lines (1996), and Worthington (2004, 2006), have used this definition, in part because of its flexibility.

Others have proposed definitions of financial literacy that take a different perspective. Vitt *et al.*'s (2000) definition was more specific about the skills and abilities relevant to financial literacy: 'The ability to read, analyse, manage and communicate about the personal financial conditions that affect material wellbeing' (p. XII). Others (including Kim, 2001; Bowen, 2003; Courchane and Zorn, 2005) have approached the definition from a knowledge perspective. Danes and Haberman (2007) applied Graham's (1980) definition to describe financial literacy as: 'the ability to interpret, communicate, compute, develop independent judgment, and take actions resulting from those processes in order to thrive in our complex financial world' (p. 49).

In yet another approach, the Jump\$Start Coalition for Personal Financial Literacy (2007) definition combined knowledge, skills and action: 'Financial literacy is the ability to use knowledge and skills to manage one's financial resources effectively for lifetime financial security' (p. 1). The U.S. President's Advisory Council on Financial Literacy (2008) as well as academics (Hung *et al.*, 2009) has adopted this comprehensive definition.

Johnson and Sherraden (2006) explained well the value of a definition that combines knowledge and the ability to apply that knowledge when they argued 'Participation in economic life should maximize life chances and enable people to lead fulfilling

lives; this requires knowledge and competencies, ability to act on that knowledge and opportunity to act' (p. 6). Huston (2010) and Remund (2010) asserted that financial literacy combines 'both knowledge and application (ability) of human capital specific to personal finance' (Huston, 2010, p. 307) and 'measures the degree to which one understands key financial concepts (knowledge) and possesses the ability and confidence to manage personal finances through appropriate, short-term decision-making and sound, long-range financial planning, while mindful of life events and changing economic conditions' (Remund, 2010, p. 284).

Despite the cogent scholarly arguments that financial literacy is more than merely knowledge, many efforts to measure financial literacy have focused solely or primarily on knowledge. With that as background, there have been a multitude of approaches to assessing knowledge. While some (see e.g. Grable *et al.*, 2009; Lusardi and Tufano, 2009) have asked respondents to assess their own knowledge, the primary effort has been objective assessment. A few researchers have asked respondents to answer knowledge questions with binary yes-or-no responses (see e.g. Borden *et al.*, 2008; Servon and Kaestner, 2008; Hung *et al.*, 2009); however, the majority have built knowledge questions with four response options (Volpe *et al.*, 1996; Chen and Volpe, 2002; Beal and Delpachitra, 2003; NASD, 2003; Worthington, 2004; Jones, 2005; Lusardi and Mitchell, 2008a). Some have argued for the addition of a 'don't know' response to knowledge questions (Manton *et al.*, 2006; Hill and Perdue, 2008; Lusardi and Mitchell, 2008a; van Rooij *et al.*, 2011), suggesting that it reduces the possibility of a correct response by a consumer who was forced to guess.

There is little consistency in the questions used to assess financial literacy other than the repeated use of questions written by Lusardi and Mitchell. These questions test consumers' knowledge about inflation, compound interest, diversification, and stock and bond ownership. The questions have appeared in multiple tests of financial literacy,¹ either exactly as written originally or with modification.

There are inconsistencies in the literature about whether financial literacy measures should assess comprehensive or specific financial knowledge. Both Remund (2010) and Huston (2010) argued for operational definitions of financial literacy that span budgeting, saving, borrowing and investing. Many (Chen and Volpe, 2002; FSA, 2006; NEFE, 2006; U.S. Department of the Treasury, Office of Financial Education, 2006; ANZ, 2008; Financial Fitness for Life, 2008; JumpStart Coalition for Personal Financial Literacy, 2008; National Foundation for Credit Counseling, 2008) have adopted this broad approach to assess financial literacy. Others (e.g. Worthington, 2006) have argued for a more focused approach in which financial knowledge is

measured in the context of individual needs and circumstances. Researchers following this approach have assessed knowledge in a single area of personal finance such as investments (Volpe *et al.*, 1996), the US stock market (NASD, 2003; Müller and Weber, 2008), credit (Jones, 2005) and debt (Lusardi and Tufano, 2009).

There is greater uniformity among researchers about using responses to financial knowledge questions to create a single measure of financial literacy. Usually, the measure is the total number of questions answered correctly (Volpe *et al.*, 1996; Moore, 2003; NASD, 2003; Worthington, 2004; Atkinson *et al.*, 2006; Borden *et al.*, 2008; Servon and Kaestner, 2008; Hung *et al.*, 2009) but others have asked a limited number of questions and analysed the responses to each question separately (Lusardi and Mitchell, 2008b; Lusardi and Tufano, 2009). Some researchers (Kempson, 2009) also suggested weighting knowledge data to account for the relative relevance and difficulty of the questions.

Although financial literacy assessment results are not necessarily comparable to each other, scholars have been consistent in describing the populations they studied as having a less than ideal level of knowledge. In the US, whether it was investors (NASD, 2003), Washington state residents involved in predatory lending cases (Moore, 2003), American college students (Volpe *et al.*, 1996; Chen and Volpe, 1998, in a study focused on investing), high school students (Mandell and Klein, 2009), older US women (Lusardi and Mitchell, 2008a), or a general population of US adults (Lusardi and Tufano, 2009), financial knowledge tests indicated fewer than 50% of respondents were knowledgeable, with a mean score as low as 22% in some assessments. Researchers also have demonstrated low levels of financial knowledge in other countries, including the UK (Atkinson *et al.*, 2006), Japan (OECD, 2005) and the Netherlands (van Rooij *et al.*, 2011). In a more sophisticated approach to determine financial literacy, Huston (2010) assessed both knowledge and the ability to apply knowledge. Using a sample from Ohio State University's Consumer Finance Monthly survey, she evaluated only 14% of respondents as 'fully financially literate' and the majority (54%) as failing.

With globalization, individuals have opportunities to buy financial goods and services anywhere. Consumers who live in countries with less sophisticated financial markets no longer are insulated from more sophisticated choices. Thus, cross-national differences in financial literacy are as relevant as within-country differences. The Organisation for Economic Development (2005) called for cross-national work to account for economic, demographic and policy influences on financial literacy.

Reliable estimates of financial knowledge are more critical if financial knowledge leads to improved financial behaviours that ultimately improve consumers' well-being. The evidence on the relationship between financial knowledge and financial behaviours is mixed, in part due to definitional and measurement issues. Willis (2008) stated that 'financial literacy is not sufficient for good financial decision making' (p. 201). In a study of American college students, Borden *et al.* (2008) found that financial knowledge was not a significant predictor of either effective financial behaviours or risky financial behaviours. However, several researchers have found links between financial knowledge and positive financial behaviours. Researchers have linked financial knowledge with

¹The Lusardi and Mitchell questions have been used in surveys in Australia (Beal and Delpachitra, 2003), Canada (Canadian Financial Capability Survey; Statistics Canada, 2009), France (La culture financière des Français; Autorité des Marchés Financiers, 2011), Germany (The German SAVE study; Mannheim Research Institute for the Economics of Aging, 2009), Italy (Indagine sui bilanci delle famiglie italiane; Banca d'Italia, 2010), New Zealand (ANZ Retirement Commission Financial Knowledge Survey; ANZ Bank, 2009), Portugal (Survey on the Financial Literacy of the Portuguese Population; Banco de Portugal, 2010), Russia (The Russia Financial Literacy Diagnostic Survey; World Bank, 2009), Sweden (Survey on Financial Literacy in Sweden; Finansinspektionen, 2010) and the Netherlands (DNB Household Survey; CentERdata, 2006).

improved savings rates (Bernheim *et al.*, 1997), a suite of responsible financial behaviours (Hilgert *et al.*, 2003; Grable *et al.*, 2009), stock market participation (Yoong, 2010; van Rooij *et al.*, 2011), wealth accumulation (Lusardi and Mitchell, 2011), retirement planning (Lusardi, 2008), and more responsible and less expensive credit use (Lusardi and Tufano, 2009; Gerardi *et al.*, 2010; Robb, 2011).

