Financial literacy and its influence on internet banking behaviour*

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Abstract

This paper presents the survey results for financial literacy among Cypriot adults and reports their financial aptitude and behaviour. Additionally, it investigates for the first time the implications of financial literacy on respondents' usage of digital financial services, particularly internet banking (i-banking). The focus is on Cyprus, a country that experienced an unprecedented financial crisis in 2013 that resulted in a bail-in and an enormous subsequent shrinkage of the banking sector. Cypriot consumers face an ever-increasing need for financial sophistication to effectively utilise and manage digital banking services. Neverthless, financial literacy is still low in Cyprus, whereby only 37.33% of survey respondents showed proficiency in financial knowledge. The findings indicate that there is a statistically positive relationship between the levels of financial knowledge and the frequency of i-banking use. More importantly, financially illiterate consumers appear to report - far more often than their financially literate peers - the lack of trust in i-banking, as well as a lack of self-confidence in financial and digital skills as the main reasons for not using this service. The findings highlight the interplay between financial literacy and digital proficiency, and their implication on individuals' use of i-banking services.

JEL subject codes: D14, D91, G21.

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1 Introduction

Amid the technological disruptions that are changing the financial services industry at a rapid pace, consumers need to make progressively more well-informed financial decisions. Today's complex financial markets offer consumers a vast array of digital financial instruments, so they must be equipped with the knowledge and skills set required to evaluate the options, and make the best choices to maximise their long-term financial wellbeing. Consumers need to have an ever-increasing

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financial (and digital) sophistication to effectively use products offered through electronic channels.[1] The digital age demands digitally smart people equipped with financial literacy for their effective participation in the new economy.

The importance of financial literacy, including its positive externalities - such as better financial decision making- is substantiated by a growing body of studies. Individuals with a higher level of financial literacy are less vulnerable to being exploited or deceived (Campbell *et al.*, 2011; Lusardi and Mitchell, 2011; Deevy *et al.*, 2012; de Bassa Scheresberg, 2013; Balloch *et al.*, 2015; Andreou and Philip, 2018), less prone to over-indebtedness (Lusardi and Tufano, 2015; Andreou and Philip, 2018), better at retirement planning (Lusardi and Mitchell, 2007; van Rooij et al., 2012), participate more often in financial markets (van Rooij *et al.*, 2011; Balloch *et al.*, 2015) and have higher returns on savings accounts (Deuflhard *et al.*, 2018).

Despite the long list of studies on financial literacy, an in-depth analysis of the relationship between financial literacy and consumer use of digital financial services such as i-banking remains a notable gap in the literature. The contribution of this paper is thus twofold: first, it investigates the level and scope of financial literacy among various socio-demographic characteristics in Cyprus. Second, the paper offers novel evidence by investigating the extent to which i-banking behaviour is influenced by variations in financial literacy levels.

In general, Cyprus has not come close to matching the range and depth of studies, as far as adult population is concerned, conducted in other European countries investigating financial literacy and its implications. To fill this void, this paper extends Andreou and Philips (2018) study and exploits data from Cyprus using survey responses from 600 adults aged between 25 and 65, where the overwhelming majority holds a bank account. The results show that financial knowledge proficiency, measured as the average score of correct answers to six questions that span economic concepts in the "saving, portfolio and mortgage" choice domain, is rather low among Cypriots. Specifically, only 37.33% of the respondents answered at least four questions correctly, which is the minimum target level, with females showing much lower levels of financial knowledge (a gender gap of around 10%). This places Cyprus below the OECD country average that stands at around 62% (OECD, 2016, p. 26) and well below from leading countries in the financial literacy domain, like Estonia (73%), Finland (70%) and Latvia (68%).[2]The rather low financial knowledge score in Cyprus can be also corroborated by evidence from international surveys (e.g. Demirguc-Kunt *et al.*, 2015). Consequently, individuals appear to be ill-equipped to participate in today's complex (and digitalised) financial sector. Further, the 10% gender gap compares unfavourably to the corresponding of 5% across major emerging economies (Hasler and Lusardi, 2017).

With only 30.03% of the group characterised as financial literate, the results point to, individuals aged 39 or under -millennials - as individuals with a higher probability of showing low levels of

[1]According to the European Banking Federation, the number of branches across the EU-28 decreased by 5.6% in 2018 relative to the previous year, reflecting the increasing interaction of consumers with banks through digital channels. Furthermore, according to Eurostat, 58% of individuals in the EU-28 used i-banking in 2019 (up from 32% in 2009).

[2]The financial knowledge scores of this study cannot be strictly compared to evidence from the OECD (2016) due to the studies' dissimilarities in survey questions and designs.

financial knowledge. This result squares with other recent empirical evidence. For example, Lusardi *et al.* (2018) show that millennials know little about their student loans and many do not attempt to calculate their future loan payment amounts. Andreou and Philip (2018) show that Cypriot university students, mostly aged 18 to 24, also exhibit low levels of financial literacy: most fail to effectively manage credit card debt and tend to be more susceptible to financial fraud. These findings point to a need for the inclusion of financial education programmes in national strategy and policy making: *"Young people can't afford to make financial mistakes.... [hence] financial education is an important part for their financial empowerment"*.[3]

The study reveals that financial literacy is an important channel of influence on i-banking behaviour, above various other important socio-demographics, skills and traits. Interestingly, those lacking financial knowledge are also more likely to report a corresponding lack of information technology skills, banking-specific knowledge, and confidence, as reasons for not using i-banking. The latter points to the co-existence of financial illiteracy and absence of digital know-how, i.e. *digital financial illiteracy*.

