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**THE INTERSECTION OF FINANCIAL LITERACY, COGNITIVE ABILITY, AND
NUMERACY SKILLS IN PAKISTANI ADULTS**

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ABSTRACT

The evolution of complex financial products is changing the landscape of the global financial system and to make informed financial choices, one must equip themselves with at least the basic financial knowledge. Financial literacy is a life-skill that must be possessed by all. In this study we examine the impact of cognitive ability and numeracy skills on financial literacy among adults in Pakistan. An online survey was conducted from February to April 2022, and responses of 163 individuals were collected on questions relating to demographics, financial literacy, cognitive reflection, and numeracy skills. The results of the study reveal a positive relationship between financial literacy, numeracy skills, cognitive ability, and some socioeconomic characteristics. It was also found out that education, income, and employment status significantly influence financial literacy levels. These findings add to the existing literature on financial literacy and provide valuable insights for policymakers to design effective and targeted financial literacy programs, which also focus on improving numeracy and cognitive skills to enhance individuals' overall financial decision-making skills.

JEL Codes: D14, D83, O16

INTRODUCTION

With increased globalization, people are faced with abundant financial choices, making the task of financial decision-making an abstruse challenge. The complex nature of global economy is a reflection of the extensive set of financial products and services that are at the disposal of individual and institutional consumers. The onset of global financial crisis of 2008-09 has brought to light two main concerns. First, it has highlighted the need of transparent and ethical disclosure of financial data and information. And second, it stresses on the need to have better standard of financial literacy. Both these factors combined can lead individuals to make more sound financial decisions.

Financial literacy, as described by the Organization for Economic Co-operation and Development (OECD, 2011), is ‘a combination of awareness, knowledge, skill, attitude and behaviour necessary to make sound financial decisions and ultimately achieve individual financial wellbeing.’ Financial literacy affects individuals as well as the overall economy; from daily, routine choices to long-term financial arrangements. Financial wisdom has substantial impact on individuals and households when they make decisions regarding budgeting their day-to-day expenses, buying or renting a house, funding for child education and appropriating funds for retirement. Individuals possessing at least basic financial knowledge are more confident in decision making, are better prepared to handle the ups and downs during an economic cycle and are less susceptible to financial frauds.

On a macro level, higher savings and investments by households result in greater domestic capital formation. Households aid the businesses and government with necessary capital to build infrastructure, generate employment and eventually grow the GDP. On the flip side, financial illiteracy leads to lower savings, poor spending, more vulnerability to Ponzi schemes, unfavourable decisions and ultimately lower standard of living. Moreover, financial

instability in families drives them to theft, cheating, domestic violence, divorces, suicides, and other crimes.

During the past few decades, we have been faced with increasingly complex financial products (Lusardi, 2015), such as different mortgages, auto loans, student loans, complicated retirement plans, sophisticated investment funds and so on. The financial future, therefore, undoubtedly rests in the hand of the single individual. Astute money management is the need of the hour, but Pakistan is in troubled waters because of lower levels of financial knowledge. With an unimpressive 26% rate of financial literacy (Klapper et al., 2015), Pakistan needs to ramp up its initiatives. Financial education must be embedded in regular coursework at schools and colleges. By giving the populace a constant insight of money management at every level of education, our country can become financially cultured to contribute to the overall well-being of the society.

A greater knowledge of financial principles will aid an individual in making complex financial choices successfully. This impression has been validated by (Chang & Hanna, 1992) who found out that economic agents possessing greater financial knowledge tend to make effective decisions as compared to those who score low on the scale of financial knowledge. (Perry & Morris, 2005) observe that better financial literacy stimulates the sense of savings among individuals and facilitates them in organizing and maintaining improved budgets for future.

Being financially educated, thus being competent to make prudent financial choices based on elemental know-how of financial concepts, is an important life skill that is not only essential on an individual level but is equally necessary on a societal level (Lusardi, 2012; Lusardi & Mitchell, 2014). Extant research pinpoint that many individuals around the world are financially illiterate, at least when measuring their literacy on measures of financial literacy,

e.g., (Lusardi & Mitchell, 2014). This is alarming as well as distressing, considering the rise of more refined yet complicated financial products, the individual is not only faced with making day-to-day decisions but also long term financial investments.