Previous research has identified a number of socio-demographic characteristics, including gender, age, marital status, income and employment (Kempson, 2009; Yoong, 2010), that influence one's financial literacy. Danes and Haberman (2007), Lusardi and Tufano (2009), and van Rooij *et al.* (2011) are among those who examined the influence of gender on financial knowledge and concluded that men generally have greater financial literacy. Lusardi and Tufano (2009), van Rooij *et al.* (2011) and Gerardi *et al.* (2010) all demonstrated the influence of age, with financial literacy generally increasing as one ages. Income (Lusardi and Tufano, 2009) and wealth (van Rooij *et al.*, 2011) have been shown to be positively associated with financial literacy. Other demographic variables examined in previous research include marital status, employment (van Rooij *et al.*, 2011) and number of children (Gerardi *et al.*, 2010; van Rooij *et al.*, 2011). The possibility that financial knowledge can be developed by experiences gained through use of financial products has led to the inclusion of other variables such as home ownership (Xiao, 1997; Chien and DeVaney, 2001; Choi, 2010) in some models. Agarwal *et al.* (2013) provided evidence about the positive role of the use of financial products on financial knowledge. The authors found that the fees new card holders pay fall by 75% within the first 3 years after an account is opened, suggesting that consumers learn how to avoid triggering fees. The role of experience also is evident in the responses to a University of Michigan Surveys of Consumers question about the most important way respondents learned about personal finance. One-half cited personal financial experience. This proportion was more than twice as large as those who cited friends and family, and four to five times the proportion who cited formal financial education as their most important source of knowledge about personal finance (Hilgert *et al.*, 2003).

Thus, most previous studies analysed data about financial literacy from a single country or a subset of the population of a country. In addition, the literature suggests the value of assessing financial knowledge lies in examining its relationship with financial behaviours, after controlling for socio-demographic characteristics. Therefore, in the current research, data from four countries about financial knowledge as well as financial behaviours were examined.

Data

The lack of data from cross-national surveys about financial literacy required an analysis of comparable data from different national surveys. The criteria for choosing the countries were (1) survey data available to the researchers; (2) questions about financial literacy that were the same (or similar) in all surveys; and (3) cultural, economic and financial systems across the countries. Application of these criteria resulted in the selection of four developed economies: the US, UK, Canada and Italy. Both the US and Canada are large North American countries with similar econo-

mies but important cultural and political differences. The UK and Italy are both members of the European Union but, as with the US and Canada, are different culturally and politically. The similarities and differences combine to create an interesting set of countries for analysis.

Data for the US came from the 2009 FINRA National Financial Capability Study (FINRA, 2010). This is a nationally representative study that consisted of three linked surveys conducted in mid-2009: (1) a national, random-digit-dialled telephone survey of 1488 respondents; (2) a state-by-state online survey of approximately 25 000 respondents; and (3) an online survey of 800 military personnel and spouses. The national data from the telephone survey were used in this study.

The 2006 FSA Financial Capability Baseline Survey provided the data for the UK. This nationally representative survey was commissioned by the British FSA (the Financial Service Authority) to the Personal Finance Research Centre of Bristol (UK) to measure financial capability (literacy) in the UK. The survey was conducted between June and September 2005 and a total of 5328 people were interviewed. Because a later wave of the survey data was not available, the 2005 data were selected for this study.

The Canadian data were from the 2009 Canadian Financial Capability Survey, conducted by Statistics Canada between February and May 2009. The nationally representative survey was conducted as a random-digit-dialled survey, with the cooperation and support of Human Resources and Skills Development Canada, Finance Canada, and the Financial Consumer Agency of Canada. The sample size was 27 555.

The nationally representative data from Italy were from the 2009 'Indagine sui bilanci delle famiglie italiane' (Italian Survey on Household Income and Wealth). This survey has been replicated since the 1960s but has only recently been upgraded to include questions about financial literacy. The sample size was 7951.

Across the four data sets, only four financial literacy questions were the same or similar enough to use for comparison across countries. The questions and answer choices are reported in Table 1. A complete list of the questions used from each national survey is available in the Appendix. Limitations of the use of these existing data must be acknowledged. Only the inflation question was identical across the four data sets and even then the wording varied by country. The remaining three questions represented the best matches across the four countries but the content assessed varied somewhat by country. Thus, differences in results across countries may reflect to some extent the inconsistencies in the questions used to assess financial knowledge. Other limitations of the study are discussed later in the article.

The independent variables were selected based on previous work. Gender, age, education, the presence of dependent children, income, employment, marital status and home ownership were the independent variables in the regression analyses. They are described in Table 2.

Due to the interest in linking financial literacy and financial behaviours in previous research, nine variables assessing financial behaviours were selected from the data sets for inclusion in the analyses. Summary statistics for the variables are reported in Table 2 and the variables are described in Table 3.

