Financial literacy and its consequences: Evidence from Russia during the financial crisis

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ABSTRACT

The ability of consumers to make informed financial decisions improves their ability to develop sound personal finance. This paper uses a panel data set from Russia, an economy in which household debt has grown at an astounding rate, to examine the importance of financial literacy and its effects on behavior. The paper studies both the financial and real consequences of financial illiteracy. Even though consumer borrowing increased very rapidly in Russia, only 41% of respondents demonstrate an understanding of interest compounding and only 46% can answer a simple question about inflation. Financial literacy is positively related to participation in financial markets and negatively related to the use of informal sources of borrowing. Moreover, individuals with higher financial literacy are significantly less likely to report experiencing a negative income shock during 2009 and have greater availability of unspent income and higher spending capacity. The relationship between financial literacy and availability of unspent income is higher in 2009, suggesting that financial literacy may better equip individuals to deal with macroeconomic shocks.

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1. Introduction

The 2008 financial crisis, characterized in part by mounting losses for individuals, has generated interest in better understanding how to promote savvier saving and borrowing behavior. The ability of individuals to make informed financial decisions is critical to developing sound personal finance, which can contribute to more efficient allocation of financial resources and to greater financial stability at both the micro and macro level (see, e.g., Lusardi, 2008; Lusardi and Tufano, 2009a,b). Recent studies have shown financial literacy to be a key determinant of household financial behavior (Lusardi and Mitchell, 2013). Efforts to improve financial literacy can also be an important component of efforts to increase saving rates and lending to the poorest and most vulnerable consumers (Cole et al., 2011).

Our paper extends the existing literature in a new direction, using a panel survey of financial literacy administered to a nationally representative sample of over 1000 Russian individuals during 2008 and 2009. Russia is a particularly important country to study, given the large increase in consumer credit it has recently

experienced. Household debt in Russia grew at an astonishing rate: from about RUB 112.5 billion in 2002 to over RUB 4 trillion in 2008—accounting for nearly 10% of GDP in 2008 versus 1% in 2002. Moreover, the volume of credit institutions' lending to households increased at an average annual nominal growth rate of 84% (World Bank, 2009). This is one of the few panel data sets on financial literacy, and with it we are able to address some novel questions, such as: What is the level of financial literacy in a country without a legacy of consumer credit and financial education? Are there not only financial but also real consequences of low financial literacy? Are lower levels of financial literacy related to greater financial vulnerability during a crisis, i.e., are less financially literate individuals less able to deal with financial crises?

Assessing the direction of causality between financial literacy and financial decision making or consumption and saving behavior has been a challenge in previous work, as financial literacy is potentially an endogenous variable. However, this assessment in a country like Russia may suffer less from the endogeneity problem, as financial markets are less developed and there are few financial education programs in place. In our empirical work we are able to address this problem by relying on instrumental variables (IVs) estimation and using a new set of instruments, i.e., the number of newspapers and the number of universities across regions, to measure exposure to financial information or to peers

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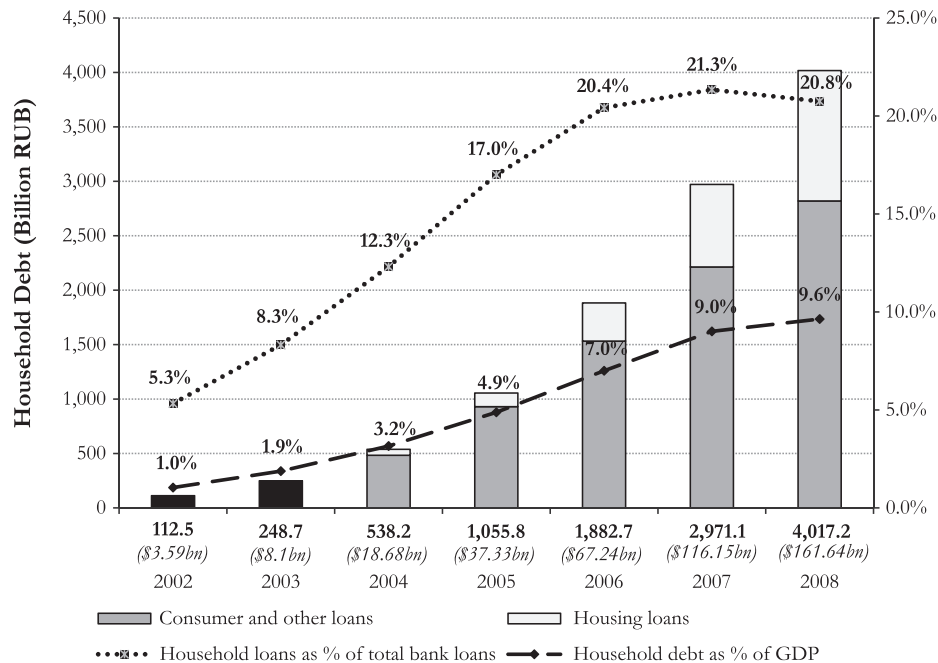
Fig. 1. Russian household debt. Notes: The source of the data is the European Credit Research Institute (World Bank, 2009). $US values are calculated using exchange rate data from the World Development Indicators.

with higher financial knowledge. Importantly, because we have a panel data set, we are also able to account for unobservable variables, such as intelligence, ability, and interest in financial matters, which can also affect the relationship between financial literacy and financial or real outcomes.

We find that even though consumer borrowing increased very rapidly in Russia between 2002 and 2008, in the latter year only 41% of respondents in our sample have an understanding of the workings of interest compounding and only 46% can answer a simple question about inflation. Financial literacy is not only low in the general population but is particularly severe among specific groups, such as women, the old and pensioners, those with low income and low educational attainment, and those living in rural areas. Most importantly, we find that financial literacy in Russia is significantly related to the use of formal banking and borrowing and negatively related to the use of informal borrowing. Financial literacy has real as well as financial consequences: Even after accounting for many characteristics and income, individuals with greater financial literacy are significantly less likely to report experiencing a negative income shock during 2009. Moreover, they are more likely to report having higher availability of unspent income and less likely to report low spending capacity. In addition, the relationship between financial literacy and availability of unspent income is stronger in 2009 versus 2008, showing that financial literacy may be related to particular individual strategies in coping with macroeconomic shocks.

Our findings suggest that the rapid growth of consumer credit combined with low levels of financial literacy might end up being a dangerous mix. As Russia transitions quickly to a market-based banking system, financial education and basic financial literacy are still lagging. Many young Russians have parents who did not have experience with bank loans (i.e., they did not have an opportunity to receive financial education at home)[1] and did

not receive formal financial literacy courses in school (i.e., there is no curriculum requirement for financial education in Russia). Furthermore, consumer debt was almost non-existent before 2001, so few individuals are likely to have long personal banking relationships or experience with formal debt contracts and other financial products. In the context of current events, this is likely to be the first financial crisis that most Russians have experienced as borrowers.

The paper is organized as follows: Section 2 reviews the existing literature on financial literacy and its effects on financial decision making; Section 3 reviews the environment for consumer finance in Russia; Section 4 describes our data, variables, and summary statistics; and Section 5 presents our empirical strategy and reports our results. Section 6 concludes.

2. Review of existing literature

Many papers have documented a link between financial literacy and a set of behaviors. Bernheim (1995, 1998) shows that most households lack basic financial knowledge and cannot perform very simple calculations and that the saving behavior of many households is dominated by crude rules of thumb. Hilgert et al. (2003) find a strong correlation between financial literacy and day-to-day financial management. Financial literacy has also been linked to a set of behaviors related to saving, wealth, and portfolio choice. For example, several papers show that individuals with greater numeracy and financial literacy are more likely to participate in financial markets and to invest in stocks (Christelis et al., 2010; Yoong, 2011; Almenberg and Dreber, 2011; Christiansen et al., 2008; Almenberg and Widmark, 2011; Van Rooij et al., 2011). Moreover, more literate individuals are more likely to choose mutual funds with lower fees (Hastings and Tejeda-Ashton, 2008; Hastings and Mitchell, 2011).

Similarly, Lusardi and Mitchell (2007a, 2011b) show that those with high levels of literacy are more likely to plan for retirement and, as a result, accumulate much more wealth, a finding reproduced in many of the countries that are part of an international comparison of financial literacy (Lusardi and Mitchell, 2011c),

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[1] Although state banks existed in Soviet times, their main role was to serve state-owned enterprises. There were no credit-reporting bureaus and the availability of credit to private firms and individuals was limited (McMillan and Woodruff, 2002). For the relationship between financial literacy and parental background, see Lusardi et al., 2010).

which includes Russia (Klapper and Panos, 2011).[2] Financial literacy is found to affect not only the assets side but also the liability side of households' balance sheet. Moore (2003) reports that respondents with lower levels of financial literacy are more likely to have costly mortgages. More recently, Gerardi et al. (2010) show that those with low literacy are more likely to default on sub-prime mortgage or have problems with them, and Campbell (2006) shows that individuals with lower incomes and lower education levels—characteristics that are strongly related to financial literacy—are less likely to refinance their mortgages during a period of falling interest rates. Stango and Zinman (2009) find that those who are not able to correctly calculate interest rates out of a stream of payments end up borrowing more and accumulating lower amounts of wealth. Lusardi and Tufano (2009a,b) report that individuals with lower levels of financial literacy tend to transact in high-cost manners, incurring higher fees and using high-cost methods of borrowing. The less knowledgeable also report that their debt loads are excessive or that they are unable to judge their debt position. These experiences are not specific to the United States; similar findings have been reported in the UK (Disney and Gathergood, forthcoming).

In addition to greater susceptibility to fraud and abuse, lack of financial literacy might lead to borrower behavior that increases financial fragility (i.e., greater loan losses). Informed consumers may also exercise innovation-enhancing demand on the financial sector and play an important monitoring role in the markets which can help improve transparency and honesty in financial institutions. Furthermore, financial illiteracy appears to be particularly severe for key demographic groups: women; the less educated; those with low income; ethnic minorities; and older respondents (e.g., Bernheim, 1995; Lusardi and Mitchell, 2007a,b, 2008, 2011b; Lusardi and Tufano, 2009a,b).

Correlation between financial literacy and behavior does not mean causation, and it is important to establish a causal link. Nevertheless, obtaining an exogenous source of variation in financial literacy has been challenging. One way around this problem is to look at financial mistakes and assess whether they are correlated with financial literacy, as it is harder to argue that the causality goes from mistakes to financial literacy. Agarwal et al. (2009) show that financial mistakes are prevalent among the young and the elderly, which are the groups that display the lowest levels of financial knowledge. Calvet et al., (2007, 2009) find that poorer, less educated, and immigrant households in Sweden—demographic characteristics that are strongly associated with low financial literacy—are more likely to make financial mistakes.

A recent development in the literature involves using field experiments (using randomized control trials) to explore the causal impact of financial literacy on financial outcomes. For instance, in Indonesia, a randomly selected group of unbanked individuals were offered financial literacy training sessions. Comparing with individuals not exposed to training, these sessions were found to increase the demand for banking services, in particular among those with low initial levels of financial literacy and low levels of education (Cole et al., 2011). Another strategy has been to rely on instrumental variable (IV) estimation. For example, Bernheim and Garrett (2001) and Lusardi and Mitchell (2009, 2011b) use high school financial literacy mandates in different states and time periods in the United States. Van Rooij et al. (2011) have used the financial literacy of others, such as siblings and parents, as instruments. Behrman et al. (2010) use exposure to a new educational voucher system in Chile to isolate the causal effects of financial literacy and schooling attainment on wealth. All these studies have shown robust and potent effects of financial literacy on desirable economic outcomes.