To equip the masses with the necessary financial competence, an instinctive response by governing decision-makers has been to offer courses and study modules targeted at increasing the levels of financial (Hilgert et al., 2003; Lusardi & Mitchell, 2006). However, in a comprehensive meta-analysis by (Fernandes et al., 2014) it is shown that financial literacy alone did not play a noticeable role in shaping financial behaviours. The researchers believe this could be due to some other, unexplained, third factor, such as cognitive abilities of individuals that could influence financial behaviours. This, then, justifies those interventions, such as offering courses on finance, targeted at increasing financial literacy alone are not sufficient.

In this study we aim to examine the factors, such as numeracy knowledge and cognitive ability, proposed by (Fernandes et al., 2014) which may affect financial literacy of individuals. Numeracy skills, in the basic framework, refer to the capability to understand, employ and interpret mathematical information and utilizing it for solving real life problems. Numeracy skills cover both basic and advanced skills. Basic skills include solving simple algebra whereas the advanced consist of complex algebraic, statistical, and graphical concepts.

This study will focus on addressing the problem of skills disparity between cognitive aptitude and numeracy capability, which contributes to poor financial knowledge and leads to flawed financial decisions. Being equipped with formal financial knowledge is essential to secure financial independence. In Pakistan, the importance of financial literacy in context of stock market investment is studied, but no study has been conducted to test the relationship

between numeracy skills and financial literacy in the country. While numeracy and exceptional cognitive skills have been shown to be projecting greater decision making (Ghazal et al., 2014), this research aims at linking these skills to financial literacy among adults, aged 18+, in Pakistan.

This research is conducted through electronic survey with financial literacy questions, along with the Cognitive Reflection Test (CRT) (LIBERALI et al., 2012) and the Berlin Numeracy Test (BNT) (Cokely et al., 2012). The Berlin Numeracy Test is effective in gauging numeracy skills, risk knowledge, and overall decision-making capabilities of individuals.

This research aims to contribute to the existing literature in two ways. First, it adds new data on financial literacy among 18+ literate adults in Pakistan. Second, this study details the relationship between financial literacy, numeracy skills and cognitive abilities, along with socioeconomic characteristics. The remainder of the paper is organised as follows. Section 2 provides the literature review. Section 3 describes the research method. Section 4 puts forth the findings and analysis of the survey. Conclusively, section 5 gives concluding remarks and recommendations for future research.

2. LITERATURE REVIEW

Financial literacy enables people to develop knowledge and skills necessary for making favourable and rewarding financial decisions. It comprises of savings, investments, money management and debt management which leads individuals to a comprehensive financial well-being (Schmeiser & Seligman, 2012). A perceptive knowledge of financial management is immensely crucial as every aspect of life revolves around money, yet many people stay oblivious to the fact that understanding money and consequently making sophisticated financial choices can keep them out of struggle and stress.

The theoretical aim of this study is to indicate that correlations between numeracy skills, cognitive abilities and financial literacy could be used to estimate the financial IQ of individuals. People perceive financial literacy as an investment decision, where the positive benefits of financial education induces them to acquire required skills (Skagerlund et al., 2018). Existing literature supports this notion by stating that individuals make sensible financial decisions if they possess ample financial knowledge (Lusardi, 2019). Another benefit of having greater financial knowledge, as highlighted by (Skagerlund et al., 2018), is lower financial anxiety. Multiple studies have shown the effect of financial literacy on different variables, such as investments decisions, savings behaviour, and financial performance of enterprises, but there are only few studies that focus on the financial literacy as a criterion variable. The focus of this study, therefore, will be to empirically test on this front.

Existing literature exhibits opposing views as to how to increase financial literacy. It is observed that some researches target financial literacy through financial education (Lusardi, 2012), whereas others believe and empirically test that behavioural biases play a part in financial decision making, and though, there is a positive correlation between financial literacy and financial education, there is little evidence that the latter contributes significantly to improved financial outcomes. (Gale & Levine, 2010; Willis, 2009) argue that while financial education is always suggested as the best intervention, it may not produce greater financial well-being. He reinforces this notion with two findings – first, as the financial world is evolving fast, individuals are required to update their knowledge on a timely basis; which many are not willing to do. And secondly, individual decisions regarding investments, mortgages and insurance not only require sound financial knowledge, but also proficiency in numeracy skills and the ability to make sound future expectations. Hence, financial education

given to subjects at a certain period of time, or once in a number of years, will not contribute much to greater financial welfare.