The OECD (2018) highlights digital financial literacy as an important component of the global policymaking agenda, but does not provide an explicit definition of the term. In a recent policy brief, Morgan *et al.* (2019) discuss four important dimensions that a definition should encompass: knowledge of digital financial products and services; experience in using digital financial products and services; awareness of digital financial risks; and skill in controlling and managing financial digital activities. In the absence of a standardised definition, we perceive *digital financial literacy* as a nexus of competencies spanning elements of financial literacy and digital proficiency, that enable individuals to maintain their financial wellbeing by confidently making effective and responsible use of digital financial products and services. Digital financial literacy can therefore be visualised as a multidimensional concept referring to individuals' breadth and depth of financial knowledge and skills, enhanced by their aptitude in using products and services offered in a digital fashion. Conversely, within the context of our study, *digital financial illiteracy* is perceived as a lack of such knowledge, skills and aptitude, with negative consequences on individuals making use of financial products and services offered through digital platforms, such as i-banking.

The evidence from Cyprus complements several studies, consistently showing that, levels of financial literacy are relatively low, even across advanced economies. For example, the OECD (2017) states that fewer than half of the adult population in the G20 countries is financially literate, and thus national policies should be oriented towards enhancing financial education. According to the findings of Standard and Poor's Rating Services Global Financial Literacy Survey (Klapper *et al.*, 2015), financial literacy rates vary widely across the EU with the rates much lower in Southern Europe. Lusardi and Mitchell (2011) find that only about a third of the global population has familiarity with the basic concepts that underlie everyday financial decisions. Given the above empirical evidence, and the fast-changing economic landscape where individuals are progressively

[3]Dr Adele Atkinson, Senior Policy Analyst at OECD. Statement provided at the 2nd Forum for Economic and Social Policy organised by the Cyprus University of Technology at the Central Bank of Cyprus, 2 November 2018.

becoming more responsible for their own financial planning (Lusardi, 2019), including their retirement (see Lusardi and Mitchell, 2011; Klapper and Panos, 2011), further investigation of financial literacy levels across EU countries is crucial.

In this context, Cyprus is a very interesting case and offers important insights to the extant literature. First, it was among the European countries hit hardest during the economic and banking crisis of 2013. Although the crisis in Cyprus shared similar earlier macroeconomic imbalances with other crisis-hit South European countries, it was different in nature and led to an unexpected bail-in.[4] Against this background and in the wake of the economic turmoil that followed in the period 2014-2017, the important question thus arises whether Cypriot consumers have significantly stepped up their efforts to improve their financial literacy levels in line with other leading European countries. This kind of spill-over effect is motivated by evidence showing that people are learning through experience, especially when it adversely affects their financial wellbeing (Lusardi, 2009; OECD, 2009).

Second, a large consolidation process is taking place in the banking sector. Cypriot banks, in an endeavour to achieve economies of scale by downsizing their network, are actively encouranging their customers to avoid visiting the branches, and instead carry out transactions through i-banking platforms. In fact, the number of branches has fallen drastically over the past few years, and as such, consumers in Cyprus face an ever-increasing need for financial and digital sophistication to make informed financial decisions. While empirical studies (see, for example, Calvet *et al.*, 2007; Klapper *et al.*, 2013; Lussardi and Tufano, 2015) have alluded to the benefits of financial literacy in terms of making prudent financial decisions, the evidence of Cyprus highlights that financial literacy is instrumental for the effective and responsible use of digital financial products.

A rather surprising result of this study is that, almost a decade after the banking crisis and while new technologies continue to disrupt the financial industry, Cyprus' financial literacy level (and proficiency in using digital services) remains low compared to its European peers, for example Denmark, Norway and Estonia.[5] This evidence could convey two important, yet worrisome, takeaways.

First, the crisis in Cyprus has revealed many fault lines, with far too many people having faced real hardship. Despite households in Cyprus experiencing severe economic repercussions from the crisis and a resulting expectation that more effort would be expended to enhance the financial literacy of the population, the results of this survey indicate that financial literacy has remained low. Financial education plays an important role in preparing people to face economic challenges and in equipping individuals to deal with macroeconomic shocks (Klapper *et al.*, 2013).

[4]For an overview of the Cypriot crisis see Clerides (2014), Michaelides (2016), Orphanides (2016) and Zenios (2016).

[5]These particular countries are also those that appear to rank relatively high in the dimensions that are marked as key in the 2019 Global Competitiveness Report. The dimensions include the information and communications technology (ICT) adoption pillar, where Denmark ranks 9th, Norway 10th and Estonia 16th while Cyprus ranks 58th (among 141 countries); the skills pillar where Denmark ranks 3rd, Norway 6th and Estonia 15th, while Cyprus ranks 32nd; and the innovation capability pillar where Denmark ranks 11th, Estonia 34th and Norway 20th while Cyprus ranks 43rd.

The implication is therefore that no lesson was to be learnt from the crisis.

Second, the evidence from Cyprus indicates that, amongst other negative factors, financial illiteracy could be holding consumers back from the broad adoption of financial innovations, of which i-banking is an example. The study shows that, while Cyprus is rapidly transitioning to digital banking systems - which offer households a broader set of opportunities and encourage them to adopt electronic channels such as i-banking - financial literacy is still lagging behind. Hence, this could be used as evidence that digital financial illiteracy is a looming threat to the financial inclusion of individuals in the new age of digital banking.

Given the above, the findings of this study have key implications and provide ample material for policy design. Financial literacy is in fact becoming increasingly important and elevating financial literacy levels - in combination with improving consumers' digital proficiency to enable them address the emerging issues pertaining to the digitalisation of financial products - has been set as a top priority for policy makers internationally.[6] The OECD/INFE, for example, has released "Digitalization and Financial Literacy", a policy guidance, endorsed by the G20 in 2018 that "provides policy makers with tools to help economies and societies prosper in an increasingly digital and data-driven world" (OECD, 2018). In this regard, the evidence from Cyprus can facilitate existing policy directions: education programmes on digital finance should be a central element in national financial literacy strategies, with a focus to enhance consumers' skills likely to be critical in the digital age, including special programmes for vulnerable groups.