3. The Russian banking system

Russian annual per capita income grew from US$ 2101 in 2001 to US$ 8676 in 2009, an increase of over 400% (World Development Indicators, 2011). This rapid increase in purchasing power was associated with an increase in demand for consumer credit, particularly for the purchase of household appliances and other durable goods (Presniakova, 2006).[3] Within this same time period, the volume of credit institutions' lending to households increased at an average annual nominal growth rate of 84% (World Bank, 2009). As shown in Fig. 1, household debt grew at a very fast rate, reaching RUB 4.017 trillion in 2008 (preceding a decline in 2009). This accounted for 9.6% of GDP in 2008 versus about 1% in 2002. Household loans as a percentage of total bank loans increased from 5.3% in 2002 to 20.8% by 2008. Consumer loans (excluding mortgages) grew at an average of 74%, from RUB 112.5 billion in 2002 to RUB 2.820 trillion in 2008. The growth figure for housing loans between 2004 and 2008 was 121%, from RUB 54 billion in 2004 to RUB 1198 trillion in 2008. The ratio of housing loans to total household debt increased from 10% to 30% during that period.

Despite this recent growth, the Russian banking system remains small by international standards (Oxford Analytica, 2007; Rohland, 2008; Doing Business, 2011). Within this weak business environment, there is concern that the tremendous growth of credit will be associated with high rates of default, in particular if rapid growth in consumer credit is combined with low levels of financial literacy among borrowers. The share of bad consumer loans was a sizeable 12.25% in 2010 (Central Bank of Russia, 2011). It is within this rather unique context that our survey instrument was designed.

4. Data and summary statistics

We use a panel data set of Russian individuals interviewed in May/June 2008 and in June 2009.[4] The 2008 sample was designed to be nationally representative at the individual level and was weighted by gender, age, education, 46 oblasts (i.e., administrative regions), and 7 federal regions[5] for a total of 1600 individuals interviewed face-to-face.[6] This is one of the very few panel surveys

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[2] As shown by Chang and Krosnick (2009), a typical point caution in international comparisons stems from differences in sampling designs and data collection methods.

[3] It is possible that Russians are more comfortable borrowing for durable goods, as buying goods on installment was quite popular in Soviet times.

[4] The Russian Financial Literacy diagnostic survey was undertaken as part of the World Bank-supported Russia Financial Literacy and Financial Education program in 2008. The authors of the questionnaire are L. Mundell, A. Markov, and I. Shulga. The survey was conducted by the National Agency for Financial Studies (NAFS) in 2008 at the request of the World Bank. The survey aimed to provide information on the initial level of financial literacy (i.e., financial planning and managing debt, attitudes toward/ understanding of personal responsibilities and consumer rights in the area of financial services, knowledge of financial products/services, etc.). The NAFS kept a detailed record of the individuals who were eligible to be surveyed and could examine whether the final sample was representative of the population. Their analysis showed this is the case and that weighting was unnecessary.

[5] Since March 1, 2008, the Russian Federation consists of 83 federal subjects. Six types of federal subjects are distinguished: 21 republics, 9 krais, 46 oblasts, 2 federal cities, 1 autonomous oblast, and 4 autonomous okrugs. We exclude the North-Caucasian (Chechnya) district because civil unrest prohibited surveying. The sampling regions in the Russian Financial Literacy diagnostic survey are shown in the Appendix figure A1.

[6] Summary statistics by gender, age, and education (% with secondary degrees) are very similar to those found in the 2002 Russia Longitudinal Monitoring Survey (LSMS), as well as the 2002 Russian National Census. Relative to the census data, however, our survey appears to under-represent individuals in the highest income bracket. This is likely the result of difficulty in gaining access to the highest income individuals, many of whom live in gated housing communities, in order to conduct face-to-face interviews.

Table 1
Summary statistics.

	Full sample	Financial literacy	
		High (⩾2)	Low (<2)
	(1)	(2)	(3)
Panel A: Time-invariant characteristics			
Male	43.9%	46.7%**	41.5%
Educ: Primary or Incomplete	8.4%	4.3%	11.9%***
Educ: Secondary	29.9%	26.3%	33.0%***
Education: Vocational–Technical	38.4%	41.1%**	36.1%
Educ: Higher or incomplete higher	23.4%	28.4%***	19.1%
Occ: Employed	52.5%	59.1%***	42.5%
Occ: Entrepreneur	2.8%	3.1%	2.5%
Occ: Unemployed	0.9%	0.8%	1.0%
Occ: Pensioner	25.5%	15.5%	34.0%***
Occ: Other	18.3%	20.2%**	16.6%
Fed. region: Central	27.1%	27.9%	26.4%
Fed. region: North-Western	10.0%	11.0%	9.1%
Fed. region: Southern	17.3%	14.5%	19.7%***
Fed. region: Volga	22.9%	24.3%	21.7%
Fed. region: Urals	5.8%	5.6%	5.9%
Fed. region: Siberian	11.3%	11.5%	11.1%
Fed. region: Far-Eastern	5.7%	5.3%	6.0%
2007 2-digit regional statistics			
Total number of newspapers	55.80	–	–
Total number of universities	18.54	–	–
# Observations	*2148*	*986*	*1162*

	Full sample	Yearly		#Changes		Fin. Literacy	
		2008	2009	2008	2009	High	Low
	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel B: Time-variable characteristics							
Age	45.13	44.63	45.63	–	–	42.06	49.97***
Single Person Household	11.6%	10.7%	12.5%	60	79	9.1%	15.6%***
Urban region	28.2%	28.6%	27.8%	18	10	32.3%***	21.8%
Family Income per capita	7491.5	7062.2	7920.7***	–	–	8263.8***	6274.6
– 1st – Quartile (lowest)	25.1%	25.1%	25.1%	139	138	21.6%	30.6%***
– 2nd – Quartile	25.0%	25.0%	25.0%	172	172	23.1%	27.8%**
– 3rd – Quartile	25.1%	25.2%	25.1%	176	174	25.7%	24.2%
– 4th – Quartile–(highest)	24.8%	24.7%	25.0%	125	128	29.5%***	17.4%
Financial Penetration							
Bank Account	34.4%	33.8%	35.0%	0	13	36.9%***	30.5%
Formal Credit	17.9%	18.1%	17.7%	131	127	20.6%***	13.6%
Informal Credit	14.9%	17.0%***	12.9%	140	97	15.1%	14.8%
Financial Vulnerability							
Has experienced negative income shock in last year	35.9%	35.2%	36.7%	240	256	36.5%	35.0%
Low Spending	31.6%	30.1%	33.1%	148	180	24.6%	42.6%***
Low Spending Index (1–5)	3.22	3.20	3.25	–	–	3.08	3.45***
Unspent Income	39.4%	34.0%	44.8%***	173	289	44.8%***	30.9%
Unspent Income Index (1–5)	2.36	2.14	2.57***	–	–	2.50***	2.13
Financial Literacy							
Fin. Literacy: #Correct Responses	1.85	1.80	1.91**	–	–	2.68***	0.55
Fin. Literacy: Index	0.00	−0.04	0.04*	–	–	0.67***	−1.06
# Observations	*2148*	*1074*	*1074*	*1074*	*1074*	*1314*	*834*

Notes: From a *t*-test of mean differences between individuals with high and low financially literacy.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

measuring financial literacy and other key variables over time. In 2009, 22% of individuals from the original sample either no longer resided at the same location or refused to answer the follow-up survey. However, analysis of the data between the 2 years does not show evidence of significant selection bias across the covariates used in the empirical work (available upon request).

These surveys collected information on individual levels of financial literacy (i.e., numeracy, knowledge of interest compounding, understanding of inflation), as well as use of financial services (e.g., the use of bank accounts and formal credit). The data set also provides rich demographic and socioeconomic information and measures of financial vulnerability. The primary respondent was the household head, without an age limit.

4.1. Demographic information

Table 1 provides summary statistics of the main variables in this study. Panel A presents the averages of the time-invariant characteristics for the pooled sample in column 1 (2008 and 2009). It further distinguishes between individuals in the high and low financial literacy groups, in columns 2 and 3, a feature discussed in Section 4.4. Panel B presents averages for the time-varying characteristics in the pooled sample (column 4), for 2008 and 2009 (columns 5 and 6, respectively). In addition, it presents changes by year for the binary variables (columns 7 and 8), and also presents mean comparisons for the high and low financial literacy groups (columns 9 and 10).

The percentage of male respondents is 43.9%, consistent with national census averages (Russian National Census, 2002). The average age in the pooled sample is around 45. About 11% of individuals live in single-person households (in unreported statistics, 66% live in households with three or more individuals), and 28.2% of individuals live in urban regions, defined as settlements with a population greater than 500,000.

With respect to employment, 52.5% are employees (in both skilled and unskilled paid employment), while 25.5% are retirees. The education level of individuals in our sample is relatively high: only 8.4% of the sample has less than a secondary education, 29.9% completed secondary school, and 61.8% completed a special vocational/technical school or initiated/completed their higher education, a characteristic that sets Russia apart from other emerging markets and makes it a particularly interesting country to study.

The survey asks individuals to report their personal and household monthly income, but these values are missing for almost 30% of the sample.[7] For our main regressions in the next section we impute missing income observations and include dummies for brackets of family income rather than using income values.[8]

4.2. Use of formal and informal credit

Our next set of variables measures financial inclusion, which includes variables related to respondent affiliation with financial institutions and borrowing behavior.[9] Our first variable is *Bank Account,* which indicates whether an individual uses a bank account (which includes the use of debit cards). In Russia it is common practice for an employer to provide employees with an account and an associated debit card, so-called salary or "plastic" cards, at a bank chosen by the employer, and salaries are paid to these accounts only. However, the employee can use this account only to withdraw salary, and cannot make deposits to the account; thus, this may overestimate the actual voluntary "use" of bank accounts (Danske Bank, 2011). Similarly, accounts might be used only to withdraw government transfers. As shown in Panel B of Table 1, 33.8% of respondents report using a checking account in 2008 and 35% in 2009, with only 13 individuals (1.2%) adding an account in 2009 and no individuals closing an account (changes in financial usage between the 2 years are shown in columns 7 and 8).

We also have information on consumer credit received from a bank or other formal financial institution, including consumer debt, credit card debt, and mortgages.[10] In 2008, 18.1% of our sample received bank credit and in 2009, 17.7% did so. Table 1 shows that 12.2% of the sample (131 individuals) used bank credit in 2008 but not in 2009, while 11.8% of the sample (127 individuals) who did not have bank credit in 2008 did have it in 2009.

We measure the use of informal debt by defining a dummy that equals one when individuals respond yes to the question *Do you currently have debt?* but do not report having any bank credit.[11] In 2008, 17% of individuals in the sample report using informal sources of borrowing, while 12.9% of individuals used informal borrowing in 2009; 13% of the sample (140 individuals) used informal borrowing only in 2008, and 9% (97 individuals) used informal borrowing only in 2009. Note that informal borrowing typically involves shorter repayment periods than formal borrowing, along with higher interest rates, penalties, and other fees.

4.3. Capacity to spend and save

The next set of variables assesses respondent's shocks to income and spending and saving capacity. First, the survey includes a self-reported measure of income shocks. Individuals are asked, "*Did you (your family) experience an unexpected significant reduction of your income over the past 12 months?*", and we define a dummy "income shock" for those who answer yes to this question. The summary statistics in Table 1 show that 35.9% of the sample reported the experience of a negative income shock (36.7% during 2009), showing that the crisis and associated decline in income affected a large share of the Russian population. The survey also includes a self-reported measure of spending capacity. This is a categorical variable: the first category is individuals who can afford quite expensive things, such as apartments and dacha (country house or cottage) (0.4%); the second category is individuals who report that they can buy food, clothes, and durable goods, but cannot afford to buy a car (16%); the third category is individuals who report that they can buy food and clothes but not durable goods (e.g., a TV set or refrigerator) (52%); the next category is individuals who report that they can buy food, but cannot buy clothes (24%); the final category is individuals who report that they do not have enough money, even for food (7%). We use an ordinal variable ranking between 1 (highest spending capacity) and 5 (lowest spending capacity) and, for robustness, define a dummy variable for individuals who report not having enough money for more than food. As shown in Table 1, 31.6% of individuals in the sample report low spending capacity, with the figure being higher during 2009 (33.1%, compared to 30.1% in 2008), consistent with the financial crisis experienced in that time period.