(Bucher-Koenen & Ziegelmeyer, 2011) explored the relationship between financial literacy, cognitive ability, and financial crisis on the German households. By making use of an extensive survey data, on one hand, they found out that individuals possessing lower financial literacy and cognitive ability were more prone to make faulty decisions. But surprisingly, these same individuals who scored low on financial literacy were less affected by financial crisis because they had fewer investments in the stock market. On the other hand, the researchers observed that individuals who rated low on financial literacy realized their stock market losses and were reluctant to invest again even when the market conditions improved, thus lowering their potential returns in the long-run.

(Cokely et al., 2012) established the Berlin Numeracy Test, which aims to assess statistical numeracy and risk knowledge. By using diverse population groups across 15 countries and conducting the survey on 5,336 participants, they found that the Berlin Numeracy Test is a strong predictor of risk faced on routine basis. The Berlin Numeracy Test is designed in a way that it is quick – takes around 3 minutes to complete; adaptive – there are separate tests designed for highly educated samples as well as for less educated samples; and convenient – having an online format as well as a traditional paper-and-pencil format. The Berlin Numeracy Test is inspired by the tests created by (Lipkus et al., 2001) and (Schwartz et al., 1997), but is more powerful than both on the basis of test-retest reliability.

Taking the notion of widespread financial illiteracy (Hastings & Mitchell, 2011; Lusardi & Mitchell, 2014) contribute by empirically testing how financial literacy and “present-biased” behaviour of individuals affect the savings and investment decisions. By making use of Chilean Social Protection Survey data, which uses the financial literacy questions devised

by(Lusardi & Mitchell, 2007), the researchers also added with it a game to test for participants' impatience – whether they will be opting for instant, present gains, or would prefer to wait to have greater gains in the future. This helped the authors to identify whether the survey respondents are more inclined to save for retirement or lack the vision for future income stream.

(Lusardi, 2012) research presents an image of financial capability in America as one of the potential causes of the financial crisis. Lusardi's definition of financial capability describes an individual's ability to make financial decisions concerning investing, saving, and debt. According to (Lusardi, 2012) the condition of individual financial knowledge is in a very sad state and leads individuals to be confused about finances and to make decisions that are harmful to their financial well-being. While (Lusardi, 2012) clearly identifies this as a descriptive study the paper does reference some theoretical and empirical data from previous research. Much of the empirical evidence that supports the thesis of this paper comes from three surveys with populations of 1,488 American adults, 25,000 American adults (approximately evenly drawn from all 50 states), and a survey of 800 military service members and their spouses (Lusardi, 2012).

(Lusardi et al., 2017) discussed the effectiveness of financial literacy programs. The researchers propose the use of a stochastic life cycle method to compare the outcomes of various financial literacy programs. What the research finds is that factors such as the recipients' age and whether the program provides follow-up can impact the effectiveness of such programs. Using a sophisticated model, the researchers assigned a cost to obtaining financial literacy through programs that must meet specific criteria. The experiment evaluated the gain to net wealth for those with the financial literacy education versus those without it. The findings showed a very small (1%) and insignificant effect of the financial literacy

education offered in the workplace. The research also found that participation was more likely for subjects aged over 40 and for subjects with higher education level.

In research on cognitive ability, (Macpherson & Stanovich, 2007) explored the factors of cognitive ability, thinking dispositions, and instructional set as predictors of critical thinking. At the heart of what Macpherson and Stanovich researched about cognitive ability is the individual decision-making process based upon believability versus logic validity. The sense here is that faulty decision making based upon belief bias and confirmation bias is centred on the inability to separate opinion or prior knowledge from the critical thinking process. The test of risk preference in this research was based upon prospect theory which posits that people are generally more willing to take risks to avoid losses than to achieve gains (Kahneman & Tversky, 1979).

Research Question

The research question this study aims to explore is

Is there an association between financial literacy, cognitive reflection, and numeracy skills in adults in Pakistan?

The corresponding null and alternate hypothesis will be:

H₀: There is statistically no significant association between financial literacy, cognitive reflection, and numeracy skills.

H_A: There is statistically significant association between financial literacy, cognitive reflection, and numeracy skills.

3. METHOD

3.1 Participants and procedure

An electronic survey was conducted among individuals aged 18+ in Pakistan (N = 163, 58% men, 42% women). The survey was conducted between February and April 2022 through an online form, which required the participants to answer all questions. The online survey was divided in four sections. The first section collected details on demographics, including gender, age, income, employment status, and household income.

This online survey also conducted tests measuring numeracy skills (NS) and cognitive reflection (CR). See Appendix A for the questions constituting the survey and the percentage of correct responses for each question. Refer to Appendix B for survey questionnaire.