Table 1 Financial literacy questions

	US	UK	Canada	Italy
Investment	<p>If interest rates rise, what will typically happen to bond prices?</p> <ul style="list-style-type: none"> • They will rise • They will fall • They will stay the same • There is no relationship between bond prices and the interest rate • Don't know • (Refused) 	<p>Which of these savings and investments do you think would have their cash value directly affected by stock market performance?</p> <ul style="list-style-type: none"> • Cash ISA • Insurance/investment bond (e.g. managed bond, with-profits bond) • Savings account with a bank or building society • Equity ISA • Endowment policy (with profits or unit linked) • Unit trust • Personal pension plan (with profits or unit linked) • Don't know • (Refused) 	<p>Lindsay has saved \$12 000 for her university expenses by working part-time. Her plan is to start university next year and she needs all of the money she saved. Which of the following is the safest place for her university money?</p> <ul style="list-style-type: none"> • Corporate bonds • Mutual funds • A bank savings account • Locked in a safe at home • Stocks • Don't know • (Refused) 	<p>A firm can raise money by issuing stocks or bonds. Which one is more risky for the investors?</p> <ul style="list-style-type: none"> • Stocks • Bonds • Stocks and bonds have the same risk • I don't know the difference between stocks and bonds • Don't know • (Refused)
Credit (mortgage)	<p>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.</p> <ul style="list-style-type: none"> • True • False • Don't know • (Refused) 	<p>Can you tell me for which of these types of mortgage you would be guaranteed to pay off the full amount borrowed if you kept up the repayments?</p> <ul style="list-style-type: none"> • Repayment mortgage • Low-cost endowment mortgage • Interest-only mortgage with an associated investment in a stocks and shares ISA or PEP • Interest-only mortgage with no associated investment • Don't know • (Refused) 	<p>Which of the following will help lower the cost of a house?</p> <ul style="list-style-type: none"> • Paying off the mortgage over a long period of time • Agreeing to pay the current rate of interest on the mortgage for as many years as possible • Making a larger down payment at the time of purchase • Making a smaller down payment at the time of purchase • Don't know • (Refused) 	<p>With which of the following mortgages can you know from the beginning the maximum value and the total number of the instalments that you'll have to pay to repay your debt?</p> <ul style="list-style-type: none"> • Floating rate mortgage • Fix rate mortgage • Fix rate mortgage with fix instalment • Don't know • (Refused)
Inflation	<p>Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?</p> <ul style="list-style-type: none"> • More than today • Exactly the same • Less than today • Don't know • (Refused) 	<p>If the inflation rate is 5% and the interest rate you get on your savings is 3%, will your savings have at least as much buying power in a year's time?</p> <ul style="list-style-type: none"> • Yes • No • Don't know • (Refused) 	<p>If the inflation rate is 5% and the interest rate you get on your savings is 3%, will your savings have at least as much buying power in a year's time?</p> <ul style="list-style-type: none"> • Yes • No • Don't know • (Refused) 	<p>Suppose you have €1000 in your bank account with an interest rate of 1% and no fees or other expenses. Suppose that the inflation rate is equal to 2%. Do you think that at the end of the year, when you'll have back your money, you'll be able to buy the same amount of goods that you can buy today with your €1000?</p> <ul style="list-style-type: none"> • Yes • No, I'll be able to buy less • No, I'll be able to buy more • Don't know
Money management (bank account)	<p>Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think would you have in the account if you left the money to grow?</p> <ul style="list-style-type: none"> • More than \$102 (EUR 76) • Exactly \$102 • Less than \$102 • Don't know • (Refused) 	<p>Looking at this example of a bank statement, please can you tell me how much money was in the account at the end of February?</p>	<p>If you had a savings account at a bank, which of the following statements would be correct concerning the interest that you would earn on this account?</p> <ul style="list-style-type: none"> • Sales tax may be charged on the interest that you earn • You cannot earn interest until you pass your 18th birthday • Earnings from savings account interest may not be taxed • Income tax may be charged on the interest if your income is high enough. • Don't know • (Refused) 	<p>Look at this bank statement. Can you tell me how much money you have in your account at the end of the period?</p>

Table 2 Descriptive statistics

		US	UK	Canada	Italy				
Variables (Quiz)		Correct answer (%)	Correct answer (%)	Correct answer (%)	Correct answer (%)				
Question 1 – Investment		22.24	35.21	59.79	33.48				
Question 2 – Credit (mortgage)		71.10	70.92	81.68	66.41				
Question 3 – Inflation		65.86	44.76	61.71	72.55				
Question 4 – Money management (bank account)		65.76	91.00	57.16	60.38				
Financial literacy index mean (SD)		2.251 (1.137)	2.419 (0.982)	2.603 (1.275)	2.328 (1.192)				
		US		UK		Canada		Italy	
Variables	Values	Obs.	%	Obs.	%	Obs.	%	Obs.	%
Gender	1 = Male	768	51.61	2678	50.26	6 925	44.62	4934	61.85
	2 = Female	720	48.39	2650	49.74	8 594	55.38	3043	38.15
	Total	1488	100	5328	100	15 519	100	7977	100
Age	1 = 18–24	205	13.78	699	13.13	1 199	7.73	61	0.76
	2 = 25–34	250	16.80	996	18.71	2 212	14.25	480	6.02
	3 = 35–44	284	19.09	1012	19.02	2 902	18.70	1272	15.95
	4 = 45–54	273	18.35	833	15.65	3 137	20.21	1556	19.51
	5 = 55–64	220	14.78	795	14.94	2 822	18.18	1611	20.20
	6 = 65 +	256	17.20	987	18.55	3 247	20.92	2997	37.57
Total		1488	100	5322	100	15 519	100	7977	100
Education	1 = Less than high school	152	10.22	2969	55.72	2 768	17.84	319	66.68
	2 = High school	411	27.62	1353	25.39	3 284	21.16	2603	32.63
	3 = Some college/university	431	28.97	1	0.02	1 670	10.76	1	0.01
	4 = College/university	307	20.63	620	11.64	6 348	40.90	53	0.66
	5 = PhD/postgraduate	187	12.57	385	7.23	1 449	9.34	1	0.01
Total		1488	100	5328	100	15 519	100	7977	100
Income	1 = Less than \$25 000	457	30.71	209	3.92	2 816	18.15	1992	24.97
	2 = At least \$25 000 but less than \$50 000	359	24.13	2668	50.08	3 661	23.59	3408	42.72
	3 = At least \$50 000 but less than \$75 000	275	18.48	1474	27.67	3 162	20.38	1519	19.04
	4 = At least \$75 000 but less than \$100 000	147	9.88	605	11.36	1 949	12.56	538	6.74
	5 = At least \$100 000 but less than \$150 000	148	9.95	208	3.90	1 592	10.26	257	3.22
	6 = \$150 000 or more	102	6.85	108	2.03	748	4.82	263	3.30
Total		1488	100	5328	100	15 519	100	7977	100
Employment	0 = Disabled	94	6.32	241	4.52	1	0.01	1	0.01
	1 = Unemployed/not working	113	7.59	392	7.36	1 601	10.32	1710	21.44
	2 = Student	51	3.43	270	5.07	597	3.85	12	0.15
	3 = Household work	93	6.25	507	9.52	402	2.59	1	0.01
	4 = Employed	728	48.92	2761	51.82	7 541	48.59	2629	32.96
	5 = Self-employed	145	9.74	1	0.02	1 395	8.99	771	9.67
	6 = Retired	263	17.67	1155	21.68	3 938	25.38	2852	35.75
7 = Other		1	0.07	1	0.02	44	0.28	1	0.01
Total		1488	100	5328	100	15 519	100	7977	100
Marital status	1 = Single	823	55.31	2656	49.85	9 080	58.51	5045	63.24
	2 = Married	382	25.67	1621	30.42	3 191	20.56	903	11.32
	3 = Separated	145	9.74	491	9.22	1 291	8.32	586	7.35
	4 = Divorced	114	7.66	435	8.16	1 369	8.82	1442	18.08
	5 = Widow	24	1.61	125	2.35	588	3.79	1	0.01
Total		1488	100	5328	100	15 519	100	7977	100
Home ownership	(Value equal to 1)	917	61.63	3097	58.13	11 044	71.16	5641	70.72
Financial behaviour variables									
Advice	(Value equal to 1)	843	56.65	1482	27.82	3 254	20.97	16	0.20
Bank account	(Value equal to 1)	1333	89.58	4834	90.73	13 395	86.31	6613	82.90
InfoIntermediaries	(Value equal to 1)	495	33.27	50	0.94	7 930	51.10	118	1.48
InfoNewspapers	(Value equal to 1)	934	62.77	11	0.21	2 908	18.74	6	0.08
InfoFriends	(Value equal to 1)	NA	NA	25	0.47	6 178	39.81	8	0.10
Compare shop	(Value equal to 1)	139	9.34	352	6.61	10 931	70.44	365	4.58
Investment	(Value equal to 1)	637	42.81	563	10.57	6 193	39.91	975	12.22
Mortgage	(Value equal to 1)	571	38.37	1694	31.79	6 389	41.17	736	9.23
Loans	(Value equal to 1)	430	28.90	NA	NA	4 348	28.02	1005	12.60
Variable		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Children		0.047	0.336	0.103	0.489	0.152	0.359	0.198	0.593

NA, not applicable.