The remainder of the paper is structured as follows. Section 2 gives an overview of the Cypriot environment and reviews some recent evidence on financial literacy in Cyprus. Section 3 discusses the design of the research. Section 4 presents some findings about the levels of financial literacy and Section 5 focuses on i-banking behaviour. Section 6 draws conclusions and offers policy suggestions.

2 Background

2.1 The unique banking environment in Cyprus

The special social and economic characteristics of Cyprus qualify the country as a prominent case of investigation across EU countries.

First, Cyprus is one of the smallest countries in the EU, with a population of 864,234, that is relatively highly educatied. According to Eurostat, tertiary education attainment reached a record high of 57.1% in 2018; far above the EU-28 average (40.7%). Second, the financial sector has played a dominant role in the Cypriot economy. Specifically, according to the Central Bank of Cyprus, total banking sector assets rose from €50 billion or 340% of GDP at the end of 2005, to about €128 billion or 688% of GDP at the end of the second quarter of 2010. By the end of 2012 and with the banking crisis looming ahead, total assets had dropped to €105 billion or 540% of GDP.[7] Following

[6] In 2016, the G20 leaders endorsed the *High-level Principles for Digital Financial Inclusion*, which include Principle 6 to "Strengthen Digital and Financial Literacy and Awareness" (GPFI, 2016).

[7] https://www.centralbank.cy/en/publications/monetary-and-financial-statistics

a period of strong economic growth, in 2013, Cyprus experienced a major banking crisis that was unprecedented in scale and caused a meltdown of the economy.[8] Cyprus was the first Eurozone country ever to apply capital controls in March of 2013, with limits on credit card transactions, daily withdrawals and overseas money transfers.

Since then, the Cypriot banking system has undergone considerable transformation leading to an enormous downsizing. For example, according to Central Bank of Cyprus, at the end of the third quarter 2016, total assets had dropped to €68 billion or 386% of GDP - loans to monetary and financial institutions (MFIs) excluded - while this figure dropped below 320% of GDP in 2018. In 2019, there were 30 authorised credit institutions in Cyprus: seven local institutions, three subsidiaries of foreign credit institutions from EU member states, one subsidiary of a foreign credit institution from a non-EU country, five branches of credit institutions from EU member states, 13 branches of credit institutions from non-EU member states and one representative office.[9] At the end of 2018, there were 352 branches in Cyprus, compared to 502 in 2016, a drastic drop of about 30%. The most recent development in the banking sector, was the shutting down of the state-owned Cooperative Central Bank in August 2018, which lead to an even greater reduction in the number of branches.

The recent Cyrpus banking crisis has had multiple negative effects, including crippling the economy and severely damaging the country's banking sector (Brown *et al.*, 2018). Cypriots tend to take a great deal of debt and despite the ongoing deleveraging process, household debt in Q1 2020 amounted to €20.2 billion or 92% of GDP. To date, Cyprus also has one of the highest non-performing loan ratios in the EU (27.8% in April 2020). Although there are different views about the relative importance of the contributing factors, it is generally accepted that the banking crisis in Cyprus stemmed from a combination of errors and omissions, as well as risky and improper behaviour by various players (Clerides, 2014). Financial literacy can help people better manage their finances through times of hardship and buffer themselves against financial emergencies. Whilst financial illiteracy was not necessarily the *raison d'être* for the Cyprus banking crisis, a lack of understanding of essential financial issues and the absence of personal financial responsibility undoubttedly contributed to the crisis at least to some extent, a linkage that has also been identified in similar crisis situations in other countries (OECD, 2009).

2.2 Use of i-banking and financial literacy in Cyprus

The penetration of i-banking has been steadily increasing in Cyprus over recent years, although it still lags behind the EU average; indeed, it is one of the lowest shares. According to Eurostat, in 2018, 38% of individuals between 25 and 64 years old in Cyprus used i-banking (EU average 59%) compared to 18% in 2009 (EU average 36%). I-banking is particularly popular among 25-34

[8] According to the Cyprus Statistical Service, in 2008, GDP growth exhibited a slow deceleration reaching a growth rate of 3.7%, while in 2009, GDP registered a significant contraction of 2.0%. Subsequently, signs of recovery were recorded in 2010, where GDP growth reached 1.4% and in 2011, the economy recorded a marginal growth of 0.4%. The growth rate of the GDP plunged to -2.4% and -5.9% in 2012 and 2013, respectively.

[9] https://www.centralbank.cy/en/licensing-supervision/banks/register-of-credit-institutions-operating-in-cyprus

years-olds, with 50% using this facility. Its use tends to increase in line with the education level of the user: while only 5% of individuals 25 to 64 years old with a low education level use i-banking, 67% with a high level of education use this service.

In 2019, Cyprus ranked overall 22nd among the EU-28 on the Digital Economy and Society Index (DESI), while in the "human capital" dimension of the index, Cyprus ranked 24th. Although Cypriots increasingly go online, their level of basic and advanced digital skills remains below the EU-28 average and the same holds for their usage of internet services. Overall, Cypriots are keen to engage in a variety of online activities and they are active internet users, but they still lag behind EU-28 average.

Evidence also suggests that Cypriots' overall financial literacy level is low. An early survey was conducted by the Cyprus Securities and Exchange Commission (CySEC) in 2010,[10] which covered individuals over 22 years old, but focused only on general knowledge and information issues related to the capital market, investments in securities and investment products. As such, the primary goal of the survey was not to measure financial literacy levels, but rather to identify participants' level of awareness and knowledge on concepts related to CySEC's agenda. As a result, the survey was neither informative nor conclusive regarding the country's financial literacy level. Later, in 2014, Cyprus participated in Standard and Poor's global financial literacy survey. While the survey concluded that financial literacy levels in Cyprus were low, we note that it only measured four fundamental financial decision-making concepts (i.e. basic numeracy, interest compounding, inflation and risk diversification). Furthermore, Standard and Poor's global survey does not consider the antecedents of financial literacy or any of its implications on consumer behaviour in Cyprus.