A third set of variables measures the availability of unspent income, based on the question How often during the last 12 months did you (or your family) have any money unspent from previous earnings before new revenues arrived. The menu of responses is "always," "very often," "sometimes," "very rarely," and "never." Our main results use an ordinal variable ranging from 1 to 5, and, for robustness, we also define a dummy variable equal to one if the respondent reports "always" or "very often." The statistics shown in Table 1 indicate that 39.4% of the sample report having unspent income "always" or "very often" on a typical basis, and that the availability of unspent income increased significantly from 34% in 2008 to 44.8% in 2009. We speculate that at the onset of the crisis, some individuals increased their saving (and/or reduced their spending), expecting to have lower income in the future. The ordinal variable for the availability of unspent income has an average value of 2.36, with the average being significantly higher in 2009 (2.57 compared to 2.14 in 2008).

4.4. Financial literacy

Our survey includes four financial literacy questions, covering interest rates and interest compounding (two questions), inflation

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[7] In our sample, mean personal monthly income for 2008 is RUB 9640 (US$ 388), while average family monthly income is RUB 19,460 (US$ 783) and average family income per capita is RUB 7062 (US$ 284). The exchange rate used for the year 2008 is US$ 1 = RUB 24.85. The official statistics for 2008 report average per capita monthly income of RUB 15,136 with the average wage being equal to RUB 17,226 and the average pension equal to RUB 4199. Source: Russian Federation Federal State Statistics Service: http://www.gks.ru/bgd/regl/b09_12/IssWWW.exe/Stg/d01/01-01.htm.

[8] The imputation methodology is based on regressions of family income on federal regions, gender, age, education categories, and self-assessed economic classification groups. These estimated values are divided by the number of people living in the respondent's household (including him/herself). The corresponding imputed family income per capita quartiles are: $Q_1 \in [333, 3667]$, $Q_2 \in (3667, 5500)$, $Q_3 \in (5500, 8333]$, $Q_4 \in (8333, 40,000]$.

[9] An important feature to note about Russia is the relatively low level of trust in the banking sector, which is potentially an important factor in explaining the low level of use of banking products. Remarkably, only 28% of surveyed individuals in Russia report confidence in banks, the second to lowest score in the region (EBRD, 2006).

[10] Less than 5% of individuals have a mortgage or credit card.

[11] Because of the sensitivity of information regarding informal lenders in Russia, we were unable to ask this question directly.

Table 2
Financial literacy: Descriptive statistics.

	Definition		Fullsample (1)	Yearly 2008 (2)	2009 (3)	#Changes 2008 (not 2009) (4)	2009 (not 2008) (5)
Panel A: Summary statistics – Financial literacy							
Interest 1	Let's assume that you deposited 100,000 rubles in a bank account for 5 years at 10% interest rate. The interest will be earned at the end of each year and will be added to the principal. How much money will you have in your account in 5 years if you do not withdraw either the principal or the interest?	Correct	38.04%	41.43%	34.64%	23.18% (249)	16.39% (176)
		Incorrect	31.61%	31.19%	32.03%	19.37% (208)	20.20% (217)
		DK/DA	30.35%	27.37%	33.33%	12.94% (139)	18.90% (203)
Interest 2	Let's assume that you took a bank credit of 10,000 rubles to be paid back during a year in equal monthly payments. The credit charge is 600 rubles. Give a rough estimate of the annual interest rate on your credit.	Correct	29.66%	23.37%	35.94%	13.78% (148)	26.35% (283)
		Incorrect	21.18%	28.31%	14.06%	23.37% (251)	9.12% (98)
		DK/DA	49.16%	48.32%	50.00%	20.58% (221)	22.25% (239)
Inflation	Let's assume that in 2010 your income is twice as now, and the consumer prices also grow twofold. Do you think that in 2010 you will be able to buy more, less, or the same amount of goods and services as today?	Correct	48.04%	45.62%	50.47%	20.67% (222)	25.51% (274)
		Incorrect	27.79%	31.47%	24.12%	23.28% (250)	15.92% (171)
		DK/DA	24.16%	22.91%	25.42%	15.55% (167)	18.06% (194)
Discounts	Let's assume that you saw a TV-set of the same model on sales in two different shops. The initial retail price of it was 10,000 rubles. One shop offered a discount of 1500 rubles, while the other one offered a 10% discount. Which one is a better bargain – a discount of 1500 rubles or 10%?	Correct	69.55%	69.55%	69.55%	17.88% (192)	17.88% (192)
		Incorrect	8.75%	9.12%	8.38%	7.54% (81)	6.80% (73)
		DK/DA	21.69%	21.32%	22.07%	14.43% (155)	15.18% (163)

2009/2008		0	1	2	3	4	Total (2008)
Panel B: Transition matrix – Financial literacy – Number of correct responses							
0		**28.57%**	25.51%	21.94%	19.90%	4.08%	18.25%
1		17.54%	**28.51%**	24.56%	18.42%	10.96%	21.23%
2		16.02%	17.51%	**32.34%**	24.04%	10.09%	31.38%
3		7.24%	19.00%	28.05%	**29.86%**	15.84%	20.58%
4		13.04%	17.39	26.09%	27.17%	**16.30%**	8.57%
Total (2009)		16.57%	21.60%	27.37%	23.56%	10.89%	–

(one question), and sales discounts (one question). The exact wording of the questions is reported below (the correct answer is underlined):

(1) _Let's assume that you deposited 100,000 rubles in a bank account for 5 years at 10% interest rate. The interest will be earned at the end of each year and will be added to the principal. How much money will you have in your account in 5 years if you do not withdraw either the principal or the interest?_
- _More than 150,000 rubles._
- _Exactly 150,000 rubles._
- _Less than 150,000 rubles._
- _I cannot estimate the amount even roughly._

(2) _Let's assume that you took a bank credit of 10,000 rubles to be paid back during a year in equal monthly payments. The credit charge is 600 rubles. Give a rough estimate of the annual interest rate on your credit. The interest rate is about:_
- _3%._
- _6%._
- _9%._
- _12%._
- _I cannot estimate it even roughly_

(3) _Let's assume that in 2010 your income is twice what it is now and that consumer prices also grow twofold. Do you think that in 2010 you will be able to buy more, less, or the same amount of goods and services as today?_
- _More than today._
- _Exactly the same._
- _Less than today._
- _I cannot estimate it even roughly._

(4) _Let's assume that you saw a TV set of the same model on sale in two different shops. The initial retail price of it was 10,000 rubles. One shop offered a discount of 1500 rubles, while the other one offered a 10% discount. Which one is a better bargain—a discount of 1500 rubles or 10%?_
- _A discount of 1500 rubles._
- _A 10% discount._
- _I cannot estimate it even roughly._

Similar questions have been asked in other surveys, such as the US Health and Retirement Study, the American Life Panel, and the English Longitudinal Study on Aging, and have been shown to measure both numeracy and financial knowledge (Lusardi and Mitchell, 2009, 2011b; Banks and Oldfield, 2007).

As shown in Table 2, in 2008, 41.4% of respondents correctly answered the question on interest compounding; 23.3% correctly answered the monthly interest payment calculation question; 45.6% correctly answered the question on inflation; and 69.5% correctly answered the question on sales discounts. A large number of respondents reported they "did not know" the answer to these questions. On average, in the pooled sample, 27.4% of individuals replied "don't know" to the question on interest compounding; 48.3% to the question on monthly interest payments; 22.9% to the question on inflation; and 21.3% to the question on sales discounts. These findings are similar to those reported in other surveys (Van Rooij et al., 2011; Lusardi and Mitchell, 2011b; Lusardi and Tufano, 2009a,b) and in data from seven other countries (Lusardi and Mitchell, 2011c). Notably, we find that correct responses to all but one question (interest compounding) increased during the financial crisis, which might be explained by increased attention to financial issues in the media or a rise in individuals' interest in understanding their own finances.

Panel B of Table 2 explores the within individual variation in our primary financial literacy measure—the number of correct responses to the four financial literacy questions—by presenting a transition matrix of correct responses in the two survey waves. The number of individuals who get the same number of questions right in each wave is roughly 30% of the sample. Despite the fact that the diagonal elements are the highest figures in all four columns, there is considerable variation in both directions, i.e., both upward and downward. An interesting observation is that individuals with two or three correct responses are more likely to show an improvement in financial literacy in the next year than are individuals with zero or one correct responses.

Table 1, columns 2–3 and 9–10, show summary statistics for individuals with high and low levels of financial literacy; asterisks indicate significant mean differences. We identify the group who responded correctly to at least two financial literacy questions as the "high" financial literacy group. This definition allows for individual variation across waves and is also based on the fact that individuals with at least two correct responses are more likely to exhibit upward mobility in financial literacy (as shown in Panel B).

Financially literate individuals are more likely to be male, not living alone, younger, and residents of urban Russian regions. They are more likely to have vocational/technical education, or some level of higher education, and be employed (particularly in skilled or non-manual occupations— not shown). Importantly, individuals in the lowest income quartile are more likely to score low in terms of their financial literacy, while those in the highest income quartile are more likely to be high financial literacy. This is consistent with many other surveys on financial literacy in other countries (see Lusardi and Mitchell, 2011c, for an overview of financial literacy data in eight countries).

Our primary interest is the association between financial literacy and financial outcomes. Table 1 indicates that there is a moderately positive association between financial literacy and having a bank account (also shown by the significant positive pairwise correlation between financial literacy and bank account in Appendix Table A5). Individuals in the high literacy group are also significantly more likely to use formal bank credit. In the univariate comparisons, the difference between the high and the low financial literacy groups with respect to the experience of an income shock is not significant at conventional levels. However, high literacy groups are significantly less likely to experience low spending capacity, both in terms of the binary and the ordinal spending capacity variable. Moreover, individuals with higher financial literacy are significantly more likely to experience having unspent income and with higher frequency.

5. Financial and real consequences of financial literacy

The important question we aim to address in this paper is whether financial literacy matters. To do so, we consider the following set of outcomes that expand upon the previous literature. We first estimate a set of regressions in which the dependent variable is (a) having a bank account, (b) using formal bank credit, and (c) using informal credit. In addition to financial outcomes we also look at real outcomes. Our set of dependent variables further includes (a) the experience of a negative income shock during the last year, (b) level of spending capacity and (c) availability of unspent income. The sets of explanatory variables in our regressions include financial literacy; gender; single-person household; the logarithm of age; and dummy variables for education (4 dummies), occupation (5 dummies), family income per capita (quartile dummies), and federal region of residence (7 dummies).

Table 3
Bank account.