Table 3 Description of consumer attitude and behaviour variables

Variable	Description
Advice	Dummy variable equal to 1 if the consumer uses a financial adviser (and 0 otherwise)
Bank account	Dummy variable equal to 1 if the consumer owns in his/her name at least 1 bank account (and 0 otherwise)
InfoIntermediaries	Dummy variable equal to 1 if the consumer uses intermediaries (banks, etc.) as a source of information (and 0 otherwise)
InfoNewspapers	Dummy variable equal to 1 if the consumer uses regularly financial newspapers or reads the financial section of newspapers in order to be updated on financial topics (and 0 otherwise)
InfoFriends	Dummy variable equal to 1 if the consumer talks with friends and relatives about financial topics on a regular base (and 0 otherwise)
Compare shop	Dummy variable equal to 1 if the consumer compares different providers when he wants to buy financial products or services (and 0 otherwise)
Investment	Dummy variable equal to 1 if the consumer owns investment products such as bonds, stocks and mutual funds (and 0 otherwise)
Mortgage	Dummy variable equal to 1 if the consumer has a mortgage (and 0 otherwise)
Loans	Dummy variable equal to 1 if the consumer has a loan or other debts, except mortgages (and 0 otherwise)

Methodology

As the aim of this paper was to analyse financial literacy in different countries, the following research questions were proposed: (1) Are there differences in financial literacy across countries? (2) If financial literacy differs between countries, do differences in socio-demographic characteristics or levels of participation in financial markets or differences in financial behaviour explain these differences?

A quantitative measure of financial literacy was created based on responses to the four financial literacy questions that appeared in all four data sets. The four questions included one each on the topics of investment, credit, inflation and money management. Creation of an index to measure financial literacy, equal to the number of correct answers to the four questions, was consistent with previous literature (see Volpe *et al.*, 1996; Moore, 2003; NASD, 2003; Worthington, 2004; Atkinson *et al.*, 2006; Borden *et al.*, 2008; Servon and Kaestner, 2008; Hung *et al.*, 2009). The value of the index could range from 0, if the respondent answered all four questions incorrectly, to 4, if all of the answers were right.

The descriptive statistics in Table 2 show the distribution of the sample. To further examine the factors that may be predictors of financial literacy after controlling for other related variables, regression analyses were conducted. To address the first research question regarding differences in financial literacy between countries, an ordered logistic regression was used to analyse a data set that included the data from all four countries. An ordered logistic regression model was selected because of the limited nature of the dependent variable (Greene, 2011). Greene suggested the use of ordered logit for dependent variables that are not continuous, such as the financial literacy index, rather than ordinary least squares (OLS) regression because one of the key assumptions for using OLS is that the dependent variable is continuous. The financial literacy index was the dependent variable and the full sets of socio-demographic and financial behaviour variables were included as independent variables. Four dummy variables also were included to account for differences by country.

To address possible bias due to differences in sample sizes, the same regression was replicated applying weights to the national data. First, the weights were applied to resize all of the individual

country data to the largest sample size (Canada). Second, weights were applied to resize all of the individual country data to the smallest sample (US). Results from the three different regressions shed light on the possible bias on results due to differences in sample sizes.

Data about five financial behaviour variables (InfoFriends in the US, Loans in the UK, and Advice, InfoIntermediaries and InfoFriends in Italy) were unavailable in at least one of the data sets. In the by-country regression analyses, these variables were eliminated from the model for the countries for which the data were missing.

The second research question regarding differences in the factors that influence financial literacy between countries also was investigated using an ordered logistic regression analysis. The data from each country were analysed separately, adopting the financial literacy index as dependent variable. In Model 1, the independent variables were the full set of socio-demographic variables. In Model 2, the socio-demographic variables as well as the financial behaviour variables were included in the analysis.

Results

Descriptive statistics

Descriptive statistics for the dependent and independent variables are reported in Table 2. Demographically, the Italian sample was considerably older than the US sample and less well educated than any of the other three samples. The Canadian sample reported the highest levels of education. Relative to the other countries, the UK sample was much less likely to be self-employed. The Italian sample included proportionately more divorced individuals than any of the other three samples.

The mean of the financial literacy index across the four countries was 2.48; the means for the individual countries ranged from a low of 2.25 in the US to a high of 2.60 in Canada. Question 1 (investment) was the most difficult question in each country except Canada where a roughly equal proportion also incorrectly answered Question 4 (money management). In contrast, Question 4 was the question most often answered correctly in the UK. In the US and Canada, Question 2 (credit) was most often answered

correctly while Question 3 (inflation) was most often answered correctly in Italy.

There also was a considerable range in financial behaviours across countries. Italian consumers were less likely to have a mortgage or a loan than those in the other three countries. More than one-half of US consumers used a financial advisor (Advice) while this was rare in Italy. One-third of US consumers and one-half of those in Canada used intermediaries as a source of information, something the Britons and Italians rarely did. Reading financial newspapers or the financial sections of newspapers was common in the US but rare in the UK and Italy. Canadians were more likely than those in other countries to talk with friends and relatives about financial topics on a regular basis and to compare providers before buying financial products or services. Relative to the two other countries, a higher proportion of the US and Canadian samples owned investment products.

Across-country differences in financial literacy

Results from the ordered logistic regression analysis using the full international data set are reported in Table 4. Results of regressions from the original data and from the weighted data are reported side by side to stress the differences in results due to different sample sizes: stronger similarities within results suggest their robustness against the sample size effect. The results from the original sample indicate that men, those older than 24 years old, those with at least a high school education and those with annual incomes greater than \$25 000 (EUR 18 746; £16 139), were more financially literate than the reference groups. Self-employment, being married, separated, or widowed, and homeownership were positively associated with financial literacy. The nature of the relationships was as suggested by previous research (Lusardi and Tufano, 2009; van Rooij *et al.*, 2011). The coefficients for age and income increased continuously until reaching the oldest and highest income and age groups. Those who were divorced were less literate than the reference group of single respondents.

All of the financial behaviour variables except bank account and loans were positive and statistically significantly related to financial literacy at the $P < 0.001$ level (see Table 4).

The significance for the country dummy variables supports the hypothesis that country of origin matters when explaining financial literacy. Using the US as the reference country, the signs and values of the coefficients for the other dummy variables suggest the influence of country of origin was stronger among the Britons (1.189, P -value < 0.001) and also significant among the Italians (1.038, P -value < 0.001), but not the Canadians.

A potential concern is the differences in the sample sizes (from 1488 in the US to 15 519 in Canada). To test for sample size effects, ordered logistic regressions for both models were rerun, once with the sample sizes for the other three countries standardized to equal the Canadian sample size and once with the sample sizes standardized to equal the US sample size. Results indicated some differences between the weighted and unweighted models, but primarily for the job status variable. While only self-employment (relative to employment) was significant in the unweighted data, multiple categories of job status were significant when the data were weighted to equal the Canadian sample size and none was significant when the data were weighted to equal the US sample size. Thus, the results regarding job status appear to

be influenced by the differences in the sample sizes. However, among the financial behaviour variables, only the mortgage variable appears influenced by the differences in the sample sizes. In addition, the dummy variable for Canada was not significant in the unweighted data but was in both of the weighted data analyses.