The study of Andreou and Philip (2018) is the first attempt to provide a more detailed analysis of financial literacy and its implications in Cyprus. The survey covered 881 university students across the five biggest universities in Cyprus, aged primarily 18 to 24. Financial knowledge was measured as the understanding of six fundamental concepts for financial decision-making, i.e. interest rates, inflation, risk and diversification.[11] The results revealed that only 6.24% of students could answer all six questions correctly, while only 36.9% of students were proficient in financial knowledge (i.e. responded correctly to least to four out of six questions). Moreover, Andreou and Philip (2018) report that financial knowledge is a distinct channel of influence on students' understanding of managing credit card debt and ability to protect themselves from fraudulent investments.

However, despite these alarming initial empirical findings regarding literacy levels in Cyprus, an in-depth country-specific analysis for the whole population has yet to be conducted. Therefore, the current study is, *inter alia*, the first attempt to fully explore the Cyprus case.

[10] https://www.cysec.gov.cy/CMSPages/GetFile.aspx?guid=7f3988ff-84df-4e06-9670-96fabf044256 (in Greek)

[11] Other than the Big Three questions, Andreou and Philip (2018) ask the following three questions aiming to measure an individual's (i) understanding of simple interest rate calculations (*"Suppose you put 100 euros into a (no fee, tax-free) savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?"*); (ii) understanding of inflation (*"High inflation means that the cost of living is increasing rapidly"*); and, (iii) understanding of risk and return (*"If someone offers you the chance to make a lot of money it is likely that there is also a chance that you will lose a lot of money"*).

3 Research framework

3.1 Questionnaire design

To achieve the research objectives, a survey was conducted using an instrument developed by the authors. The questionnaire was administered in October 2018 to Cypriot individuals (aged 25 to 65) via telephone calls conducted by the market research organisation, Insights Market Research (IMR Cyprus).[12,13]

Despite best efforts, any measure of financial literacy is likely to be affected by measurement error: people may misunderstand a question, for example, especially when they are read out over a call. To evaluate these potential problems, a procedure was followed so that questions had a logical flow and appropriate wording, as well as to ensure construction validity of the questionnaire. Early drafts of the survey instrument were extensively discussed with and evaluated by an experienced scholar. IMR Cyprus then made further suggestions to the flow and phrasing of the questions. Finally, to assess validity, the survey instrument was pilot-tested with 12 individuals through a telephone interview; random digital dialing was used and the individuals were not remunerated. This ensured that the wording of the questions was comprehensible and that respondents could provide their answers within a reasonable timeframe.

The instrument is comprised of four sections.The first section asks survey participants to provide demographic data: gender, district of residence, area of residence (urban or rural), age, education level, profession industry, and monthly income level. The second section of the instrument contains questions that aim to assess the financial literacy level of respondents. Table 1 lists the six survey questions employed to capture their financial knowledge. These consist of (i) one recommended question as per the OECD (2016) survey, and similar to that of Lusardi and Mitchell (2011), that relates to the concept of "compound interest calculation" (Q1); (ii) two questions from Lusardi and Mitchell (2011) that relate to the concepts of "understanding the consequences of inflation" (Q2) and "benefits of risk diversification" (Q3); and (iii) the authors' own questions that relate to the concepts of "understanding the composition of the annual percentage rate" (Q4), "understanding the application of the annual percentage rate" (Q5), and "awareness of crucial banking issues" (Q6).[14]

[12]IMR Cyprus was chosen for leading organisation in the field, with over 18 years of experience. IMR Cyrpus was responsible for conducting the survey and provided vital support to the authors for the completion of the fieldwork to collect the data. The authors are the sole responsible for the academic research and analysis of the data.

[13]The average length of a telephone survey was 20 minutes and random digit dialling was used. There is evidence to suggest that self-administered, web-based surveys may provide more accurate results compared to an interviewer-administered approach (Chang and Krosnick, 2009). We follow the OECD INFE (2011) guidance notes to use personal interviews for the collection of internationally comparable data of financial literacy (see among others, Lusardi and Mitchell, 2011). Acknowledging the limitations of telephone surveys, this method has been extensively used in the literature for financial literacy (see, for example, Standard and Poor's Rating Services Global Financial Literacy Survey (Klapper *et al.*, 2015)).

[14]Q1 and Q2 feature multiple choice answers including "Don't Know / Don't Answer" to dissuade respondents from guessing. Q6 is open-ended, which allows respondents to answer in their own words (also allowing for "Don't Know / Don't Answer"). The remaining questions (Q3, Q4 and Q5) require a true or false response (again allowing for "Don't Know / Don't Answer").

[Insert Table 1, here]

Individuals who fail to answer Q1 and Q2 correctly will likely experience difficulties when facing basic financial decisions characterised by an investment today and return in the future. Providing the correct answer to Q3 requires some knowledge about stocks and mutual funds as well as the concept of risk diversification, and thus indicates whether respondents can effectively manage their financial assets. The aim of Q4 and Q5 is to elicit consumers' understanding of a very important financial term, in this case "annual percentage rate" (APR). These two questions along with Q6 are *banking-specific* questions in the sense that they assume that individuals have some fundamental knowledge when they engage with financial institutions to receive banking services.