	Probit		IV Probit	RE Probit	
	(1)	(2)	(3)	(4)	(5)
Financial Literacy: #Correct Responses	–	0.023[*]	0.044[**]	0.027[***]	0.022[*]
		[0.013]	[0.017]	[0.009]	[0.012]
Year 2009 [*] Fin. Lit.: #Correct Responses	–	–	–	–	0.012
					[0.016]
Year 2009	–	–	–	0.008	−0.015
				[0.020]	[0.037]
Male	0.010	0.010	0.009	0.021	0.020
	[0.029]	[0.029]	[0.028]	[0.021]	[0.021]
Log(Age)	0.146[***]	0.151[***]	0.154[***]	0.179[***]	0.179[***]
	[0.048]	[0.048]	[0.047]	[0.036]	[0.036]
Single person household	0.018	0.020	0.023	−0.042	−0.035
	[0.059]	[0.059]	[0.049]	[0.034]	[0.034]
Education (Ref:. Primary/Incomplete)					
Secondary	0.095	0.089	0.082	0.127[***]	0.117[***]
	[0.062]	[0.062]	[0.060]	[0.041]	[0.040]
Vocational–Technical	0.143[**]	0.133[**]	0.123[**]	0.170[***]	0.166[***]
	[0.061]	[0.062]	[0.059]	[0.041]	[0.040]
Higher or incomplete higher	0.189[***]	0.174[***]	0.158[**]	0.237[***]	0.232[***]
	[0.066]	[0.067]	[0.064]	[0.044]	[0.043]
Occupation (Ref:. Pensioner)					
Employed	0.050	0.040	0.033	0.042	0.040
	[0.043]	[0.043]	[0.045]	[0.033]	[0.033]
Entrepreneur	0.042	0.031	0.021	0.079	0.081
	[0.112]	[0.111]	[0.094]	[0.068]	[0.068]
Unemployed	0.058	0.064	0.072	0.266[**]	0.265[**]
	[0.171]	[0.171]	[0.142]	[0.108]	[0.108]
Other	0.048	0.039	0.033	0.011	0.015
	[0.063]	[0.061]	[0.059]	[0.043]	[0.043]
Family income per capita quartile (Ref:. 1st - Lowest)					
– 2nd –	0.029	0.023	0.019	0.047	0.049[*]
	[0.043]	[0.044]	[0.041]	[0.029]	[0.029]
– 3rd –	0.041	0.037	0.035	0.016	0.014
	[0.048]	[0.048]	[0.044]	[0.030]	[0.030]
– 4th – Highest	0.103[**]	0.099[*]	0.096[*]	0.084[***]	0.083[**]
	[0.052]	[0.052]	[0.051]	[0.033]	[0.033]
Predicted probability	0.3500	0.3499	0.3509	0.2341	0.2341
Percentage financial literacy effect	–	6.558%	12.458%	11.715%	9.309%
No. of observations	1074	1074	1074	2148	2148
Pseudo R^2	0.112	0.114	–	–	–
Wald/LR χ^2	169.56[***]	176.01[***]	152.82[***]	190.14[***]	189.98[***]

Notes: Average marginal effects (over the entire distribution) are presented. The standard errors in the probit models are bootstrapped based on 1000 replications. In the random effects probit models they are bootstrapped based on 200 replications. The specifications also include a constant term and dummy variables for federal region (7). *IV probit*: Wald χ^2 test of exogeneity = 3.54[*]. *Additional statistics based on IV LPM model*: Partial R^2 of excluded instruments = 0.0224; *F*-test of excluded instruments = 12.51[***]. (a) *Underidentification tests*: Kleibergen–Paap rk LM statistic: $\chi^2_{(2)} = 27.45^{***}$; Kleibergen–Paap rk Wald statistic: $\chi^2_{(2)} = 25.54^{***}$; (b) *Weak identification test*: Kleibergen–Paap Wald rk *F*-statistic = 12.51 [Stock-Yogo critical values: 19.93 (10%), 11.59 (15%), 8.75 (20%)]; (c) *Weak-instrument-robust inference tests*: Anderson–Rubin Wald test: $F_{(2,1052)} = 0.24$; Anderson–Rubin Wald $\chi^2_{(2)}$ test = 0.50; Stock-Wright LM $\chi^2_{(2)}$S statistic = 0.58; (d) *Overidentification tests*: Hansen J statistic: $\chi^2_{(1)} = 0.569$.
[*] $p < 0.10$.
[**] $p < 0.05$.
[***] $p < 0.01$.

5.1. Empirical strategy

Because we have a panel data set, we are better equipped to assess the effect of financial literacy on a set of outcomes than previous studies. Our primary explanatory variable is financial literacy, i.e., the number of correct responses to the financial literacy questions discussed in Table 2, ranging from zero to four.[12] First, we utilize specifications in which the dependent variable involves 2009 outcomes while using 2008 values of financial literacy and other explanatory variables. We use past values of the independent variables to account for both the potential simultaneity between

financial literacy and financial outcomes, along with the potential endogeneity of the financial literacy measure.

Second, we use IV estimation to assess the impact of financial literacy on financial behavior. Two instruments are used: (a) the number of newspapers in circulation per two-digit region (both regional and national) and (b) the total number of universities per two-digit region (both public and private). Both of our instruments refer to 2007, i.e., a year prior to the start of the survey. These two variables can be expected to be correlated with financial literacy in terms of "exposure" to information and economic knowledge (either directly or through family members and neighbors who read newspapers) and higher education of peers in the region.[13] The experience of others is not under the control of the respondent and is thus exogenous with respect to his or her actions, but respondents can learn from

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[12] In the last section, we also examine specifications in which we use dummies for each financial literacy question. Moreover, in the Appendix, we present results using a financial literacy index. The latter is constructed using principal components analysis (PCA); the procedure used to construct the index is described in detail in a previous working paper version of this study (Klapper et al., 2012).

[13] We need to note that the lack of time variation in our two instruments (both are for the year 2007) prevents us from using them in panel IV analysis. Noting this caveat, we utilize them for IV models with past values of the independent variables.

Table 4
Formal credit.

	Probit		IV Probit	R.E. Probit		F.E. Logit
	(1)	(2)	(3)	(4)	(5)	(6)
Fin. Lit.: #Correct Responses	–	0.025**	0.024**	0.021***	0.027***	1.333***
		[0.010]	[0.012]	[0.007]	[0.010]	[0.115]
Year 2009 * Fin. Lit.: #Correct Responses	–	–	–	–	–0.013	–
					[0.013]	
Year 2009	–	–	–	–0.004	0.022	0.820
				[0.015]	[0.031]	[0.202]
Male	–0.039	–0.040	–0.040*	–0.032*	–0.032*	–
	[0.024]	[0.024]	[0.023]	[0.018]	[0.018]	
Log(Age)	–0.048	–0.042	–0.042	–0.039	–0.040	44.841
	[0.039]	[0.039]	[0.038]	[0.030]	[0.030]	[333.657]
Single person household	0.011	0.013	0.013	–0.038	–0.039	0.752
	[0.045]	[0.045]	[0.043]	[0.032]	[0.032]	[0.317]
Education (Ref:. Primary/Incomplete)						
Secondary	–0.010	–0.014	–0.014	0.034	0.034	–
	[0.056]	[0.056]	[0.052]	[0.042]	[0.042]	
Vocational–Technical	–0.024	–0.033	–0.033	0.001	0.001	–
	[0.056]	[0.056]	[0.052]	[0.042]	[0.042]	
Higher or incomplete higher	0.011	–0.005	–0.005	0.022	0.021	–
	[0.059]	[0.059]	[0.054]	[0.044]	[0.044]	
Occupation (Ref:. Pensioner)						
Employed	0.183***	0.171***	0.171***	0.170***	0.170***	–
	[0.045]	[0.045]	[0.043]	[0.031]	[0.031]	
Entrepreneur	0.243***	0.227***	0.228***	0.217***	0.215***	–
	[0.077]	[0.078]	[0.073]	[0.055]	[0.055]	
Unemployed	0.062	0.068	0.068	0.104	0.105	–
	[0.099]	[0.097]	[0.146]	[0.094]	[0.094]	
Other	0.080	0.068	0.068	0.075*	0.074*	–
	[0.060]	[0.060]	[0.057]	[0.039]	[0.039]	
Family income per capita quartile (Ref:. 1st – Lowest)						
– 2nd –	–0.017	–0.018	–0.018	–0.023	–0.022	0.808
	[0.032]	[0.032]	[0.033]	[0.024]	[0.024]	[0.241]
– 3rd –	0.006	0.005	0.005	0.014	0.014	0.866
	[0.036]	[0.035]	[0.034]	[0.024]	[0.024]	[0.258]
– 4th–Highest	–0.039	–0.043	–0.043	–0.009	–0.009	0.884
	[0.039]	[0.039]	[0.038]	[0.027]	[0.027]	[0.284]
Predicted probability	0.1767	0.1767	0.1781	0.1494	0.1492	–
Percentage financial literacy effect	–	13.907%	13.418%	13.750%	18.284%	–
No. of Observations	1074	1074	1074	2148	2148	516
Pseudo R^2	0.083	0.089	–	–	–	0.038
Wald/LR χ^2	86.15***	84.02***	81.45***	98.09***	98.38***	13.47*

Notes: The comments in Table 3 hold. Column 6 presents odds ratios and from logit models with fixed effects, and bootstrapped standard errors, based on 200 replications. *IV probit*: Wald χ^2 test of exogeneity = 0.01. *Additional statistics based on IV LPM model* (remaining statistics as reported in Table 3): (c) *Weak-instrument-robust inference tests*: Anderson–Rubin Wald test: $F_{(2,1052)}$ = 1.65; Anderson–Rubin Wald $\chi^2_{(2)}$ test = 3.36; Stock–Wright LM $\chi^2_{(2)}$ S statistic = 3.33; (d) *Overidentification tests*: Hansen J statistic: $\chi_{(1)}$ = 3.335*.

those around them, thus increasing their own literacy. Several other studies have documented that individuals learn about financial matters from peers (Duflo and Saez, 2003; Hong et al., 2004; and Brown et al., 2008). Studies have also used proximity to a university as an exogenous measure of financial knowledge (Christiansen et al., 2008).

The bottom of Table 1 shows that the means number of newspapers (56) and universities (18; 11 public and 7 private). Appendix Fig. A1 presents maps illustrating the regional variation in the number of newspapers in circulation and the number of universities in the 46 Russian oblasts of our sample.[14]

Third, to account for unobserved heterogeneity that can affect the relationship between financial literacy and our set of outcomes, we use both years of data and estimate individual random effects and fixed effects models.

5.2. Empirical estimates: Financial outcomes

Our first set of estimates examines the correlates of the use of bank accounts by respondents in our sample. Due to the low variation in the number of new bank accounts in the panel, fixed effects models cannot be estimated. Table 3 presents probit estimates. In columns 1–3, the dependent variable is a dummy equal to one if the individual reports having a bank account in 2009 and equal to zero otherwise. Explanatory variables are dated as of 2008 in order to mitigate as much as possible simultaneity problems. Average marginal effects over the distribution are reported. In the baseline probit models of columns 1–2, bootstrapped standard errors, based on 1000 replications, are presented. We do so to account for the imputation of the family income variable.[15] In column 3, for the IV probit model, robust standard errors are reported.

[14] In terms of federal regions (figures available upon request), the Central, Volga, and Southern Federal regions have the highest newspaper circulation, while the Ural, Far Eastern, and Siberian Federal regions have the lowest numbers of newspapers in circulation. Moreover, the Southern region has the highest number of universities, with the next highest being the Northwestern and Central regions. The lowest numbers of universities are found in the Ural, Far Eastern, and Siberian Federal regions.

[15] As an alternative to the imputation and bootstrapping, and based on the analysis of "match bias" during imputation in Hirsch and Schumacher (2004) and Bollinger and Hirsch (2006) for the US Current Population Survey (CPS), we have also conducted the analysis dropping the observations with missing income. The results prove robust, and these tables are available upon request.

Table 5
Informal credit.