The control variables that are used in the baseline regression include age, gender, education, employment status and average annual household income. These control variables are expressed by a vector X_i :

$$\text{Financial_Literacy}_i = \beta X_i + u_i \quad [1]$$

Gender is reported as a binary variable, where male is represented by a zero, and female is represented by 1. Age is a categorical variable, but in regression analysis we have taken it as a dichotomous variable, where respondents aged between 8 to 29 years old are represented by a 0, and respondents aged equal to or greater than 30 years as 1. Educational attainment is gauged by categorizing the variable into four levels: 1 represents a two-year Associate Degree, 2 denotes a four-year Bachelor's Degree, 3 represents a Master's Degree, and 4 shows a person having a degree of Doctorate, Law or any Professional level that is of usually six years or so. Employment status is reported as a dichotomous variable, where 0 represents unemployed or retired persons, and 1 represents the employed class. Aggregate average monthly household income is classified into six categories, starting from 1 as less than PKR

30,000, progressing to 2 as households earning an average monthly income of PKR 30,000 to PKR 59,999. Category 3 represents a range of PKR 60,000 to PKR 89,999, category 4 ranges from PKR 90,000 to PKR 119,000. Category 5 is denoted by households earning an average monthly income of PKR 120,000 to PKR 149,999. The last category is represented by 6 which reports individuals earning more than PKR 150,000 as their aggregate average monthly income.

Extant literature affirms that women, children, elderly and people belonging to lower-income class are deficient in financial literacy (Böhm et al., 2023; Dewi, 2022; Rahman et al., 2021). Therefore, in this model we expect the sign of gender to be negative and the sign of income to be positive.

In this basic model we then incorporate the effect of cognitive reflection and numeracy skills, and run OLS on the following model:

$$\text{Financial_Literacy}_i = \beta_1 \text{CR}_i + \beta_2 \text{NS}_i + \beta X_i + u_i \quad [2]$$

In this model specification, we anticipate the sign of numeracy skills (NS) and cognitive reflection (CR) to be positive, with an unknown effect size.

Stata-12 was used to carry out the multivariate linear regression analysis. All eight assumptions of linear regression model were tested and satisfied.

3.2. Gauging financial literacy, cognitive reflection, and numeracy

3.2.1. Determining financial literacy

Participants were assessed for financial literacy on ten questions which tested them on different topics, including inflation, volatility, returns, interest rates, stocks, bonds, and mutual funds (refer to Appendix A for questions and response correctness). These questions were sourced from the studies of (Hung et al., 2009; Lusardi & Mitchell, 2006; van Rooij et

al., 2011). An index of financial literacy was constructed based on the total number of correct responses. To check internal validity, Cronbach's alpha was used and it showed an internal consistency of 0.72.

3.2.2. Determining cognitive reflection

In order to assess the level of cognition of individuals, we conducted the Cognitive Reflection Test (CRT) which consisted of the three original questions from (Frederick, 2005). These questions are structured in a way which requires a person to reflect keenly on them before jumping to answers that may be wrong. Following questions are part of the CRT: 1) “A bat and a ball cost \$1.10. The bat costs \$1.00 more than the ball. How much does the ball cost?”, 2) “If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 10 widgets?”, 3) “In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?” The number of correctly answered problems was used as an index of cognitive reflection ability. Cronbach's alpha was calculated at 0.72.

3.2.3. Measure of numeracy

We assessed the level of numeracy skills of individuals over five questions, of which three questions were taken from (Schwartz et al., 1997) and two from the adapted Berlin Numeracy Test (BNT) which was developed by (Cokely et al., 2012). We chose these questions because they tested subjects on numeracy skills and risk knowledge, which are both crucial when making financial decisions. Cronbach's alpha showed a reliability coefficient of 0.77, which is similar to other numeracy measures (Lipkus et al., 2001) and the BNT (Cokely et al., 2012).

4. RESULTS AND ANALYSIS OF SURVEY

To test for the issue of multicollinearity, we conducted the Variance Inflation Factor (VIF), which has to be less than 10 to ensure no multicollinearity. The Variance Inflation Factor was 1.75, which confirmed that the model was free of multicollinearity.

[Insert Table 1 here]

Table 1 exhibits the means and standard deviations, along with the correlations and their significance for all the variables. We also examined the correlation between the explanatory variables, and we found that there existed high correlation between numeracy skills and cognitive reflection ($r= 0.68$, $p<0.01$).