Because of concerns about the sample size effect on the job status variable, that variable was removed from the by-country regression analysis, which used unweighted data. Across the four Model 1 by-country regression analyses (Table 5), the only consistency was the influence of education on financial literacy. The coefficients for men were positive and significant in each country with the exception of UK (Model 1) where being male was negatively associated with financial literacy. Education was significant and positive across the countries but the relationships were strongest in Canada. Those who owned their houses had significantly higher financial literacy than those in other living conditions in the three countries (US, UK and Canada).

There were, however, also inconsistencies in the results across countries. Relative to the reference group (18- to 24-year-olds), only the 55- to 64-year-olds in the US were more financially literate while all Canadian age groups with the exception of the 35- to 44-year-olds were more financially literate. Income was significant and positive in Italy (except for the highest income group), Canada (for all groups) and the US (but not significant for the greater than \$100 000 income groups). Marital status was significant in Canada and Italy but the specific nature of the relationship was different between the two countries.

Financial behaviour variables were added to the regression analyses in Model 2 (see Table 5, Model 2 columns). Using this larger set of variables, the R^2 increased in each analysis and the majority of the socio-demographic variables retained their significance.

In Model 2, gender was the only consistent socio-demographic influence across countries. Men had higher scores in each country. The influence of education in all countries, age in the US and Canada, marital status in Canada and Italy, and income in Italy was consistent between Models 1 and 2. The introduction of financial behaviour variables seems to have reduced the influence of higher education on financial literacy in the US and occupation and home ownership in Canada.

Conclusions

This research used variables from four data sets to assess financial literacy and its influences in four countries as well as across the four countries. The results suggest varying levels of financial knowledge across the four countries. In addition, there were inconsistencies in the influence of socio-demographic variables. Adding financial behaviour variables to the ordered logistic regression model increased the explanatory power of the model in each country but the socio-demographic variables generally retained their explanatory power.

The results clearly indicate the need to coordinate if not standardize financial literacy assessments across countries. Asking identical financial literacy questions (with appropriate adjustments for country-specific information, such as currencies) would facilitate comparison. While the Lusardi and Mitchell questions are a start, they cover a relatively narrow range of content. Little is

Table 4 Results of ordered logistic regression analysis using full international data set

Variables	Original sample			Sample weighted matching the biggest national sample			Sample weighted matching the smallest national sample		
	Coefficient	SD	P-value	Coefficient	SD	P-value	Coefficient	SD	P-value
Socio-demographic variables									
Men	0.414	0.022	0.000***	0.438	0.015	0.000***	0.438	0.051	0.000***
Age	(Reference group)			(Reference group)			(Reference group)		
18–24							0.143	0.109	0.191
25–34	0.189	0.052	0.000***	0.143	0.033	0.000***	0.413	0.114	0.000***
35–44	0.446	0.053	0.000***	0.413	0.035	0.000***	0.530	0.115	0.000***
45–54	0.623	0.053	0.000***	0.530	0.035	0.000***	0.685	0.122	0.000***
55–64	0.785	0.057	0.000***	0.685	0.037	0.000***	0.188	0.152	0.215
>65	0.322	0.069	0.000***	0.189	0.047	0.000***			
Education									
Less than high school	(Reference group)			(Reference group)			(Reference group)		
High school	0.589	0.029	0.000***	0.588	0.020	0.000***	0.588	0.066	0.000***
Some college/university	0.787	0.050	0.000***	0.704	0.031	0.000***	0.704	0.103	0.000***
College/university	0.792	0.035	0.000***	0.721	0.026	0.000***	0.721	0.086	0.000***
PhD/Postgraduate	0.859	0.050	0.000***	0.894	0.034	0.000***	0.894	0.111	0.000***
Children	0.021	0.015	0.183	0.005	0.009	0.528	0.005	0.029	0.845
Income									
Less than \$25 000	(Reference group)			(Reference group)			(Reference group)		
At least \$25 000 but less than \$50 000	0.355	0.031	0.000***	0.400	0.021	0.000***	0.400	0.400	0.000***
At least \$50 000 but less than \$75 000	0.519	0.037	0.000***	0.625	0.026	0.000***	0.625	0.625	0.000***
At least \$75 000 but less than \$100 000	0.572	0.047	0.000***	0.639	0.033	0.000***	0.639	0.639	0.000***
At least \$100 000 but less than \$150 000	0.590	0.053	0.000***	0.812	0.038	0.000***	0.812	0.812	0.000***
\$150 000 or more	0.482	0.064	0.000***	0.557	0.044	0.000***	0.557	0.557	0.000***
Job									
Employed	(Reference group)			(Reference group)			(Reference group)		
Unemployed/not working	0.127	0.101	0.209	0.215	0.050	0.000***	0.215	0.161	0.182
Student	0.125	0.116	0.284	0.134	0.063	0.033**	0.134	0.204	0.510
Household work	0.108	0.111	0.331	-0.017	0.056	0.752	-0.017	0.181	0.922
Disabled	0.111	0.098	0.258	0.127	0.046	0.006**	0.127	0.150	0.397
Self-employed	0.305	0.105	0.004**	0.179	0.053	0.001**	0.179	0.173	0.299
Retired	0.152	0.103	0.142	0.133	0.051	0.010**	0.133	0.166	0.423
Other	-0.426	0.284	0.133	-0.323	0.238	0.176	-0.322	0.770	0.675
Marital status									
Single	(Reference group)			(Reference group)			(Reference group)		
Married	0.119	0.033	0.000***	0.105	0.023	0.000***	0.105	0.105	0.159
Separated	0.274	0.041	0.000***	0.256	0.028	0.000***	0.256	0.256	0.005**
Divorced	-0.218	0.041	0.000***	-0.236	0.029	0.000***	-0.236	-0.236	0.012**
Widow	0.222	0.069	0.001***	0.144	0.054	0.008**	0.144	0.144	0.409
Home ownership	0.262	0.028	0.000***	0.313	0.020	0.000***	0.313	0.313	0.000***
Financial behaviour variables									
Advice	0.212	0.031	0.000***	0.131	0.020	0.000***	0.131	0.131	0.050**
Bank account	-0.133	0.151	0.380	0.056	0.049	0.261	0.056	0.056	0.727
InfoIntermediaries	0.511	0.030	0.000***	0.362	0.023	0.000***	0.362	0.362	0.000***
InfoNewspapers	0.345	0.036	0.000***	0.347	0.024	0.000***	0.347	0.347	0.000***
InfoFriends	0.229	0.031	0.000***	0.254	0.031	0.000***	0.254	0.254	0.011**
Compare shop	0.642	0.030	0.000***	0.436	0.024	0.000***	0.436	0.436	0.000***
Investment	0.368	0.026	0.000***	0.278	0.019	0.000***	0.278	0.278	0.000***
Mortgage	0.070	0.031	0.023*	0.105	0.021	0.000***	0.105	0.105	0.128
Loans	-0.006	0.031	0.834	-0.004	0.021	0.836	-0.004	-0.004	0.949
Country dummy variables									
US	(Reference group)			(Reference group)			(Reference group)		
UK	1.189	0.146	0.000***	1.269	0.050	0.000***	1.201	0.867	0.000***
Canada	0.091	0.148	0.539	0.401	0.056	0.000***	0.246	0.183	0.029**
Italy	1.038	0.147	0.000***	1.086	0.053	0.000***	0.990	0.111	0.000***
R ²	0.2718			0.2720			0.2720		

*P < 0.10; **P < 0.05; ***P < 0.001.