	Probit		IV Probit	R.E. Probit		F.E. Logit
	(1)	(2)	(3)	(4)	(5)	(6)
Fin. Lit.: #Correct Responses	–	−0.016*	−0.031***	−0.007	−0.012	0.897
		[0.009]	[0.012]	[0.006]	[0.009]	[0.096]
Year 2009 * Fin. Lit.: #Correct Responses	–	–	–	–	0.011	–
					[0.012]	
Year 2009	–	–	–	−0.036***	−0.056**	0.520***
				[0.014]	[0.026]	[0.114]
Male	−0.002	−0.001	−0.001	−0.018	−0.018	–
	[0.021]	[0.021]	[0.021]	[0.016]	[0.016]	
Log(Age)	−0.059*	−0.061*	−0.065*	−0.046*	−0.046*	1.10E+04
	[0.036]	[0.036]	[0.035]	[0.027]	[0.027]	[7.0e+04]
Single person household	0.085**	0.083**	0.080**	0.001	0.002	0.341**
	[0.036]	[0.035]	[0.034]	[0.026]	[0.026]	[0.155]
Education (Ref:. Primary/Incomplete)						
Secondary	0.084	0.088	0.092**	0.061*	0.061*	–
	[0.058]	[0.057]	[0.045]	[0.033]	[0.033]	
Vocational–Technical	0.095*	0.101*	0.109**	0.060*	0.060*	–
	[0.057]	[0.056]	[0.045]	[0.033]	[0.033]	
Higher or incomplete higher	0.029	0.039	0.05	−0.001	−0.001	–
	[0.061]	[0.059]	[0.048]	[0.037]	[0.037]	
Occupation (Ref:. Pensioner)						
Employed	0.018	0.026	0.033	0.026	0.027	–
	[0.036]	[0.036]	[0.035]	[0.025]	[0.025]	
Entrepreneur	−0.006	0.002	0.014	0.032	0.034	–
	[0.072]	[0.072]	[0.070]	[0.053]	[0.053]	
Unemployed	0.146	0.146	0.14	0.098	0.098	–
	[0.093]	[0.095]	[0.097]	[0.076]	[0.076]	
Other	0.049	0.057	0.064	0.066**	0.067**	–
	[0.048]	[0.048]	[0.045]	[0.032]	[0.032]	
Family income per capita quartile (Ref:. 1st–Lowest)						
– 2nd –	0.020	0.023	0.027	−0.023	−0.023	0.658
	[0.030]	[0.030]	[0.028]	[0.020]	[0.020]	[0.187]
– 3rd –	0.013	0.016	0.020	−0.114***	−0.114***	0.276***
	[0.032]	[0.032]	[0.030]	[0.023]	[0.023]	[0.090]
– 4th –Highest	−0.015	−0.011	−0.005	−0.074***	−0.075***	0.487**
	[0.036]	[0.036]	[0.034]	[0.024]	[0.024]	[0.167]
Predicted probability	0.1294	0.1294	0.1328	0.1163	0.1166	–
Percentage financial literacy effect	–	−12.289%	−23.500%	−5.795%	−10.078%	–
No. of Observations	1074	1074	1074	2148	2148	474
Pseudo R^2	0.046	0.049	–	–	–	0.119
Wald/LR χ^2	37.10***	43.09***	58.89***	67.14***	67.97***	38.98***

Notes: The comments in Table 3 hold. *IV probit*: Wald χ^2 test of exogeneity = 5.42**. *Additional statistics based on IV LPM model (remaining statistics as reported in Table 3)*: (c) *Weak-instrument-robust inference tests*: Anderson–Rubin Wald test: $F_{(2,1052)}$ = 2.21; Anderson–Rubin Wald $\chi^2_{(2)}$ test = 4.51; Stock–Wright LM $\chi^2_{(2)}$ S statistic = 4.42; (d) *Overidentification tests*: Hansen J statistic: $\chi^2_{(1)}$ = 3.411*.

Column 1 shows the baseline probit model, which excludes the measure of financial literacy. We find that individuals who are older, more educated, and have higher income are more likely to have a bank account, consistent with findings in other countries (Christelis et al., 2010; Cole et al., 2011). Column 2 includes our measure of financial literacy (i.e., the number of correct responses to the financial literacy questions). The measure shows a significantly positive effect (at the 10% level) of financial literacy on the likelihood of using a bank account. The marginal effects suggest a sizeable impact of 2.3 percentage points. In order to facilitate the interpretation, we calculate percentage point effect by dividing this with the predicted probability of the model. Hence, one additional correct financial literacy response raises the likelihood of using a bank account by 6.6%. Also note that adding financial literacy does not much affect the estimates of education; thus, financial knowledge has an effect above and beyond general schooling.

Column 3 of Table 3 presents IV probit estimates of the probability of using a bank account. In this specification, we take into account that financial literacy could be an endogenous variable.

Moreover, financial literacy can be measured with error, and this can also affect its estimated effect on the probability of having a bank account. As discussed earlier, the variables used to instrument financial literacy are the total number of newspapers in circulation and the number of public and private universities in Russian regions. The first-stage regression is shown in Column 2 of Appendix Table A1. The two instruments have a positive and statistically significant impact on financial literacy. Both the F-statistics from the tests of joint significance and the LM tests of omitted variables shown at the bottom of the table reject the null hypotheses of joint insignificance and "significant improvement" to the model.[16]

The second stage estimates, reported in column 3 of Table 3, show that the relationship between literacy and bank account ownership remains positive, statistically significant, and is larger

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[16] The tests stem from two separate specifications for the first stage models, i.e., one without the two instruments and another incorporating the two instrumental variables, as shown in the Appendix Table A1.

Table 6
Income shock.

	Probit		IV Probit	R.E. Probit		F.E. Logit
	(1)	(2)	(3)	(4)	(5)	(6)
Fin. Lit.: #Correct Responses	–	−0.024*	−0.039***	−0.005	0.007	0.951
		[0.013]	[0.015]	[0.009]	[0.012]	[0.057]
Year 2009 * Fin. Lit.: #Correct Responses	–	–	–	–	−0.024	–
					[0.017]	
Year 2009	–	–	–	−0.013	0.031	0.992
				[0.020]	[0.038]	[0.118]
Male	0.006	0.007	0.007	−0.002	−0.001	–
	[0.029]	[0.029]	[0.029]	[0.021]	[0.021]	
Log(Age)	−0.032	−0.037	−0.040	−0.045	−0.046	0.164
	[0.051]	[0.052]	[0.049]	[0.036]	[0.036]	[0.476]
Single person household	−0.001	−0.004	−0.006	−0.003	−0.005	1.029
	[0.054]	[0.053]	[0.050]	[0.035]	[0.035]	[0.272]
Education (Ref:. Primary/Incomplete)						
Secondary	0.065	0.068	0.070	0.046	0.047	–
	[0.060]	[0.060]	[0.058]	[0.043]	[0.043]	
Vocational–Technical	−0.040	−0.032	−0.027	0.025	0.026	–
	[0.058]	[0.059]	[0.058]	[0.043]	[0.043]	
Higher or incomplete higher	−0.014	0.001	0.009	0.001	0.001	–
	[0.062]	[0.062]	[0.063]	[0.046]	[0.046]	
Occupation (Ref:. Pensioner)						
Employed	0.048	0.059	0.065	0.104***	0.103***	–
	[0.048]	[0.048]	[0.047]	[0.034]	[0.034]	
Entrepreneur	−0.020	−0.004	0.006	0.044	0.039	–
	[0.106]	[0.106]	[0.099]	[0.070]	[0.070]	
Unemployed	0.286*	0.282*	0.274*	0.239**	0.242**	–
	[0.161]	[0.162]	[0.149]	[0.108]	[0.108]	
Other	0.053	0.062	0.068	0.120***	0.120***	–
	[0.065]	[0.065]	[0.062]	[0.044]	[0.044]	
Family income per capita quartile (Ref:. 1st–Lowest)						
– 2nd –	−0.016	−0.013	−0.011	−0.047	−0.047	0.995
	[0.042]	[0.042]	[0.040]	[0.029]	[0.029]	[0.203]
– 3rd –	−0.095**	−0.091**	−0.088**	−0.063**	−0.063**	1.479*
	[0.044]	[0.044]	[0.043]	[0.030]	[0.030]	[0.314]
– 4th – Highest	−0.116**	−0.110**	−0.105**	−0.066*	−0.065*	1.637**
	[0.048]	[0.048]	[0.048]	[0.034]	[0.034]	[0.398]
Predicted probability	0.3668	0.3668	0.3670	0.3594	0.3594	–
Percentage financial literacy effect	–	−6.514%	−10.677%	−1.469%	1.881%	–
No. of Observations	1074	1074	1074	2148	2148	992
Pseudo R^2	0.052	0.055	–	–	–	0.014
Wald/LR χ^2	66.42***	71.21***	78.88***	59.06***	61.01***	9.80

Notes: The comments in Table 3 hold. *IV probit*: Wald χ^2 test of exogeneity = 2.51. *Additional statistics based on IV LPM model* (remaining statistics as reported in Table 3): (c) *Weak-instrument-robust inference tests*: Anderson–Rubin Wald test: $F_{(2,1052)}$ = 7.79***; Anderson–Rubin Wald $\chi^2_{(2)}$ test = 15.91***; Stock–Wright LM $\chi^2_{(2)}$ S statistic = 15.49 ***; (d) *Overidentification tests*: Hansen J statistic: $\chi^2_{(1)}$ = 10.089***.

than in the OLS estimates. Moreover, the Hansen J statistic of over-identifying restriction at the bottom of the table shows that the instruments are valid.[17] Finally, the random effects probit models in Columns 4 and 5 confirm the significance and magnitude of the financial literacy effects in the panel sample. Expectedly, the interaction term between financial literacy and the year 2009 exerts an insignificant impact on the probability of having a bank account. However, the financial literacy effects are between 9.3% and 11.7%.

In Table 4, we examine the impact of financial literacy on the probability of using formal bank credit. The probit estimates with

past values (dated 2008) of the independent variables in column 2 show that financial literacy is significantly positively related to the likelihood of having formal credit. The marginal effects show that one additional correct financial literacy response raises the likelihood of acquiring formal credit by 13.9%. Column 3 presents IV probit estimates. The estimates confirm the positive and statistically significant association between financial literacy and formal credit. The magnitude of the marginal effects is very similar to the baseline probit estimates (13.4%). Indeed, the exogeneity test at the bottom of the table is rejected for the bank account model. Thus, the OLS estimates significantly differ from the IV estimates.

In columns 4–6 of Table 4 we make use of the panel aspect of the data and report estimates from random effects probit and fixed effects logit models. The latter model can account for the potential that there are omitted variables (for example, ability) that can bias the estimated effect of financial literacy. It excludes observations that do not vary within the panel, and hence uses a smaller sample. Both the marginal effects from the random effects model and the odds ratios for the fixed effects model confirm the positive

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[17] Additional linear probability models examine instrument validity. The results are available upon request. The weak-instrument robust-inference tests examine the null hypothesis that the coefficients of the endogenous regressors in the structural equation are jointly equal to zero and that the overidentifying restrictions are not rejected. Both tests are robust to the use of weak instruments. The tests are equivalent to estimating the reduced form of the equation (with the full set of instruments as regressors) and testing that the coefficients of the excluded instruments are jointly equal to zero. The Hansen J statistic of overidentifying restriction at the bottom of the table accepts the null hypothesis that the instruments are valid.

Table 7
Level of spending capacity: 1 (highest)–5 (lowest).