The third section includes one multiple choice type question to identify the sources from which respondents seek financial advice. Recently, a lot of studies have addressed the question whether financial advice may act as a substitute for financial capabilities, or if these two should be considered as complementary for improving a consumer's financial decision-making. The literature has shown that financial advice is mostly sought by relatively knowledgeable investors (see, for example, Hackethal *et al.*, 2012), while less informed investors are more likely to invest without seeking advice (Collins, 2012). In the information era, internet sources and social media are new sources of information. Indeed, according to the European Commission, in 2019, Cypriots appeared to be active users of social media, with 82% using social networks, putting Cyprus in 5th place among EU countries. The survey therefore further probes respondents to indicate: "*On a scale of 1 to 10, where 1 means totally disagree and 10 means totally agree, to what extent do you agree or disagree with the following statement: Social media provide very trustworthy information pertaining to economic and banking matters*". This section of the study also features questions on consumers' behaviour, such as risk aversion and optimism and questions concerning respondents' self-confidence in dealing with numeracy, and their information technology competence. A final question addresses their daily engagement with social media.

The fourth section of the survey, features questions related to respondents' banking activity and behaviour. The baseline analysis focuses on individuals that hold a bank account and the first part of the section asks individuals to state the number of banks with which they currently have an active account. Next, respondents need to define their "primary bank", choosing from a comprehensive list of Cyprus banks, and the duration of their primary bank relationship. In this section, all respondents are also asked whether "*they have switched their primary bank in the last twelve months or are considering to switch*".

To understand respondents' attitudes on receiving banking services, all participants are asked which channel they use -branch visit or i-banking- in order to receive basic financial services (i.e. withdrawals and deposits, loan payments and utility payments) and "*how often*" they tend to use each channel. Lastly, in order to provide a more complete picture of i-banking behaviour, the participants that indicate using i-banking "rarely (or never)" are further asked the following question: "*On a scale of 1 to 10, where 1 means totally disagree and 10 means totally agree, to what extent do you agree or disagree with the following statements: I rarely use i-banking because*

(i) I don't trust i-banking; (ii) I don't have the necessary IT skills; (iii) I don't have the necessary banking knowledge; and, (iv) I want to have personal contact with the bank officer".

3.2 Sample and respondent characteristics

The survey target sample consisted of 600, Cypriot residents aged between 25 and 65 years old, who have the most knowledge of their household's finances and comprise the largest part of the working age population. The coverage target of 600 is both sufficiently large given the Cyprus population and widely used in most telephone surveys conducted by market research companies.[15] To ensure a nationally representative sample, the survey data were collected from a stratified random sample of units with known probabilities of selection from the population.[16] No data weighting was applied because the survey's sample is relatively well-balanced in terms of gender and age composition.[17]

Table 2 presents sample statistics regarding the frequency and proportion of respondents' characteristics tabulated across female, male and the entire sample. First, it is shown that ther are 301 female participants (accounting for 50.17% of the sample) and 299 male participants (accounting for 49.83% of the sample). About 246 of the survey participants (41%) live in the district of Lefkosia, the capital of Cyprus, while a total of 471 (78.50%) live in an urban area. The majority of the participants hold a bachelor's, master's or higher degree, while 84% come from non-business focused studies. Further, 40.17% of the sample has engaged in a relationship with at least two banks, while 69.33% of the individuals have a primary bank relationship for over seven years. The latter is reinforced by the observation that 76.33% responded not to have changed the primary bank during the last year.

The table also shows that there are gender differences in education at the secondary school level. About 15.67% of female and 14.50% male respondents stated having a graduate education. Women and men also differ in their use of information sources. About 22% of male sample respondents use the internet or social media as a source for financial advice, compared to 19% of women.

[Insert Table 2, here]

The notion that financial advice may act as a substitute for low levels of financial literacy rests on the assumption that less knowledgeable individuals face higher hurdles with regards to the collection and processing of information and thus, by turning to an advisor they can save on information and search costs (Georgarakos and Inderst, 2014). Internet and social media are new sources of information. In fact, as Table 2 shows, most of respondents (41.51%) seek financial advice through the Internet, an observation consistent for both female and male individuals. As for

[15] This is also the typical sample size used for Cyprus in the EU Program of Business and Consumer Surveys (https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys_en).

[16] Up to five attempts were made to call the selected household. To increase the probability of contact and completion, attempts were made at different times. This design resulted in a high response rate.

[17] A comparison between the sample and population proportions within gender-age groups shows that these are persistently below 2% for all strata. The sample slightly over-represents individuals over 40, and it under-represents young individuals. Estimation of the main financial literacy measures with the weighted sample shows only marginal differences with the unweighted one.

social media activity, men and women tend to show the same behaviour with the majority (55.67%) reporting less than one hour of daily engagement.

4 Financial literacy measures

In this study, financial literacy is measured according to the number of correct answers to the six financial knowledge questions in Table 1. Q1-Q3 (the so-called 'Big Three') have been widely adopted in the US and elsewhere (see, OECD, 2016)[18] and aim to measure financial literacy spanning economic concepts in the "saving and portfolio" choice domain (Lusardi and Mitchell, 2011). The second set of questions, Q4-Q6, are the authors' own questions designed to assess banking-related knowledge. Since the purpose of this study is to investigate the influence of financial literacy on i-banking behaviour, these questions aim to capture concepts that lie at the basis of day-to-day financial transactions and are related to important issues in the Cypriot banking sector, especially mortgage-related concepts that cannot solely be assessed by the Big Three questions. Hence, the addition of the three additional banking specific questions (Q4-Q6) to the Big Three questions (Q1-Q3), enables us to develop a comprehensive measure of financial literacy that spans the "saving, portfolio and mortgage" choice domain. Overall, the inclusion of six (instead of three) questions enhances our capacity to differentiate between financial literacy levels, which, as suggested by Lusardi and Mitchell (2011), is a prerequisite to compare people in terms of their scores on a common set of questions.