Significant variables are in bold.

Table 5 Results from ordered logistic regression on financial literacy index (national database, $n = 30\,312$)

Variables	US						UK						Canada						Italy					
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2					
	Coefficient	SD	Coefficient	SD	Coefficient	SD	Coefficient	SD	Coefficient	SD	Coefficient	SD	Coefficient	SD	Coefficient	SD	Coefficient	SD	Coefficient	SD				
Men	0.552**	0.217	0.532**	0.220	-0.020	0.183	-0.022	0.184	0.208***	0.059	0.273***	0.066	0.432***	0.087	0.465***	0.054	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
Age	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
18-24	0.289	0.356	0.180	0.361	0.144	0.347	0.089	0.348	0.330**	0.131	0.243	0.149	0.297	0.525	0.291	0.583	0.297	0.525	0.291	0.583				
25-34	0.251	0.386	0.161	0.393	0.333	0.393	0.282	0.394	0.194	0.130	0.268**	0.148	0.384	0.513	0.430	0.573	0.384	0.513	0.430	0.573				
35-44	0.531	0.394	0.441	0.402	0.007	0.395	-0.060	0.398	0.463***	0.129	0.524**	0.147	0.288	0.511	0.325	0.571	0.288	0.511	0.325	0.571				
45-54	0.978**	0.488	0.855*	0.497	-0.160	0.415	-0.173	0.416	0.565***	0.140	0.665***	0.159	0.385	0.511	0.554	0.572	0.385	0.511	0.554	0.572				
55-64	0.252	0.546	0.113	0.562	-0.685	0.466	-0.652	0.469	0.093	0.161	0.277	0.184	-0.133	0.569	0.216	0.642	-0.133	0.569	0.216	0.642				
>65	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
Education	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
Less than high school	0.311	0.285	0.273	0.290	1.095***	0.304	1.042**	0.306	0.398***	0.077	0.151*	0.087	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
High school	0.838**	0.324	0.700**	0.332	(Dropped)	(Dropped)	(Dropped)	(Dropped)	0.827***	0.110	0.511**	0.124	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
Some college/university	0.785**	0.395	0.543	0.406	1.097**	0.468	1.018**	0.469	0.807***	0.079	0.422**	0.088	0.468	0.745	0.260	0.748	0.468	0.745	0.260	0.748				
College/university	0.937*	0.505	0.744	0.519	0.576	0.524	0.468	0.528	0.913***	0.130	0.455**	0.145	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
PhD/postgraduate	0.137	0.108	0.161	0.111	0.068	0.121	0.065	0.120	0.188**	0.083	0.101	0.092	-0.050	0.053	-0.067	0.057	-0.050	0.053	-0.067	0.057				
Children	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
Income	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
<\$25 000	0.476*	0.273	0.298	0.282	0.910**	0.295	0.831**	0.296	0.206**	0.079	0.053	0.089	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
\$25 000-\$50 000	0.660*	0.392	0.389	0.407	0.907*	0.496	0.736	0.502	0.274**	0.095	-0.019	0.107	1.043***	0.084	0.980***	0.090	1.043***	0.084	0.980***	0.090				
\$50 000-\$75 000	1.324**	0.640	0.985	0.653	(Dropped)	(Dropped)	(Dropped)	(Dropped)	0.402**	0.120	0.082	0.136	1.880***	0.170	1.802***	0.181	1.880***	0.170	1.802***	0.181				
\$75 000-\$100 000	0.458	0.511	0.076	0.525	(Dropped)	(Dropped)	(Dropped)	(Dropped)	0.217*	0.125	-0.056	0.206	2.247***	0.333	2.185***	0.352	2.247***	0.333	2.185***	0.352				
\$100 000-\$150 000	0.150	0.579	-0.228	0.594	(Dropped)	(Dropped)	(Dropped)	(Dropped)	0.461*	0.185	-0.056	0.206	2.676***	0.591	2.456***	0.594	2.676***	0.591	2.456***	0.594				
>\$150 000	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
Marital status	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)	(Reference group)				
Single	-0.223	0.304	-0.170	0.309	0.065	0.272	0.092	0.273	0.172**	0.086	0.251**	0.098	0.216	0.141	0.224	0.152	0.216	0.141	0.224	0.152				
Married	0.318	0.416	0.403	0.425	0.210	0.328	0.216	0.329	0.348**	0.115	0.372**	0.126	0.360**	0.166	0.378**	0.178	0.360**	0.166	0.378**	0.178				
Separated	0.362	0.423	0.429	0.431	-0.374	0.258	-0.335	0.258	-0.097	0.098	-0.090	0.111	-0.144	0.106	-0.077	0.114	-0.144	0.106	-0.077	0.114				
Divorced	-0.525	0.684	-0.438	0.694	0.047	0.540	0.072	0.540	0.251	0.153	0.344**	0.169	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
Widow	0.678**	0.248	0.598*	0.309	0.731***	0.201	0.498**	0.222	0.580***	0.061	0.004	0.075	0.037	0.083	0.027	0.089	0.037	0.083	0.027	0.089				
Home ownership	0.373	0.275	0.373	0.275	0.275	0.264	0.256	0.264	0.408**	0.123	0.408**	0.123	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
Advice	0.147	0.276	0.147	0.276	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
Bank account	-0.300	0.330	-0.300	0.330	-0.548	0.055	-0.548	0.055	1.260***	0.082	1.260***	0.082	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
InfoIntermediaries	0.433**	0.207	0.433**	0.207	(Dropped)	(Dropped)	(Dropped)	(Dropped)	0.511***	0.109	0.511***	0.109	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
InfoNewspapers	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	1.053***	0.080	1.053***	0.080	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
InfoFriends	-0.097	0.520	-0.097	0.520	0.648	0.052	0.648	0.052	1.812***	0.063	1.812***	0.063	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
Compare shop	0.749	0.295	0.749	0.295	0.628	0.433	0.628	0.433	0.760***	0.083	0.760***	0.083	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
Investment	-0.120	0.357	-0.120	0.357	0.474	0.368	0.474	0.368	0.446***	0.098	0.446***	0.098	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
Mortgage	0.384	0.288	0.384	0.288	(Dropped)	(Dropped)	(Dropped)	(Dropped)	-414***	0.077	-414***	0.077	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)	(Dropped)				
Loans	0.1161	0.1368	0.1161	0.1368	0.0913	0.0960	0.0913	0.0960	0.0610	0.2809	0.0610	0.2809	0.1805	0.1846	0.1846	0.1805	0.1805	0.1846	0.1846	0.1805	0.1846			
F^2																								

* $P < 0.10$; ** $P < 0.05$; *** $P < 0.001$. Significant variables are in bold.

known about how well responses to these questions correlate with knowledge about other aspects of financial management. In addition, all of the questions include numbers; it is unknown whether they assess financial literacy or numeracy or both. Methodologically, it could be important to administer the survey in a similar fashion and to similar numbers and types of respondents across cultures.