	Ordered probit		IV model	R.E. GLS		F.E. model
	(1)	(2)	(3)	(4)	(5)	(6)
Fin. Lit.: #Correct Responses	–	−0.098***	−0.072**	−0.075***	−0.073***	−0.062***
		[0.032]	[0.031]	[0.014]	[0.018]	[0.019]
Year 2009 * Fin. Lit.: #Correct Responses	–	–	–	–	−0.004	–
					[0.024]	
Year 2009	–	–	–	0.041	0.048	0.027
				[0.026]	[0.052]	[0.036]
Male	−0.121*	−0.118	−0.068	−0.02	−0.020	–
	[0.073]	[0.073]	[0.044]	[0.034]	[0.035]	
Log(Age)	0.393***	0.376***	0.225***	0.166***	0.165***	0.721
	[0.124]	[0.125]	[0.074]	[0.059]	[0.060]	[0.848]
Single person household	0.655***	0.644***	0.417***	0.386***	0.385***	0.273***
	[0.123]	[0.122]	[0.079]	[0.055]	[0.052]	[0.083]
Education (Ref:. Primary/Incomplete)						
Secondary	0.153	0.165	0.097	0.067	0.067	–
	[0.138]	[0.138]	[0.090]	[0.071]	[0.069]	
Vocational–Technical	0.003	0.036	0.024	0.018	0.018	–
	[0.132]	[0.132]	[0.088]	[0.072]	[0.068]	
Higher or incomplete higher	−0.24	−0.182	−0.093	−0.067	−0.067	–
	[0.149]	[0.150]	[0.096]	[0.077]	[0.074]	
Occupation (Ref:. Pensioner)						
Employed	−0.236**	−0.196*	−0.129*	−0.139**	−0.139**	–
	[0.115]	[0.116]	[0.071]	[0.057]	[0.055]	
Entrepreneur	−0.43	−0.372	−0.169	−0.155	−0.156	–
	[0.315]	[0.317]	[0.186]	[0.140]	[0.113]	
Unemployed	1.373***	1.353***	0.834***	0.325	0.325*	–
	[0.501]	[0.510]	[0.289]	[0.227]	[0.181]	
Other	−0.089	−0.05	−0.04	−0.049	−0.049	–
	[0.153]	[0.154]	[0.093]	[0.073]	[0.072]	
Family income per capita quartile (Ref:. 1st–Lowest)						
– 2nd –	−0.512***	−0.500***	−0.331***	−0.278***	−0.278***	−0.250***
	[0.095]	[0.095]	[0.061]	[0.045]	[0.044]	[0.061]
– 3rd –	−0.929***	−0.919***	−0.573***	−0.494***	−0.494***	−0.476***
	[0.109]	[0.109]	[0.067]	[0.046]	[0.046]	[0.067]
– 4th–Highest	−1.345***	−1.328***	−0.802***	−0.772***	−0.772***	−0.645***
	[0.125]	[0.126]	[0.073]	[0.051]	[0.051]	[0.078]
No. of Observations	1074	1074	1074	2148	2148	2148
Pseudo R^2/Overall R^2	0.143	0.148	0.293	0.256	0.256	0.199
Wald χ^2 [*F*-statistic in (3)]	356.61***	363.43***	21.97***	678.00***	640.04***	99.10***

Notes: The comments in Table 3 hold (the comments for the probit models correspond to these for the ordered probit models, and the same holds for the linear panel models).
Additional statistics (remaining statistics as reported in Table 3): (c) *Weak-instrument-robust inference tests*: Anderson–Rubin Wald test: $F_{(2,1052)} = 1.99$; Anderson–Rubin Wald $\chi^2_{(2)}$ test = 4.07**; Stock–Wright LM $\chi^2_{(2)}$ S statistic = 4.08**; (d) *Overidentification tests*: Hansen J statistic: $\chi^2_{(1)} = 0.059$.

association between financial literacy and bank credit. Hence, an increase in the financial literacy score within the year is associated with a higher likelihood of acquiring formal credit. There is a 13.8% effect in the random effects model, increasing to 18.3% when the interaction term between financial literacy and the year 2009 is included. The latter is insignificant. However, the fixed effects logit model reveals an odds ratio of 1.333. Hence, individuals who give an additional correct financial literacy response are on average 1.3 times more likely to have acquired formal credit.

Finally, Table 5 examines the likelihood of using informal credit as the dependent variable. The marginal effects from the probit model with past values of the independent variables, shown in column 1, suggest that single individuals (those living in single person households) and those with low educational attainment are more likely to use informal credit. Column 2 adds our financial literacy measure and shows that it is negatively associated with the likelihood of using informal credit. The marginal effects suggest that an additional correct financial literacy response reduces the likelihood of acquiring formal credit by 12.3%. The effect is statistically significant at the 10% level.

Column 3 presents the marginal effects and robust standard errors from the IV probit regressions using the same instruments

that were mentioned previously. The results confirm the negative association seen previously between financial literacy and use of informal credit. The magnitude of the negative coefficient estimates increased by almost twofold compared to the simple probit model estimates (23.5%), and it becomes statistically significant at the 1% level. The panel models in columns 4–6 indicate weaker negative associations between financial literacy and informal credit, and the negative effects shown are not significant at any conventional levels. Interestingly, the significance of the year 2009 crisis dummy suggests that the incidence of informal credit use decreased during the financial crisis.

5.3. Real effects of financial literacy

We turn now to the real consequences of financial literacy. In this section, we examine the relationship between financial literacy and financial vulnerability indicators, such as the likelihood of a negative income shock, respondent level of spending capacity and availability of unspent income. Tables 6–8 replicate the same four sets of estimates as the previous tables, using as dependent variables: (a) a binary variable capturing the occurrence of a negative income shock during the past year, (b) an ordinal spending

Table 8
Level of unspent income: 1 (low)–5 (high).

	Ordered probit		IV model	R.E. GLS		F.E. model
	(1)	(2)	(3)	(4)	(5)	(6)
Fin. Lit.: #Correct Responses	–	0.094***	0.132***	0.116***	0.062**	0.014
		[0.028]	[0.044]	[0.023]	[0.032]	[0.034]
Year 2009 * Fin. Lit.: #Correct Responses	–	–	–	–	0.105**	–
					[0.043]	
Year 2009	–	–	–	0.414****	0.220**	0.410***
				[0.048]	[0.094]	[0.072]
Male	0.078	0.075	0.079	0.083	0.083	–
	[0.070]	[0.070]	[0.081]	[0.058]	[0.057]	
Log(Age)	−0.118	−0.100	−0.110	−0.129	−0.126	0.425
	[0.115]	[0.116]	[0.135]	[0.102]	[0.098]	[2.138]
Single person household	−0.216*	−0.203	−0.215	−0.091	−0.082	−0.003
	[0.126]	[0.127]	[0.141]	[0.096]	[0.090]	[0.141]
Education (Ref:. Primary/Incomplete)						
Secondary	0.027	0.017	−0.029	−0.11	−0.116	–
	[0.145]	[0.146]	[0.164]	[0.114]	[0.113]	
Vocational–Technical	−0.049	−0.08	−0.133	−0.109	−0.112	–
	[0.152]	[0.154]	[0.169]	[0.119]	[0.112]	
Higher or incomplete higher	0.119	0.064	0.005	0.022	0.022	–
	[0.161]	[0.162]	[0.182]	[0.123]	[0.121]	
Occupation (Ref:. Pensioner)						
Employed	0.098	0.060	0.050	0.007	0.008	–
	[0.106]	[0.107]	[0.127]	[0.092]	[0.090]	
Entrepreneur	−0.183	−0.242	−0.392*	0.074	0.091	–
	[0.193]	[0.204]	[0.234]	[0.175]	[0.186]	
Unemployed	−0.205	−0.175	−0.171	−0.057	−0.07	–
	[0.538]	[0.554]	[0.513]	[0.330]	[0.297]	
Other	−0.132	−0.170	−0.240	−0.094	−0.092	–
	[0.141]	[0.142]	[0.167]	[0.127]	[0.118]	
Family income per capita quartile (Ref:. 1st–Lowest)						
– 2nd –	0.019	0.007	0.01	0.183**	0.183**	0.205**
	[0.096]	[0.096]	[0.114]	[0.073]	[0.076]	[0.103]
– 3rd –	0.154	0.139	0.157	0.244***	0.246***	0.135
	[0.107]	[0.107]	[0.122]	[0.078]	[0.079]	[0.114]
– 4th–Highest	0.464***	0.442***	0.544***	0.500***	0.498***	0.22
	[0.118]	[0.118]	[0.138]	[0.081]	[0.087]	[0.135]
No. of Observations	1074	1074	1074	2148	2148	2148
Pseudo R^2/Overall R^2	0.027	0.030	0.086	0.096	0.099	0.067
Wald χ^2 [F-statistic in (3)]	82.44***	91.34***	4.95***	276.62***	224.30***	84.27***

Notes: The comments in Table 7 hold. *Additional statistics* (remaining statistics as reported in Table 3): (c) *Weak-instrument-robust inference tests*: Anderson–Rubin Wald test: $F_{(2,1052)} = 0.18$; Anderson–Rubin Wald $\chi^2_{(2)}$test = 0.37; Stock–Wright LM $\chi^2_{(2)}$ S statistic = 0.37; (d) *Overidentification tests*: Hansen J statistic: $\chi^2_{(1)} = 0.003$.

capacity variable, ranging from 1 (high spending) to 5 (low spending), and (c) an ordinal variable capturing the availability of unspent income, ranging from 1 (low frequency) to 5 (high frequency).[18] Probit and logit models are used for the binary income shock dependent variable, and ordered probit and linear probability models are used for the two ordinal variables.

Table 6 presents estimates of the likelihood of reporting a negative income shock experience during the last year. The baseline probit estimates of column 1 show that unemployed individuals and those in the lowest income quartiles are the ones more likely to report the incidence of such a shock. Column 2 shows that financially literate individuals are less likely to experience a negative income shock. The magnitude of the effect is in the order of −6.5% and it is significant at the 10% level. The IV probit estimates of column 3 confirm the negative significant association. The effect is in the magnitude of −10.7% and is significant at the 1% level. However, the panel estimates in columns 4–6 show weaker associations which are not significant at any conventional levels.

Table 7 presents estimates from models in which the ordinal level of spending capacity is the dependent variable. Higher values of the dependent variable indicate lower spending capacity. The results in column 1 show that older individuals, as well as those in the lowest income quartiles, are more likely to experience low spending capacity. The addition of the financial literacy variable in the ordered probit model of column 2 indicate that financial literacy also matters for spending; those who are more financially literate are less likely to report low spending capacity during the financial crisis. The IV estimates from a linear model in column 3 continue to confirm the negative association between financial literacy and low spending capacity.

Moreover, the panel models in columns 4–6 of Table 7 confirm the negative relationship between financial literacy and low spending capacity, both in the random effects GLS model and within groups, in the fixed-effects model.[19] The results are statistically

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[18] Models using binary variables capturing low spending capacity and frequent unspent income are reported in the Appendix Table A3.

[19] It is important to note the significance in these regressions of transitory income shocks (not shown), as well as low permanent income (Attanasio and Weber, 2010). Although the results are robust to individual fixed effects and the use of the income shock variable as an independent variable, we acknowledge the importance of both transitory and permanent income on the level of spending capacity.

Table 9
Financial literacy components.