The main measure of financial knowledge is the average score of correct answers to the six financial knowledge questions of Table 1, namely FK OVERALL, whereby each correct answer takes a score of one and all others take a score of zero (OECD, 2016; Andreou and Philip, 2018). For comparison, and in order to see whether there are any differential effects between the three alternative sets of questions (Q1-Q3, Q4-Q6 and Q1-Q6), we present results separately for FK BIG3 (i.e. the average score from the respondents' correct answers to the Big Three questions Q1, Q2 and Q3) and for FK BANK (i.e. the average score from the respondents' correct answers to Q4, Q5 and Q6). Table A1 of the Online Appendix exhibits definitions for the three financial literacy measures along with other variables, which are used in this study's analyses.

4.1 Descriptive analysis

The breakdown of the responses to financial knowledge questions regarding the frequency and proportion of "Correct", "Wrong", "Don't Know / Don't Answer" replies by female, male and the entire sample is reported in Table 3. Panel A shows that more than half of the respondents (350 respondents or 58.33% of the entire sample) answered correctly to the question on inflation

[18]The OECD/INFE International Survey of Adult Financial Literacy Competencies (2016) questions are largely drawn from existing surveys and have all been validated and approved by OECD/INFE experts. They represent good practices in financial literacy and financial inclusion measurement. The questionnaire has been successfully used to capture the financial literacy of diverse populations and has been applied to more than 40 countries that participated in an international survey of adult financial literacy competencies.

(Q2) and the question on awareness of crucial banking services (Q6) (335 respondents or 55.83% of the entire sample). The percentage of correct answers to the question on understanding the composition of the annual percentage rate (Q4) is 49.67%, and to the question on the benefits of risk diversification (Q3) is 50.67%. The compound interest rate question (Q1) and the understanding of the application of annual percentage rate (Q5) presented more of a challenge, since only 42% and 42.50% of respondents respectively could answer accurately. This evidence provides the first indication of reliability in our FK OVERALL instrument, as the distribution of correct answers seems to be balanced between its two composite measures, namely FK BIG3 and FK BANK.

[Insert Table 3, here]

Panels B, C and D of Table 3 show the number of "Correct", "Wrong" and "Don't Know/ Don't Answer" responses for Q1-Q3 (FK BIG3), Q4-Q6 (FK BANK) and Q1-Q6 (FK OVERALL). Accordingly, the number of individuals who answered correctly to Q1-Q3 is close to the number of individuals who answered correctly to Q4-Q6. The first question (Q1) is the one which presents the lowest frequency of correct answers, while the second and sixth questions (Q2 and Q6) are those with the highest frequencies in the entire sample. However, over the entire sample, only 32 respondents (or 5.33% of the sample) answered all the questions (Q1-Q6) correctly. Thus, individuals who answered Q1-Q3 correctly are not the same individuals as those that answered Q4-Q6 correctly, i.e. questions Q1-Q3 and Q4-Q6 capture different aspects of financial knowledge. This pattern of responses further corroborates the reliability of our financial knowledge measure, since it is obvious that our own banking-related questions add information to the overall measure and are complementary to the Big Three.[19] The reliability of the scale of financial knowledge (FK OVERALL) was also assessed using Pearson pairwise correlation coefficients for the number of correct answers to each question, along with pairwise correlation coefficients with FK BIG3 and FK BANK (Table A2 of the Online Appendix). While the degree of financial literacy as measured by FK OVERALL is clearly correlated to each of the six questions forming the overall measure (coefficients of correlation between 0.46 and 0.78), the correlation between the six questions is smaller, ranging from 0.01 to 0.29.[20]

In this study, following Andreou and Philip (2018), a proficiency in financial knowledge is attributed to those answering at least four out of six financial knowledge questions correctly.[21]

[19]Given that the numbering of the questions here does not reflect the original numbering of the questions as they appear in the survey instrument, the above resembles a split-half reliability test where the sample is randomly split and the scores are then calculated for each half. In untabulated results, we also tried different splits (for example Q1, Q3, Q5 *vs.* Q2, Q4, Q6) and overall it can be said that the internal consistency of the data of this study is very good.

[20]The number of correct answers to Q1, Q2 and Q3 are statistically correlated (coefficients in the range 0.10 to 0.25), and the same holds true for the number of correct answers to Q4 and Q5 (coefficient of 0.29). The number of correct answers to Q4 does not present any statistically significant correlation with Q1-Q3. The number of correct answers for Q6 is strongly correlated with all other financial knowledge questions (coefficients in the range 0.12 to 0.26). As for the financial knowledge measures: FK BIG3 and FK BANK are highly correlated with FK OVERALL (correlation coefficients 0.780 and 0.778 respectively with *p-values*<0.01), while the correlation coefficient of FK BIG3 with FK BANK is 0.214 (*p-value*<0.01).

[21]This quantification focuses on the proportion of the respondents who answered at least 67% of the questions

Accordingly, 37.33% of Cypriots who responded to the survey appear to have a good level of financial knowledge and are thus perceived to be financially literate individuals.

Another robust finding across many countries is the gender gap with respect to financial literacy (Lusardi and Mitchell, 2008; Lusardi and Tufano, 2009, 2015; Hung *et al.*, 2009; Mottola, 2013; Bucher-Koenen *et al.*, 2016; Agnew and Harrison, 2015; Klapper *et al.*, 2015): men usually score higher on financial literacy than women. This is apparent in the distribution of correct answers to the six financial knowledge questions which indeed varies markedly with gender. Among those with all correct answers, only 1.67% are women, while the respective percentage for men is more than double (3.67%). Moreover, women are also much more likely to state that they cannot answer a question, which is indicative of very low levels of financial knowledge.[22] However, for the banking-related questions Q4-Q6, as captured by FK BANK, women score on average relatively well compared to men with the exception of the question on awareness of crucial banking issues (Q6), whereby 20.33% of women cannot give an answer. These results square with women's banking attitudes. Specifically, when combined with the respondents' summary statistics presented in Table 2, women tend to have a relationship with fewer banks than men and for a longer duration, while they turn to a bank clerk as a primary source of financial advice more often than men.