Furthermore, including financial behaviour questions appears critical given their explanatory power. While we cannot directly change one's socio-demographic characteristics, we can ensure their access to financial behaviours that increase their financial knowledge. The effect on financial literacy of access to financial products and services has been highlighted in previous literature (see e.g. Atkinson *et al.*, 2006). Results from previous studies suggest that lack of access to financial products does play an important role in financial literacy. For instance, Agarwal *et al.* (2013) found that financial knowledge of consumers about credit cards is affected by using these cards. Hilgert *et al.* (2003) highlighted survey results reporting that personal financial experience was the primary way respondents learned about personal finance.

As noted earlier, an important limitation is the use of existing data. The fact that the knowledge score on the inflation question in the UK sample was the lowest of the four while the overall UK knowledge score was the highest across the four countries suggests, at a minimum, some inconsistencies in the measure of financial knowledge that merit further examination. In addition, the latest available data for the UK were from 2006 while the data from the other three countries were from 2009. The UK results may be different in unknown ways due to differences in economic conditions between 2006 and 2009.

Thus, there is a need to develop a broader scale to measure financial literacy in a more comprehensive and reliable way in future international studies. To better understand the factors that affect financial literacy and the negative consequences of financial illiteracy on the economy and society, a standardized measure that could be used anywhere seems necessary. Financial literacy can impact both financial market development and consumers' use of that market. For example, a study by Khorana *et al.* (2005) showed an association between financial innovation in the mutual fund industry and the mean number of years of education in a country. A related stream of research (see e.g. Grimes *et al.*, 2010) has connected consumers' use of financial services to economic and financial education. In a globalized economy, financial institutions are more likely to participate in places where the population is better informed and a financially literate population is more likely to participate in the financial products and services that the institutions have to offer. As a result, the development of a uniform financial literacy measure is of interest to both public and private decision makers. In addition, previous research has demonstrated the influence of cognitive abilities as well as numeracy on consumers' financial choices (see e.g. Beal and Delpachitra, 2003 and Christelis *et al.*, 2010), suggesting the value of an even more comprehensive data set. While designing and collecting such data across countries may prove challenging due to differences in countries' economic and financial systems, it is important as part of a larger effort to coordinate if not standardize data collection regarding financial literacy and related variables across countries.

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Appendix

Table A1 List of questions from national surveys

	US	UK	Canada	Italy
Age	<p>Variable values</p> <p>1) 18–24 2) 25–34 3) 35–44 4) 45–54 5) 55–64 6) 65+</p>	<p>Age group</p> <p>1) 18–24 2) 25–34 3) 35–44 4) 45–54 5) 55–64 6) 65+</p>	<p>[Year of birth]</p>	<p>How old are you?</p>
Education	<p>What was the last year of education that you completed?</p> <p>1 = Did not complete high school 2 = High school graduate 3 = Some college 4 = College graduate 5 = Postgraduate education</p>	<p>Starting from the top of this card, please look down the list of qualifications and tell me the number of the first one you come to that you have passed. Please just tell me the number.</p> <p>1 = Higher degree/postgraduate qualifications 2 = First degree (including BEd) Postgraduate diplomas/certificates (including PGCE) Professional qualifications at degree level (e.g. chartered accountant/surveyor) NVQ/SVQ Level 4 or 5 3 = Diplomas in higher education/other HE qualifications, HNC/HND/BTEC higher 4 = A/AS levels/SCE higher/Scottish Certificate 6th Year Studies 5 = Trade apprenticeships – 6 = ... 7 = ... 8 = Other qualifications (including overseas)</p>	<p>What is the highest level of schooling that you have ever attained?</p> <p>1 = Less than a high school diploma 2 = High school diploma or equivalent 3 = Some college, trade, vocational or technical school, CEGEP, or university without a certificate, diploma or degree 4 = College, trade, vocational or technical school, CEGEP, certificate or diploma 5 = University undergraduate degree 6 = University graduate degree (including professional degrees)</p>	<p>Which is your education?</p> <p>1 = None 2 = Primary school 3 = Middle school 4 = High school (3 years) 5 = High school (5 years) 6 = University (3 years) 7 = University (5 years) 8 = PhD</p>
Children	<p>How many children do you have who are financially dependent on you (or your spouse/partner)?</p> <p>1 = 1 2 = 2 3 = 3 4 = 4 or more</p>	<p>Please could you tell me the number of your or your partner's children who live in this household and are aged under 18, and are still at school or college or are under school age?</p>	<p>Are you financially responsible for any children under the age of 18 living in your household or currently living with someone else?</p> <p>0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 or plus</p>	<p>How many children do you have?</p>
Income	<p>1 = Less than \$25 000 2 = At least \$25 000 but less than \$50 000 3 = At least \$50 000 but less than \$75 000 4 = At least \$75 000 but less than \$100 000 5 = At least \$100 000 but less than \$150 000 6 = \$150 000 or more</p>	<p>Data not available</p>	<p>Could you tell me which of the following categories best describes your personal income in 2008?</p> <p>1 = Less than \$20 000 2 = \$20 000 to less than \$40 000 3 = \$40 000 to less than \$60 000 4 = \$60 000 to less than \$80 000 5 = \$80 000 to less than \$100 000 6 = \$100 000 or more</p>	<p>How much is your income on an annual basis?</p>

Table A1 Continued

Job	US	UK	Canada	Italy
	Variable values			
	0 = Permanent sick 1 = Unemployed/not working 2 = Student 3 = Household work 4 = Employed 5 = Self-employed 6 = Retired 7 = Other	Starting from the top of this card, please tell me the first of these that best describes your current situation. 1 = In full-time education (student) 2 = Working full-time (30+ hours) including temporarily off work (employed) 3 = Working part-time (up to 29 h) including temporarily off work (employee) 4 = Looking after the home or family (household work) 5 = Retired from paid work (retired) 6 = Unemployed (unemployed) 7 = On a government-work or training scheme (employee) 8 = Permanently sick or disabled (permanent sick)	I would now like to ask you a few questions about your employment status. Are you now . . . 1 = Employed (employed) 2 = Self-employed (self-employed) 3 = Not working and looking for work (unemployed) 4 = Not working and not looking for work (unemployed) 5 = Retired (retired) 6 = A student – including work programs (student) 7 = Doing unpaid household work (household work) 8 = Other – specify (other)	What's your job? 1 = Worker (employed) 2 = Employee (employed) 3 = Teacher (employed) 4 = Executive (employed) 5 = Manager, professor, judge (employed) 6 = Freelance (self-employed) 7 = Entrepreneur (self-employed) 8 = Self-employed (self-employed) 9 = Employed in family business (self-employed) 10 = Owner of business (self-employed) 20 = Part-time (employee) 11 = Looking for (first) job (unemployed) 12 = Unemployed (unemployed) 13 = Housewife (household work) 14 = Rich men (no work) (other) 15 = Retired from work (retired) 16 = Social pension (not from work) (permanent sick) 17 = Student (student) 18 = Child (not work) (student) 19 = Other (other) Which is your marital status? 1 = Married 2 = Single 3 = Divorced 4 = Widow Housing condition 1 = Rent 2 = Owner 3 = Lease 4 = Free use
Marital status	1 = Single 2 = Married 3 = Separated 4 = Divorced 5 = Widow	Which of these best describes you? 1 = Single, i.e. never married 2 = Married 3 = Widowed 4 = Divorced 5 = Separated	What is your current marital status? 1 = Married 2 = Living common law 3 = Widow or Widower 4 = Separated 5 = Divorced 6 = Single, never married	Which is your marital status? 1 = Married 2 = Single 3 = Divorced 4 = Widow
Home ownership	(dummy variable) 0 = No; 1 = Yes 2 = No	Housing – In which of these ways do you occupy your home? 1 = Own it outright 2 = Own it with a mortgage 3 = Rent it from a private landlord 4 = Rent it from a local authority or housing association 5 = Live with your parents/grandparents/ other family members 6 = Have some other arrangement	Tenure 1 = Member of immediate family owns principal residence without a mortgage 2 = Member of immediate family owns principal residence with a mortgage 3 = No one in immediate family owns principal residence	Housing condition 1 = Rent 2 = Owner 3 = Lease 4 = Free use