	Bank account Probit	Formal credit	Informal credit	Income shock	Level of spending capacity Ordered probit	Level of unspent income
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 2009 outcomes with 2008 explanatory variables						
Fin Lit: Interest 1	−0.018	0.010	0.025	−0.031	−0.124*	0.109
	[0.034]	[0.026]	[0.023]	[0.032]	[0.074]	[0.076]
Fin Lit: Interest 2	0.022	0.018	−0.055*	−0.046	−0.119	0.150*
	[0.040]	[0.029]	[0.029]	[0.039]	[0.087]	[0.090]
Fin Lit: Inflation	0.047	0.019	0.010	0.027	−0.078	0.144*
	[0.032]	[0.025]	[0.022]	[0.030]	[0.075]	[0.077]
Fin Lit: Discounts	0.044	0.052*	−0.046*	−0.049	−0.074	−0.015
	[0.038]	[0.031]	[0.025]	[0.035]	[0.085]	[0.081]
Predicted probability	0.3499	0.1767	0.1294	0.3519	–	–
No. of Observations	1074	1074	1074	1074	1074	1074
	Probit				GLS	
	(7)	(8)	(9)	(10)	(11)	(12)
Panel B: Random effects models						
Fin Lit: Interest 1	0.025	0.015	−0.02	−0.031	−0.070**	0.099*
	[0.022]	[0.017]	[0.016]	[0.023]	[0.034]	[0.059]
Fin Lit: Interest 2	0.024	−0.001	−0.009	−0.084***	−0.031	0.055
	[0.023]	[0.018]	[0.017]	[0.023]	[0.035]	[0.062]
Fin Lit: Inflation	0.041**	0.031*	−0.016	0.015	−0.098***	0.303***
	[0.021]	[0.017]	[0.015]	[0.021]	[0.032]	[0.055]
Fin Lit: Discounts	0.025	0.037*	0.017	−0.034	−0.098***	−0.004
	[0.025]	[0.021]	[0.018]	[0.025]	[0.037]	[0.064]
Year 2009	0.008	−0.002	−0.037***	0.002	0.037	0.412***
	[0.020]	[0.015]	[0.014]	[0.021]	[0.028]	[0.051]
Predicted probability	0.2350	0.1496	0.1159	0.3594	–	–
No. of Observations	2148	2148	2148	2148	2148	2148
	Logit				LPM	
	(13)	(14)	(15)	(16)	(17)	(18)
Panel C: Fixed effects models						
Fin Lit: Interest 1	–	1.590**	0.608**	1.091	1.046	0.878
		[0.319]	[0.148]	[0.169]	[0.224]	[0.140]
Fin Lit: Interest 2	–	1.085	1.120	0.709**	1.167	1.132
		[0.223]	[0.264]	[0.108]	[0.257]	[0.181]
Fin Lit: Inflation	–	1.988***	0.758	0.854	0.719*	1.280*
		[0.383]	[0.180]	[0.115]	[0.139]	[0.185]
Fin Lit: Discounts	–	0.846	1.191	1.253	0.581**	0.953
		[0.206]	[0.329]	[0.202]	[0.134]	[0.172]
Year 2009	–	0.869	0.489***	1.028	1.334*	1.636***
		[0.230]	[0.113]	[0.124]	[0.208]	[0.236]
No. of Observations	–	516	474	992	2148	2148

Notes: Average marginal effects over the distribution are presented for the probit models, odds ratios for the Logit models, and coefficients for the GLS and LPM models. Standard errors are bootstrapped based on 1000 replications in Panel A, and based on 200 replications in Panels B and C.

significant at all conventional levels, and the magnitude of the effects is similar to those of the IV model. The interaction between financial literacy and the year of the financial crisis in column 5 is not statistically significant.

In addition, Panel A of the Appendix Table A3 uses a binary variable for low spending capacity (i.e., the lowest two spending categories) and confirms the robustness of the results in Table 7. An additional correct financial literacy response is related to an 8–11.6% lower probability of having low spending capacity. The magnitude of the effect is consistently similar across models.

In Table 8, we use the frequency of having unspent income as (an ordinal and then a linear) dependent variable and present estimates of ordered probit models (columns 1–2), a linear IV model (column 3), random effects GLS, and fixed effects models (columns 4–6). The results suggest a significantly positive coefficient of financial literacy on the availability of unspent income. The baseline ordered probit estimates in column 1 show that high-income individuals are more likely to have income that is unspent on a reg-

ular basis. An important caveat is that higher literacy is also associated with higher income, which may help explain the higher likelihood of savings at the end of the month. Column 2 adds the financial literacy variable to the ordered probit specification and shows that financial literacy is significantly positively related to the incidence of having unspent income available. The finding is robust in the IV estimates of column 3, in which the significantly positive effect of financial literacy is confirmed.[20]

Moreover, the estimates from random effects GLS models in column 4 show a positive effect of financial literacy in the panel sample. In column 5, the inclusion of the interaction terms between financial literacy and the year 2009 in the random effects model shows a significant positive interaction term. Thus, financially literate individuals are significantly more likely to have unspent

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[20] Similarly, Klapper and Panos (2011) find that financial literacy is positively related to participating in private and public retirement plans and negatively related to informal ways of saving for retirement.

Panel A: Newspapers by federal region (2007)

Panel B: Universities by federal region (2007)

Fig. A1. Instruments. Source: Darker colors signify higher numbers, while regions without data are presented in white. The data sources are: Number of Universities: Central Bank of Russia (2007); Number of newspapers: East View Information Services (2008), http://www.eastview.com/Online/DBtitlelists.aspx. The map coordinates for the Russian administrative regions, along with map platforms are available at: http://www.diva-gis.org/gData.

income in the year 2009. This suggests that after the crisis occurred, more literate individuals were more likely to save more frequently, as compared to less literate individuals. In all three panel models, the dummy variable for the year 2009 has a significantly positive effect, confirming that individuals are more likely to spend less of their income in consumption in the post-crisis era.

Panel B of the Appendix Table A3 examines the robustness of the last findings in binary dependent variable models, in which the top two of the five frequency categories take the value one and the remaining are equal to zero. The binary models suggest that an additional correct financial literacy response exerts a positive impact on the probability of frequently having income unspent. The effect is in the magnitude of 7.5–12.3%, with IV probit models providing the lowest estimates and random effects probit models providing the highest estimates.

5.4. Financial literacy components

The results discussed in the previous sections have shown that the number of correct financial literacy responses is positively related to desirable financial and real outcomes, and vice versa. However, the four financial literacy questions are distinct (only 1 and 2 are similar) and may measure different financial concepts. Thus, it is of interest to examine whether some concepts, such as understanding interest compounding, are more important than others for the outcomes under analysis. The financial literacy literature has suggested that understanding of compound interest is a key financial literacy measure which predicts a range of outcomes and behaviors. Hence, in this section we present estimates from sets of specifications that incorporate a set of dummy variables for financial literacy.

Table A1
Financial literacy: 1st stage regressions.

Dependent variable	Fin. Lit.: #Correct Responses			
	(1)		(2)	
Number of newspapers per region	–		0.126**	[0.056]
Number of universities per region	–		0.005***	[0.001]
Male	0.036	[0.073]	0.037	[0.073]
Log(Age)	−0.182	[0.118]	−0.187	[0.118]
Single Person Household	−0.146	[0.120]	−0.110	[0.118]
Education (Ref: Primary or Incomplete)				
Secondary	0.119	[0.140]	0.146	[0.142]
Vocational–Technical	0.333**	[0.142]	0.377***	[0.143]
Higher or incomplete higher	0.596***	[0.154]	0.634***	[0.155]
Occupation (Ref: Unemployed)				
Employed	0.425***	[0.116]	0.450***	[0.116]
Entrepreneur	0.633**	[0.252]	0.683***	[0.248]
Unemployed	−0.281	[0.365]	−0.242	[0.384]
Other	0.406***	[0.149]	0.418***	[0.149]
Family Income per capita (Ref: - 1st - (lowest))				
- 2nd -	0.154	[0.102]	0.156	[0.101]
- 3rd -	0.176	[0.112]	0.137	[0.111]
- 4th–(highest)	0.271**	[0.123]	0.168	[0.123]
Federal Region (Ref: Central)				
North Western	0.086	[0.113]	1.371**	[0.601]
Southern	0.016	[0.117]	−0.003	[0.118]
Volga	0.245**	[0.105]	0.404***	[0.114]
Urals	0.360**	[0.181]	2.218***	[0.813]
Siberian	−0.028	[0.136]	0.910**	[0.441]
Far Eastern	0.286*	[0.170]	1.548***	[0.560]
Constant	1.610***	[0.528]	−6.026*	[3.395]
F-test of joint significance:	–		12.51***	
LM test of omitted variables	30.82***		–	
No. of Observations	1074		1074	
R^2	0.122		0.141	
Log-Likelihood	−1654.0		−1641.9	
F-statistic	8.82***		9.46***	

Table A2
Financial literacy index.

Dependent variable	Bank account (1)	Formal credit (2)	Informal credit (3)	Income shock (4)	Level of spendingcapacity (5)	Level of unspent income (6)
Panel A: Probit models (1074 obs.)						
Financial literacy index	0.028*	0.031**	−0.018*	−0.031**	−0.119***	0.110***
	[0.016]	[0.012]	[0.011]	[0.015]	[0.039]	[0.035]
	(7)	(8)	(9)	(10)	(11)	(12)
Panel B: IV probit models (1074 obs.)						
Financial literacy index	0.053**	0.029**	−0.038***	−0.048***	−0.086**	0.162***
	[0.021]	[0.015]	[0.015]	[0.018]	[0.037]	[0.054]
	(13)	(14)	(15)	(16)	(17)	(18)
Panel C: R.E. probit models (2148 obs.)						
Financial literacy index	0.033***	0.025***	−0.007	−0.006	−0.093***	0.135***
	[0.011]	[0.009]	[0.008]	[0.011]	[0.017]	[0.029]
	(19)	(20)	(21)	(22)	(23)	(24)
Panel D: F.E. logit models						
Financial literacy index	–	1.397***	0.888	0.951	−0.077***	0.013
		[0.148]	[0.117]	[0.069]	[0.024]	[0.041]
No. of obs.	–	*516*	*474*	*992*	*2148*	*2148*

Note: The remaining specification is identical to that of Table 3.

Table 9 presents the results of this exercise in three panels. Panel A presents the results from models with 2009 values of the outcome variables and 2008 values of the explanatory variables. Then Panel B presents the same specifications using a random effects models and Panel C using fixed effects models.

The results in Panel A suggest that an understanding of interest compounding is negatively associated with obtaining informal credit. An understanding of discounts is positively associated with use of formal credit and negatively associated with use of informal credit. Moreover, an understanding of interest rates and interest compounding is negatively related to experiencing consumption inadequacy and positively related to having unspent income. An understanding of inflation is also positively related to having unspent income.

Table A3
Low spending capacity and unspent income (binary).

	Probit		IV Probit		R.E. Probit		F.E. Logit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Low spending capacity (dep. var.)								
Fin. Lit.: #Correct Responses	−0.024** [0.011]	–	−0.026* [0.015]	–	−0.034*** [0.008]	–	0.825** [0.063]	–
Financial Literacy: Index	–	−0.029** [0.013]	–	−0.031* [0.018]	–	−0.042*** [0.010]	–	0.787** [0.074]
Predicted probability	0.3000	0.2999	0.3001	0.3000	0.2941	0.3906	–	–
No. of Observations	1074	1074	1074	1074	2148	2148	656	656
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Panel B: Unspent income (dep. var.)								
Fin. Lit.: #Correct Responses	0.044*** [0.013]	–	0.034** [0.016]	–	0.048*** [0.009]	–	1.057 [0.067]	–
Financial Literacy: Index	–	0.051*** [0.016]	–	0.042** [0.020]	–	0.055*** [0.011]	–	1.062 [0.083]
Predicted probability	0.4482	0.4482	0.4480	0.4481	0.3908	0.3906	–	–
No. of Observations	1074	1074	1074	1074	2148	2148	924	924

Note: The remaining specification is identical to that of Table 3.

Table A4
Instrumental variables regressions: Robustness tests.