Table 4 reports summary statistics for the financial literacy variables (FK BIG3, FK BANK and FK OVERALL) and all variables used in the regression analysis over the entire sample, then for the subsample of respondents who answered *fewer* than four questions correctly (perceived as financially illiterate) and also for the subsample of respondents who answered *at least* four questions correctly (perceived as financially literate). The last column of this table reports the Pearson correlations of the variables with the main financial literacy score (FK OVERALL). For completeness, Table A3 of the Online Appendix reports pairwise correlation of the three financial literacy measures with all the variables used in our analyses.

[Insert Table 4, here]

As reported in Table 4, the mean values for FK BIG3, FK BANK and FK OVERALL are 0.503, 0.493 and 0.498, respectively.[23]Respondents aged 39 or younger (MILLENNIALS) are fewer in the sample of knowledgeable respondents; the mean difference stands at -0.115 (p-*value*<0.01), while the Mann-Whitney test has p-*value*<0.01, whereby both tests confirm other recent evidence of low

correctly. In the OECD survey (2016) a minimum target score of at least five out of seven on the knowledge questions is employed, translating to a threshold of at least 70% of correct replies.

[22]Even though for the annual percentage rate questions (Q4 and Q5) the correct responses are consistent across gender, the division among correct responses becomes particularly noticeable when looking at Q1, Q2 and Q6. The gender difference is greater for the compound interest rate calculation question, to which female respondents are found to be 11 percentage points less likely to answer correctly and 4 percentage points more likely to indicate "Don't Know." A smaller difference is found for the inflation question. Here, the gender difference is 5 percentage points, and women are 4 percentage points more likely to answer "Don't Know". Finally, women are 7 percentage points less likely to correctly answer the awareness of crucial banking issues question.

[23]For comparison with the results reported in the study, we have estimated FK OVERALL using post-stratification weights that account for base weights and population proportions. Accordingly, the weighted FK OVERALL equals 0.495 (compared to 0.498 as reported in Table 4) and the level of financially literate individuals equals 36.3% (compared to the 37.33% as reported in Table 3).

financial literacy among young adults (see, for example, Lusardi *et al.*, 2010; Andreou and Philip, 2018). This evidence is also corroborated by the correlation of this variable with FK OVERALL, which is -0.146 (*p-value*<0.01). There is also a notable difference in financial knowledge between younger (25-29 years old) and older millennials (30-39 years old). The mean differences for younger millennials (YOUNG MILLENNIALS) and older millennials (OLD MILLENNIALS) stand at -0.056 and -0.060 respectively. However, these are marginally significant for YOUNG MILLENNIALS (*p-value*<0.10) and insignificant for OLD MILLENNIALS (and the same result holds true for the *p-values* for Mann-Whitney tests).

The number of respondents with a university degree (UNIVERSITY), the number of respondents studying Business at university (BUSINESS MAJOR) and the number of respondents employed in the financial services industry (FINANCIAL) are statistically higher *(p-values*<0.01) in the financially literate sample, and the Mann-Whitney tests (*p-values*<0.01) suggest that education and employment play a very important role for financial literacy. Furthermore, all the corresponding correlations of these variables with FK OVERALL are positive and highly statistically significant. Table 4 also provides supporting evidence that higher income individuals (HIGH INCOME) appear to be more financially literate compared to their lower income peers (mean difference = 0.092, *p-value*<0.01; Mann-Whitney *p-value*<0.01; correlation coefficient = 0.195, *p-value*<0.01).

Individuals with multiple bank activity (i.e. those that have a relationship with three or more financial institutions) are more likely to be financially literate. Specifically, the mean score of multiple bank activity (MULTIPLE BANKS) is statistically higher (mean difference = 0.107, *p-value*<0.01; Mann-Whitney *p-value*<0.01) in the sample of financially literate individuals, indicating that highly knowledgeable individuals tend to engage with three or more financial institutions (correlation coefficient = 0.123, *p-value*<0.01). Conversely, the proportion of individuals who have a relationship with their primary bank for seven years or longer (LONG BANK) is higher in the financially literate sample (mean difference = 0.083, *p-value*<0.05), whereby its correlation with FK OVERALL is 0.134 (*p-value*<0.01). However, changing primary bank (CHANGED BANK) in the last 12 months does not appear to be statistically significant between the two samples.

Regarding the characteristics and skills that matter for financial literacy scores the results show that the mean score of mathematical skills (MATHS SKILLS) and information technology skills (IT SKILLS) are statistically higher (*p-values*<0.01) in the financially literate sample. The Kruskal-Wallis test also indicates that financial literacy is higher for those individuals with higher scores in MATHS SKILLS (*p-values*<0.01) and IT SKILLS (*p-value*s<0.10). Both variables are also positively correlated with FK OVERALL (*p-values*<0.01). Regarding the two financial behaviour variables, i.e. risk-taking (RISK TAKING) and optimism (OPTIMISM), and the variable for cognition in avoiding numbers (AVOID NUMBERS), it appears that there is no statistically significant difference between the high and low financial knowledge groups.