The mean of Financial Literacy of 5.705 shows that of the ten questions constituting the financial literacy test, respondents, on average, gave correct responses of around 6 questions, with a standard deviation of 2.454. For the Numeracy Skills question set, on average, respondents answered 2.969 (or 3) questions correctly out of five total questions, with a standard deviation of 1.283. Lastly, for the Cognitive Skills, on average, respondents reported 1.245 correct responses out of a total three questions, with a standard deviation of 0.969.

About 61% of the respondents are aged between the bracket of 30 to 59 years, while 39% of the respondents are aged in the range of 18 years to 29 years. Only a negligible number of respondents are aged 60 years or above. Since this study is targeted towards 18+, literate individuals, a sizeable segment of the respondents – about 53% - are Masters and above, whereas, 37% are in Bachelor level (a four-year degree program) or Associate level (a two-year degree program). About 10% of the respondents held a doctorate or a professional degree (a six-year or more degree program). Employment status is skewed towards the employed class in this sample. 62% of the respondents are employed, while 38% are unemployed or retired. Monthly income at the household level revealed that a prominent 44%

of the sample had an aggregate monthly household income of Rs. 150,000, whereas, only around 7% of the respondents reported monthly income below Rs.30,000.

[Insert Table 2 here]

Table 2 outlines the outcomes of the regression analysis of financial literacy. (Lusardi & Mitchell, 2007) have found out that as education level gets better, the respondents perform well on financial literacy scores. For this purpose, the authors split the levels of education into four groups: Less than high school, high school, some college, and college or more. By classifying the respondents according to their educational attainment, the authors were able to identify that lowest group which had no high school diploma performed worst compared to other groups on financial literacy scores. In our study we see a similar pattern. Although our study focuses on adults, who are 18+ years old and are literate enough to attempt the online survey, yet we observe that as the educational attainment improves, there is an improvement in the financial literacy levels. In our model, the control variables that include age, household income, employment status and educational attainment, are positively correlated with financial literacy. In the first model, we regress financial literacy on the control variables, and it resulted in an R-squared of 0.6980. R-squared explains the percentage variation in outcome variable explained by the explanatory variables. In the second model, we include the numeracy skills index, which increases the R-squared to 0.7412. Therefore, we can say that additional 4.32% change in financial literacy is explained by numeracy skills. Likewise, when we add cognitive skills and an interaction term, the final model, model five, gives an R-squared of 0.7701. Noticing the standardized betas in the model depicted in column 4 of Table 2, we observe that cognitive skills (with $\beta=0.2489$) contribute more to financial literacy than the numeracy skills (with $\beta=0.1774$). These results are aligned with (Muñoz-Murillo et al., 2020) who determined that cognitive skills are key determinant in financial literacy.

The variable of employment was classified into two categories: employed and unemployed. There is a positive relationship between financial literacy and employment, and the coefficient of employment is statistically significant, which implies that as people get employed, they exhibit greater financial knowledge and are more likely to make prudent financial choices.

(Brañas-Garza et al., 2019) established that men and women perform differently on cognitive skills, where the former are better than the latter. To test this, we introduced an interaction term of gender and cognitive skills. The coefficient had a negative sign, which showed that women, indeed, performed poorly on cognitive skills than men, but it was insignificant. In all the model specifications the coefficient of income remained insignificant, primarily because the survey questioned about average monthly household income. So, it is highly possible that collectively members of a household earn better than others but individually they rank lower on financial literacy scores. This is also confirmed by the weak correlation coefficient of 0.3232 between income and financial literacy.

5. CONCLUSION, CAVEATS, AND RECOMMENDATIONS

The purpose of this research is to investigate the importance of cognitive abilities and numeracy skills in attaining financial literacy while controlling for covariates such as age, sex, educational level, average monthly household income, and employment status. By studying the effect of these predictors, we can assess why interventions that are targeted towards increasing financial literacy usually fail at demonstrating long-run effect. The model specification that we have used in the last column of Table 2 indicates that cognitive abilities account for major part of financial literacy. In Table 1 we can observe that distinct correlation exists between cognitive ability results and numeracy skills results ($r= 0.6810$, $p<0.001$), and between financial literacy and cognitive ability ($r=0.7286$, $p<0.001$) and between financial

literacy and numeracy skills ($r=0.7065$, $p<0.001$). Therefore, to acquire basic financial skills, an individual needs to be equipped with sound cognitive abilities and strong numeracy skills.