Dependent variable	Bank account (1)	Formal credit (2)	Informal credit (3)	Income shock (4)	Level of spending capacity (5)	Level of unspent income (6)
Fin. Literacy: #Correct responses	0.033** [0.016]	0.025** [0.012]	−0.032*** [0.012]	−0.041*** [0.015]	−0.044 [0.028]	0.137*** [0.044]
Log(regional unemployment rate)	−0.145* [0.075]	−0.026 [0.053]	0.112** [0.048]	0.133* [0.073]	−0.362*** [0.121]	−0.265 [0.217]
Log(monthly income per capita)	−0.157** [0.073]	−0.06 [0.056]	0.047 [0.049]	0.039 [0.072]	−0.507*** [0.110]	−0.223 [0.210]
Male	0.011 [0.030]	−0.041* [0.023]	0.001 [0.021]	0.006 [0.029]	−0.078* [0.043]	0.077 [0.081]
Log(Age)	0.132*** [0.049]	−0.041 [0.038]	−0.064* [0.035]	−0.037 [0.049]	0.241*** [0.074]	−0.109 [0.134]
Single Person Household	0.006 [0.049]	0.011 [0.043]	0.080** [0.034]	−0.006 [0.050]	0.398*** [0.079]	−0.224 [0.141]
Education (Ref: Primary or Incomplete)						
Secondary Education	0.107* [0.061]	−0.014 [0.052]	0.092** [0.045]	0.067 [0.057]	0.095 [0.089]	−0.026 [0.164]
Vocational–Technical Education	0.137** [0.061]	−0.034 [0.052]	0.105** [0.044]	−0.034 [0.058]	0.012 [0.087]	−0.128 [0.169]
Higher or incomplete higher	0.176*** [0.065]	−0.006 [0.054]	0.049 [0.048]	0.009 [0.063]	−0.112 [0.095]	0.004 [0.182]
Occupation (Ref:. Pensioner)						
Employed	0.032 [0.047]	0.171*** [0.043]	0.034 [0.035]	0.071 [0.047]	−0.138* [0.070]	0.045 [0.127]
Entrepreneur	0.038 [0.098]	0.223*** [0.074]	0.013 [0.069]	0.005 [0.099]	−0.221 [0.176]	−0.406* [0.235]
Unemployed	0.157 [0.149]	0.063 [0.150]	0.150 [0.096]	0.285* [0.154]	0.746*** [0.271]	−0.217 [0.506]
Other	0.008 [0.061]	0.068 [0.057]	0.064 [0.045]	0.072 [0.062]	−0.051 [0.091]	−0.245 [0.166]
Family income per capita quartile (Ref:. 1st–Lowest)						
- 2nd -	0.026 [0.042]	−0.017 [0.032]	0.026 [0.028]	−0.010 [0.040]	−0.327*** [0.061]	0.013 [0.114]
- 3rd -	0.027 [0.045]	0.009 [0.034]	0.020 [0.030]	−0.084* [0.043]	−0.540*** [0.067]	0.166 [0.122]
- 4th–Highest	0.067 [0.052]	−0.032 [0.040]	0.004 [0.035]	−0.087* [0.050]	−0.725*** [0.077]	0.555*** [0.145]
No. of Observations	1074	1074	1074	1074	1074	1074
LR χ^2 / F-statistic	52.57***	85.75***	61.14***	86.54***	21.60***	4.67***

Note: The primary comments of Table 3 hold.

Panel B replicates the six specifications of interest using random effects models. These suggest that an understanding of interest rates is significant in explaining spending capacity and the frequency of having unspent income, while an understanding of interest compounding is significantly negatively associated with the incidence of a negative income shock. Understanding inflation is positively related to having a bank account and use of formal credit as well as higher spending capacity and more frequently

Table A5
Pairwise correlation matrix.

	Bank Account	Formal Credit	Informal Credit	Income Shock	Level of Sp. Capacity	Level of Unsp. Income	FL: #Correct responses	Fin. Lit. Index	Interest 1	Interest 2	Inflation	Discounts	Family Income p.c.	Age	Male	# Newspapers	# Universities
Bank Account	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Formal Credit	0.05*	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Informal Credit	−0.01	−0.19*	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Income Shock	0.01	0.03	0.13*	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–
Low Spending Index	−0.08*	−0.02	0.06*	0.09*	1.00	–	–	–	–	–	–	–	–	–	–	–	–
Unspent Income Index	0.16*	−0.03	−0.08*	−0.09*	−0.34*	1.00	–	–	–	–	–	–	–	–	–	–	–
Fin. Lit.: #Correct responses	0.09*	0.10*	−0.03	0.03	−0.24*	0.16*	1.00	–	–	–	–	–	–	–	–	–	–
Fin. Lit.: Index	0.09*	0.10*	−0.02	0.02	−0.25*	0.16*	0.99*	1.00	–	–	–	–	–	–	–	–	–
Fin. Lit.: Interest 1	0.03	0.06*	−0.01	−0.01	−0.14*	0.07*	0.63*	0.63*	1.00	–	–	–	–	–	–	–	–
Fin. Lit.: Interest 2	0.06*	0.03	−0.03	0.07*	−0.13*	0.10*	0.61*	0.60*	0.15*	1.00	–	–	–	–	–	–	–
Fin. Lit.: Inflation	0.08*	0.05*	−0.03	0.02	−0.16*	0.16*	0.63*	0.59*	0.13*	0.22*	1.00	–	–	–	–	–	–
Fin. Lit.: Discounts	0.06*	0.09*	0.00	0.00	−0.19*	0.08*	0.69*	0.73*	0.33*	0.23*	0.23*	1.00	–	–	–	–	–
Family Income per capita	0.09*	0.01	−0.06*	−0.05*	−0.32*	0.15*	0.12*	0.13*	0.01	0.12*	0.08*	0.11*	1.00	–	–	–	–
Age	0.04	−0.15*	−0.06*	−0.10*	0.28*	−0.09*	−0.27*	−0.27*	−0.17*	−0.14*	−0.15*	−0.23*	−0.12*	1.00	–	–	–
Male	0.01	0.01	−0.02	0.01	−0.07*	0.05*	0.05*	0.05*	0.01	0.04*	0.02	0.05*	0.06*	−0.13*	1.00	–	–
Year 2009	0.01	0.01	−0.05*	0.01	0.02	0.16*	0.04*	0.03	−0.07*	0.13*	0.04*	0.00	0.06*	0.02	0.00	–	–
Educ. Primary or Incomplete	−0.08*	−0.07*	−0.02	−0.04	0.14*	−0.04*	−0.18*	−0.18*	−0.09*	−0.10*	−0.11*	−0.15*	−0.12*	0.31*	−0.03	–	–
Educ. Secondary	−0.05*	0.02	0.05*	0.03	0.09*	−0.04*	−0.07*	−0.07*	−0.05*	−0.04*	−0.05*	−0.04*	−0.10*	−0.03	0.10*	–	–
Educ. Vocational–Technical	0.02	−0.01	0.03	0.00	−0.02	−0.01	0.03	0.03	0.00	0.03	0.01	0.03	0.02	−0.02	−0.02	–	–
Educ. Higher/incomplete higher	0.07*	0.04	−0.07*	−0.02	−0.16*	0.09*	0.16*	0.16*	0.11*	0.07*	0.10*	0.11*	0.16*	−0.14*	−0.05*	–	–
Occ: Employed	0.03	0.16*	−0.01	0.04*	−0.18*	0.06*	0.17*	0.18*	0.12*	0.08*	0.08*	0.17*	0.10*	−0.33*	0.14*	–	–
Occ: Entrepreneur	0.02	0.04*	0.00	−0.01	−0.05*	0.03	0.02	0.02	0.00	0.02	0.02	0.00	0.02	−0.07*	0.08*	–	–
Occ: Unemployed	0.03	0.00	0.02	0.03	0.02	0.00	−0.01	−0.01	0.00	−0.03	0.00	0.00	0.03	−0.03	0.01	–	–
Occ: Pensioner	−0.01	−0.18*	−0.04*	−0.10*	0.27*	−0.09*	−0.27*	−0.28*	−0.16*	−0.14*	−0.15*	−0.25*	−0.15*	0.75*	−0.15*	–	–
Occ: Other	−0.05*	−0.02	0.06*	0.05*	−0.06*	0.00	0.07*	0.07*	0.02	0.06*	0.06*	0.05*	0.01	−0.37*	−0.04*	–	–
# Newspapers⊥	0.05	−0.04	−0.06	0.02	−0.09*	0.10*	0.75*	0.75*	0.45*	0.47*	0.47*	0.53*	0.06*	−0.18*	0.02	1.00	–
# Universities⊥	−0.03	−0.09*	−0.07*	−0.07*	−0.13*	0.08*	0.12*	0.12*	−0.02	0.07*	0.12*	0.15*	0.24*	−0.01	−0.01	0.13*	1.00

Notes: The reported pairwise correlations are for the panel data set (2008–2009), with the exception of the last two rows ($^{\perp}$) in which pairwise correlations between the two instruments and the variables used in the lagged models are reported.

* $p < 0.05$.

having unspent income. An understanding of discounts is also positively related to the acquisition of formal credit and greater spending capacity.

Finally, the fixed effects models of Panel C confirm the results from the random effects models regarding the importance of understanding inflation with respect to most outcomes, as well as the negative association between an understanding of interest compounding and the experience of negative income shocks. They further show that an understanding of interest rates is positively related to use formal credit and negatively associated with use of informal credit.

5.5. Robustness exercises

In Appendix Tables A2–A4 we perform three sets of robustness exercises to check the validity of our findings. The estimates in Table A2 in the Appendix replicate the estimates of the sets of six specifications using an index of financial literacy calculated using principal component analysis (PCA). For each question, we create a binary variable to identify the correct response and perform PCA analysis based on polychoric correlations, following the method developed to adapt PCA to ordinal data by Kolenikov and Angeles (2004, 2009). We estimate the financial literacy index as the principal component of the four financial literacy questions. The procedure is described in greater detail in Klapper et al. (2012). The results in Table A2 confirm the robustness of our findings using the number of correct responses as the financial literacy measure.[21]

Appendix Table A3 presents estimates for models with a binary version of low spending capacity and frequent unspent income as the dependent variable. The results using both the number of correct responses and the financial literacy index of Table A2 confirm the previous discussion regarding the importance of financial literacy for spending capacity and availability of unspent income.

Finally, in Appendix Table A4, we perform an additional robustness check concerning the validity of our instruments. We use specifications similar to our IV regressions in the previous tables, but also include control variables for the log values of the regional unemployment rate and the average monthly income per capita in every administrative region.[22] These robustness checks largely refute that the impact of our instrumental variables is due to regional differences in living standards. All financial literacy effects remain large and statistically significant, with the only exception being the effects in the spending regressions, where the coefficients become smaller in magnitude and statistically insignificant. This is indeed the variable that is likely to be affected the most by regional living standard differences. Hence, the results confirm the robustness of our instruments, and the magnitude of the majority of the effects remains high and statistically significant.

6. Conclusion

Our study contributes to the literature by examining the effects of financial literacy on both financial and real behavior in a relatively understudied context, that of an emerging market experiencing a financial crisis. We find that financial literacy is significantly related to greater participation in formal financial markets and negatively related to the use of informal sources of borrowing. Moreover, individuals with higher levels of financial literacy are significantly more likely to report greater levels of un-

spent income and less likely to report lower levels of spending. They are also less likely to report experiencing a negative income shock during the past year. Finally, the relationship between financial literacy and the level of unspent income is higher during the financial crisis, after controlling for household characteristics. Our results suggest that greater financial literacy can help individuals face unexpected macroeconomic and income shocks.

Our estimates also show that knowledge of inflation and interest compounding and capacity to do interest rates calculations play a pivotal in explaining most of the financial and real outcomes examined in this study.

It seems clear that financial literacy should not be taken for granted, in particular in countries with developing financial markets. As the shift continues toward individual responsibility for saving, investment, and debt management, it is important that people be equipped with the tools necessary to make good financial decisions. As shown in this paper, financial literacy cannot only contribute to savvier financial decisions, but individuals may also be better able to shield themselves against shocks. Improving financial literacy may not only help individuals but also contribute to market and macroeconomic stability.

Acknowledgements

Appendix A

See Fig. A1 and Tables A1–A5.

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[21] In unreported regressions, we use self-assessed financial literacy (on a scale from 1 to 5) in place of the financial literacy measures used so far. Our results prove robust to the use of this measure and are available upon request.

[22] The data is available from the Russian Federation Federal State Statistics service at: http://www.gks.ru/bgd/regl/b10_06/IssWWW.exe/Stg/1/17-01.htm.

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