Advice	(dummy variable) 0 = No; 1 = Yes	In the last 5 years, have you asked for any advice from a financial professional about any of the following ...? debt counselling. 1 = Yes 2 = No	In the last 5 years, have you received any professional advice about planning your personal finances? By that I mean things like planning for retirement, tax planning or investing money, but please do not include advice related to running a business. 1 = Yes 2 = No (Don't know)	In the past 12 months, did you make use of any advice, free or paid, on any of the following financial products? 1 = Yes 2 = No (Don't know)	When you invested did you use one of the following information? ... Financial advisors 1 = Yes 2 = No
Bank account	(dummy variable) 0 = No; 1 = Yes	Do you (Does your household) have a checking account? 1 = Yes 2 = No (Don't know)	Do you personally have a bank or building society current account in your own name or joint names? 1) Yes 2) No	Do you personally have a bank or building society current account in your own name or joint names? 1 = Yes 2 = No	How many bank accounts do you have?
InfoIntermediaries	(dummy variable) 0 = No; 1 = Yes	1) In the past 12 months, have you checked your credit score? 1 = Yes 2 = No (Don't know)	And which one of these sources did you feel most influenced your decision about what savings account to open? A. Unsolicited information sent in the post B. Information picked up in a branch C. Information found on the Internet D. Best-buy tables in financial pages of newspapers/magazines E. Best-buy information found on the Internet F. Specialist magazines/publications G. Information from sales staff of firm providing the products (including quotes) H. Recommendation from independent financial adviser or broker I. Advice of friends/relatives (not working in the financial services industry) J. Advice of friends/relatives (who work in the financial services industry)	People get information about financial investments from many sources. What sources do you feel most influence your decisions about the financial investments you make? 1 = Advertisements 2 = Magazines 3 = Newspapers 4 = Radio or television 5 = Internet 6 = Advice from a financial advisor 7 = Advice from a knowledgeable friend 8 = Other	1) When you invested did you use one of the following information? ... Financial intermediaries 1 = Yes 2 = No ... Financial newspapers 1 = Yes 2 = No ... Parents, friends, colleagues 1 = Yes 2 = No
InfoNewspapers	(dummy variable) 0 = No; 1 = Yes	2) How strongly do you agree or disagree with the following statements? - I regularly keep up with economic and financial news. 1 = Strongly disagree ... 4 = Neither agree nor disagree ... 7 = Strongly agree			
InfoFriends	(dummy variable) 0 = No; 1 = Yes	3) In the last 5 years, have you asked for any advice from a financial professional about 'saving and investments'? 1 = Yes 2 = No (Don't know)			

Table A1 Continued

Variable values		US	UK	Canada	Italy
Compare Shop	(dummy variable) 0 = No; 1 = Yes	When you were getting your mortgage, did you compare offers from different lenders or mortgage brokers? 1 = Yes 2 = No	Did you yourself collect information about different mortgages from more than one company, in order to compare them? By this I also mean checking best buys in Internet searches and newspapers. 1 = Yes 2 = No	Please tell me if you agree or disagree with the following statement: 'I always research my choices thoroughly before making any financial decisions.' 1 = Agree 2 = Disagree	When you had a consumer credit the main criteria was 'I borrowed to the first bank I visited' 1 = Yes 2 = No
Investment	(dummy variable) 0 = No; 1 = Yes	Not including retirement accounts, do you (does your household) have any investments in stocks, bonds, mutual funds or other securities? 1 = Yes 2 = No	I would now like to ask about the financial products that you have. Please look at each of these cards and tell me which, if any, of these you currently have, either in your own name or jointly with someone else? A. Current account with a bank or building society for personal use, excluding business accounts B. Credit card C. Mortgage D. Savings account with a bank or building society E. Cash ISATOISATESSA F. Premium bonds G. National savings and investments savings account H. Credit union account I. ISA (stocks and shares or life insurance) J. PEP K. Unit trust, investment trust or OEIC L. Guaranteed equity bond M. Savings bond (with a bank or building society) N. Investment bond O. Gilts P. Stocks and shares Q. National savings bonds or certificates R. Endowment policy (excluding policy linked to mortgages)/life assurance/savings plan S. Personal pension or FSAVCs T. ISA (unSURE of type)	I would now like to ask about the financial products that you have. Please look at each of these cards and tell me which, if any, of these you currently have, either in your own name or jointly with someone else? A. Current account with a bank or building society for personal use, excluding business accounts B. Credit card C. Mortgage D. Savings account with a bank or building society E. Cash ISATOISATESSA F. Premium bonds G. National savings and investments savings account H. Credit union account I. ISA (stocks and shares or life insurance) J. PEP K. Unit trust, investment trust or OEIC L. Guaranteed equity bond M. Savings bond (with a bank or building society) N. Investment bond O. Gilts P. Stocks and shares Q. National savings bonds or certificates R. Endowment policy (excluding policy linked to mortgages)/life assurance/savings plan S. Personal pension or FSAVCs T. ISA (unSURE of type)	Do you use your bank for trading stocks, bonds or other investment instruments? 1 = Yes 2 = No

Mortgage	(dummy variable) 0 = No; 1 = Yes	Do you currently have a mortgage on your home? 1 = Yes 2 = No	What type of mortgage do you have on your main home? – Repayment mortgage – Endowment mortgage – Part endowment, part repayment mortgage – Interest-only mortgage with ISA/PEP investment which will repay capital – Interest-only mortgage with pension investment which will repay capital – Interest-only mortgage with no linked investment product in place to repay the capital – Some other type of mortgage (write in on next screen) – None – mortgage is on other property How many loans or credit agreements do you currently have in total?	Is there currently a mortgage on your principal residence? 1 = Yes 2 = No	Do you have a mortgage? 1 = Yes 2 = No
Loans	(dummy variable) 0 = No; 1 = Yes	Do you (does your household) currently have an auto loan? 1 = Yes 2 = No	Do you or anyone in your family currently have any of the following types of debts or liabilities? 1 = Mortgages (include principal residence and other mortgages) 2 = Student loans 3 = Payday loans 4 = Other loans (other than student loans or payday loans) 5 = Outstanding credit card balances 6 = Outstanding balances on lines of credit 7 = Other debts or liabilities – specify 8 = None of these debts or liabilities	Have you debt related to the purchase of cars? 1 = Yes 2 = No Have you debts related to the purchase of furniture or electronic tools? 1 = Yes 2 = No	