The three constructs that we have used in our study, that is, financial literacy, numeracy skills, and cognitive abilities, are gauged using scales where the questions were based on numbers. The problems posed in the financial literacy section focused on assessing financial knowledge (e.g., awareness of different asset classes, interest rate and inflation calculation). The numeracy construct was designed to capture information on basic algebraic operations, as well as on probabilities. Finally, the cognitive reflection construct comprised of only three, yet time-demanding, questions. These questions were taken from (Frederick, 2005). Using these variables, our final model yielded an R-squared of 0.7701. This leads us to think that there may be other factors that do contribute to financial literacy and could be included in the model in future studies.

A major limitation to this study could be attributed to the fact that the survey analysis only targeted literate individuals, having access to electronic gadget (mobile phone or computer) and internet service. The method of online survey was chosen because of the ongoing pandemic, and because it was convenient, had lower cost, and no presence of interviewers (which may influence responses).

Another notable caveat to this research could be ascribed to the absence of lab settings for conducting thorough analysis on financial literacy. Argument in favour of lab setting is that it allows for exact control of extraneous and independent variables and helps in developing a cause-and-effect relationship. The downside, however, is that participants may behave unnaturally owing to the controlled environment. This may result in non-generalizability of findings.

Financial matters require individuals to not only be well-equipped with numbers, but also to have sharp cognition in order to make sound financial choices. Individuals lacking in any of these constructs have a higher chance of falling prey to financial frauds and miscalculated financial decisions. Therefore, to increase the financial well-being of the society as a whole, we first need to educate and improve the skill-set of individuals. This way, they will make more informed financial decisions and collectively lift the financial welfare of the community.

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TABLES

Table 1

Descriptive statistics and correlations among measures. Significant correlations in bold ($p < 0.01$)

Tasks	Mean	SD	2	3	4	5	6	7	8
1. Financial Literacy	5.705	2.454	0.7065	0.7286	-0.5870	0.7864	0.3618	0.3189	0.3232
2. Numeracy Skills	2.969	1.283	--	0.681	-0.4647	0.6582	0.1914	0.2183	0.2629
3. Cognitive Reflection	1.245	0.969		--	-0.5260	0.6333	0.1749	0.2513	0.2640
4. Gender ^a	0.423	0.495			--	-0.557	-0.1713	-0.1728	-0.2514
5. Age ^b	0.607	0.489				--	0.287	0.2240	0.3058
6. Education ^c	2.668	0.737					--	-0.0608	0.4287
7. Employment status ^d	0.619	0.486						--	-0.1751
8. Income ^e	4.411	1.702							--

^a Gender is measured as 0 (Male) and 1 (Female)

^b Age is measured from 0 (18 to 29 years) and 1 (≥ 30 years)

^c Education is measured from 1 (Associate degree) to 4 (Doctorate, Law or Professional).

^d Employment status is measured from 0 (Unemployed or Retired) and 1 (Employed)

^e Aggregated household income is measured from 1 (<30,000 PKR) to 6 (>150,000 PKR).

Table 2

Financial literacy index is used as the outcome variable in all specifications.

VARIABLES	(1)	(2)	(3)	(4)	(5)
	standardized variables				
Numeracy Skills index		0.284*** (0.0560)		0.1774*** (0.0589)	0.179*** (0.0589)
Cognitive Reflection index			0.325*** (0.0546)	0.2489*** (0.0589)	0.293*** (0.0713)
CR * Female					-0.103 (0.0935)
Gender	-0.399*** (0.1105)	-0.321*** (0.1038)	-0.243** (0.1033)	-0.231** (0.1008)	-0.243** (0.1013)
Age	1.180*** (0.1170)	0.851*** (0.1266)	0.886*** (0.1168)	0.749*** (0.1226)	0.7533*** (0.1225)
(ii) Bachelor's Degree (4 yr)	0.133 (0.2004)	0.150 (0.1862)	0.204 (0.1817)	0.198 (0.1771)	0.197 (0.1770)
(iii) Master's Degree (6 yr)	0.331 (0.2051)	0.397** (0.1909)	0.380** (0.1857)	0.409** (0.1813)	0.420** (0.1814)
(iv) Doctorate (>6 years)	0.569 (0.2382)**	0.557** (0.2212)	0.661*** (0.2160)	0.632*** (0.2108)	0.620*** (0.2109)
Employment Status	0.358*** (0.0975)	0.309*** (0.0911)	0.2774*** (0.0893)	0.265*** (0.0871)	0.263*** (0.0871)
Income	0.388 (0.0307)	0.022 (0.0287)	0.021 (0.0279)	0.015 (0.0273)	0.0124 (0.0274)
Constant	-1.215	-0.984	-1.031	-0.930	-0.945
Observations	163	163	163	163	163
R-squared	0.6980	0.7412	0.7545	0.7683	0.7701
F-statistic	51.18	55.14	59.18	56.36	50.92

Robust standard errors in parentheses

*** p<0.01

** p<0.05

* p<0.10

Table 3: Demographic characteristics

Category	Sub-category	Frequency (N)	Percentage (%)
Gender	Male	94	58
	Female	69	42
Age	Between 18 - 39	64	39
	Between 30 - 59	99	61
Education	Associate Degree (two-year)	10	6.13
	Bachelor's Degree (four-year)	50	30.67
	Master's Degree	87	53.37
	Doctorate, law or professional (six year or more)	16	9.82
Employment Status	Unemployed/ Retired	62	38.04
	Employed	101	61.96
Income	Less than Rs. 30,000	11	6.75
	Rs. 30,000 – Rs. 59,999	18	11.04
	Rs. 60,000 – Rs. 89,999	24	14.72
	Rs. 90,000 – Rs. 119,999	21	12.88
	Rs. 120,000 – Rs. 149,999	18	11.08
	Rs. 150,000 or more	71	43.56

APPENDIX A**Table A1. Items included in the measures of Financial Literacy, Numeracy Skills and Cognitive Abilities**

Financial Literacy	% Correct Answer
1. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy:	70.6
2. Do you think that the following statement is true or false? "Bonds are normally riskier than stocks."	71.8
3. Considering a long time period (for example 10 or 20 years), which asset described below normally gives the highest return?	32.5
4. Normally, which asset described below displays the highest fluctuations over time?	77.9
5. When an investor spreads his money among different assets, does the risk of losing a lot of money:	80.4
6. Do you think that the following statement is true or false? "If you were to invest \$1000 in a stock mutual fund, it would be possible to have less than \$1000 when you withdraw your money."	38.7
7. Do you think that the following statement is true or false? "A stock mutual fund combines the money of many investors to buy a variety of stocks."	69.3
8. Suppose you had \$100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?	54.6
9. Which of the following statements is correct?	31.9
10. Which of the following statements is correct? If somebody buys a bond of firm B:	42.9

<u>Numeracy Skills</u>	<u>% Correct Answer</u>
1. Imagine that we roll a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up as an even number? Of the values below, which is the most likely outcome?	32.5
2. In the BIG BUCKS LOTTERY, the chances of winning a \$10.00 prize are 1%. What is your best guess about how many people would win a \$10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS?	55.8
3. If the chance of getting a disease is 20 out of 100, this would be the same as having a _____% chance of getting the disease.	82.8
4. In the ACME PUBLISHING SWEEPSTAKES, the chance of winning a car is 1 in 1,000. What percent of tickets of ACME PUBLISHING SWEEPSTAKES win a car?	47.2
5. If the chance of getting a disease is 10%, how many people would be expected to get the disease out of 1,000?	78.5
<u>Cognitive Ability</u>	<u>% Correct Answer</u>
1. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?	66.3
2. A bat and ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?	14.7
3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?	43.6

Appendix B: SURVEY QUESTIONNAIRE

Demographics

1. Gender:
 - Male
 - Female
2. Age:
 - 18-29
 - 30-59
 - Greater than 60
3. Marital Status
 - Married
 - Divorced/Widowed/Separated
 - Never married
4. What is the highest degree you have received?
 - Associate degree (two-year)
 - Bachelor's degree (four-year)
 - Master's degree
 - Doctorate, law or professional (six year or more)
5. Which of the following categories best describes your employment status?
 - Employed, working 1-39 hours per week
 - Employed, working 40 or more hours per week
 - Not employed, looking for work
 - Not employed, NOT looking for work
 - Retired

- Disabled, not able to work
6. How much total combined income did all members of your household earn in 2020?
- Rs. 0 – Rs. 29,999
 - Rs. 30,000 – Rs. 59,999
 - Rs. 60,000 – Rs. 89,999
 - Rs. 90,000 – Rs. 119,999
 - Rs. 120,000 – Rs. 149,999
 - Rs. 150,000 or more
7. Either parent's highest educational level
- High school
 - Post-secondary other than college
 - College graduate
 - Graduate
 - Post-Graduate
8. Are you financially independent from your parents/guardians/others?
- I pay for all of my expenses
 - I pay for most of my expenses, but I receive some help from parents/guardians
 - I pay for about half of my expenses, and my parents/guardians/others pay for the other half
 - I pay for some of my expenses, but most expenses are paid by my parents/guardians
 - My parents/guardians/others pay for all of my expenses
9. What is your ethnicity?
- Punjabi
 - Pushtun
 - Sindhi
 - Urdu-speaking Muhajir
 - Balochi
 - Other

10-Item Financial Literacy Measure (correct response in italics):

[Inflation question]

1) Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy:

- more than today with the money in this account
- exactly the same as today with the money in this account
- less than today with the money in this account*
- Don't know
- Refuse to answer

[Volatility 1]

2) Do you think that the following statement is true or false? "Bonds are normally riskier than stocks."

- True
- False*
- Don't know

- Refuse to answer

[Returns]

3) Considering a long time period (for example 10 or 20 years), which asset described below normally gives the highest return?

- savings accounts
- stocks*
- bonds
- Don't know
- Refuse to answer

[Volatility 2]

4) Normally, which asset described below displays the highest fluctuations over time?

- savings accounts
- stocks*
- bonds
- Don't know
- Refuse to answer

[Diversification]

5) When an investor spreads his money among different assets, does the risk of losing a lot of money:

- increase
- decrease*
- stay the same
- Don't know
- Refuse to answer

[Stocks Question]

6) Do you think that the following statement is true or false? "If you were to invest \$1000 in a stock mutual fund, it would be possible to have less than \$1000 when you withdraw your money."

- True*
- False
- Don't know
- Refuse to answer

[Mutual Funds Question 1]

7) Do you think that the following statement is true or false? "A stock mutual fund combines the money of many investors to buy a variety of stocks."

- True*
- False
- Don't know
- Refuse to answer

[Compound Interest question]

8) Suppose you had \$100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. Assuming compounding interest, after 5 years, how much would you have on this account in total?

- More than \$200*
- Exactly \$200
- Less than \$200
- Don't know
- Refuse to answer

[Mutual Funds Question 2]

9) Which of the following statements is correct?

- Once one invests in a mutual fund, one cannot withdraw the money in the first year
- Mutual funds can invest in several assets, for example invest in both stocks and bonds*
- Mutual funds pay a guaranteed rate of return which depends on their past performance
- None of the above
- Don't know
- Refuse to answer

[Bonds Question]

10) Which of the following statements is correct? If somebody buys a bond of firm B:

- He owns a part of firm B
- He has lent money to firm B*
- He is liable for firm B's debts
- None of the above
- Don't know
- Refuse to answer

Note: Items 1 and 2: Lusardi and Mitchell (2006); Items 3, 4, 5, 8, 9, 10: van Rooij, Lusardi and Alessie (2012); Item 6: Agnew and Utkus (2005); Items 7: Hung, Meijer, Mihaly, Yoong (2009).

Numeracy

Schwartz et al. Numeracy scale

1) Imagine that we roll a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up as an even number? Of the values below, which is the most likely outcome?

- 157
- 298
- 512
- 754
- 919
- I do not know.

2) In the BIG BUCKS LOTTERY, the chances of winning a \$10.00 prize are 1%. What is your best guess about how many people would win a \$10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS?

- 1
- 2
- 10
- 100
- 110
- I do not know.

3) If the chance of getting a disease is 20 out of 100, this would be the same as having a _____% chance of getting the disease.

- 0.2
- 2
- 2.0
- 20
- 200
- I do not know.

4) In the ACME PUBLISHING SWEEPSTAKES, the chance of winning a car is 1 in 1,000. What percent of tickets of ACME PUBLISHING SWEEPSTAKES win a car?

- 0.001%
- 0.01%
- 0.1%
- 1.0%
- 1.1%
- I do not know.

5) If the chance of getting a disease is 10%, how many people would be expected to get the disease out of 1,000?

- 1
- 10
- 100
- 110
- 1,000
- I do not know.

Cognitive Reflection Test

1) If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

- 1 minute
- 5 *minutes*
- 10 minutes
- 100 minutes
- 1,000 minutes
- I do not know.

2) A bat and ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?

- 1 cent
- 5 *cents*

- 10 cents
- 11 cents
- 20 cents
- I do not know.

3) In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

- 24 days
- 25 days
- 32 days
- 26 days
- 47 days
- I do not know.