An important question the paper aims to answer is not only whether respondents possess financial knowledge proficiency, but also whether their financial literacy level matters in financial decision-making and banking relationships. This is done by first examining whether the source

of information that individuals use when making financial decisions is related to their literacy levels. Table 4 shows that a higher proportion of respondents who rely on professional sources of information (ADVISE PROFESS) are in the high knowledge group, although the differences are not statistically significant between the two samples. Yet, the correlation of this variable with FK OVERALL is 0.081 and statistically significant (p-$value$<0.05). Recent studies provide evidence ranging from a negative relationship between financial literacy and the demand for expert financial advice (see, for example, Hung and Yoong, 2010 for US), to a positive relationship (see, for example, Bhattacharya *et al.*, 2012 for Germany), and also to no relationship at all (Georgarakos and Inderst, 2014). The results of our study, point to a weak univariate relationship between financial literacy and the propensity to seek advice from professionals in Cyprus. However, the mean score for trust in social media (TRUST SOCIAL MEDIA) is significantly lower in the financial literacy group (mean difference = -0.468, p-$value$<0.10; correlation coefficient = -0.106, p-$value$<0.01) and the Mann-Whitney has a p-$value$<0.10. This is a good indication that financially literate individuals are more likely to understand that they cannot trust social media information, recognising that it can be associated with fake news or scams. Of course, at the same time financially illiterate individuals may be more prone to falling prey to social media pressure and envy (see, also Andreou and Philip, 2018).

4.2 Determinants of financial literacy

We investigate the determinants of financial literacy to see whether there are differential effects between the three sets of questions: FK BIG3 (Q1-Q3), FK BANK (Q4-Q6) and FK OVERALL (Q1-Q6). OLS results are presented in Table 5 using the three dependent variables, namely FK BIG3 in models (1) and (2), FK BANK in models (3) and (4) and FK OVERALL in models (5) and (6). A variance inflation factor (VIF) test suggests no multicollinearity problems (mean VIF<1.500).[24]

As in prior studies, covariate demographics as well variables for personal traits and skills that may influence financial literacy levels are included. To gain more insights about the determinants of financial literacy, more socio-demographic covariates are considered in additional analyses.

The specification includes covariates pertaining to the respondents' banking activity. These include: a binary that equals one if the respondent currently has a customer relationship with three or more financial institutions (MULTIPLE BANKS), a binary that equals one if the respondent has a primary bank relationship for seven years or longer (LONG BANK), and a binary that equals one if the respondent has changed primary bank within the last year (CHANGED BANK).

A binary is also included for indicating the respondent's skill set in using information technology (IT SKILLS) because these skills indicate an individuals' aptitude in using financial services via information technologies. Finally, as discussed above, the literature is not clear about whether people who lack financial knowledge are more likely to seek advice to make up for their shortfalls. Despite mixed evidence, financial literacy levels can be associated with some measures of financial

[24]The results remain qualitatively the same when using tobit regressions instead of OLS.

behaviour, for example the source of obtaining financial information. To take this into account, additional covariates were considered, particularly a binary indicating advice from professionals (ADVICE PROFESS) and a binary indicating the respondent' daily engagement with social networks (HIGH SOCIAL MEDIA). Optimism is employed as one of the variables since it appears to play a role in risk-taking and portfolio choice. Optimistic consumers choose risky portfolios for their investments and have higher personal debt (see, for example, Puri and Robinson, 2007).

Models (1), (2), (5) and (6) of Table 5 indicate that gender (GENDER) is positive and statistically significant (*p-values*<0.01) for FK BIG3 and FK OVERALL; on average, female respondents score worse than male respondents on these questions, as already discussed. This significant financial literacy-gender bias remains strong even after controlling for the larger set of variables in models (2) and (6), evidence that also squares with the findings in Andreou and Philip (2018). However, the gender bias although still positive, does not appear as a statistically significant determinant in models (3) and (4), where financial knowledge is measured as the average score of correct answers to the three banking related questions FK BANK (Q4-Q6).

[Insert Table 5, here]

Another robust finding reported by prior studies across a number of countries is that financial literacy levels are lowest among the young and the old (see, for example, Lusardi *et al.*, 2010; Lusardi and Tufano, 2015). Individuals aged 39 or younger, the so-called millennials or Generation Y, indeed show lower levels of financial literacy. Low literacy among the young might be problematic since this group faces financial decisions that influence their financial wellbeing for decades to come. Moreover, this generation, now making up the largest share of the labour market, is vital to financial institutions' success. Individuals aged 39 or younger, are increasingly swapping traditional banks for new options and retail banking needs to adjust its business models, products and services to keep pace with the evolving views of this younger but maturing generation. In fact, results in models (5) and (6) indicate that respondents aged 25-29 (YOUNG MILLENNIALS), as well as those aged 30-39 (OLD MILLENNIALS) scored on average lower than older respondents (*p-values*<0.01); this finding remains unchanged even after considering a larger set of explanatory variables (*p-values*<0.01). It is striking that this well-documented result in the literature is apparent in models (3) and (4) but not in models (1) and (2) (only for YOUNG MILLENNIALS and without controlling for extra variables, the coefficient is marginally significant with a *p-value*<0.10). This further vindicates the inclusion of the three banking-related questions Q4-Q6 (in addition to the Big Three questions) in the construction of the financial knowledge measure.

The results in models (2), (4) and (6) show that those who are employed in the financial services industry (FINANCIAL) tend to be more financially literate (*p-value*<0.01 for models (2) and (6) and *p-value*<0.05 for model (3)). This can be explained by the fact that those working in the finance industry are more likely to better understand and be more aware of economic and financial concepts, and hence have a higher level of financial literacy. Higher education (UNIVERSITY) also plays a significant role (*p-value*<0.01) in explaining financially knowledgeable individuals. The finding is consistent with existing literature, which outlines that education is one of the most important

factors in ensuring adequate levels of understanding of financial concepts. These results, along with the high correlation with FK OVERALL shown in Table 4, help in the construction of valid instruments for financial literacy as discussed later.

There is also some evidence in models (1), (3) and (5) to support that individuals who studied Business at university (BUSINESS MAJOR) are more likely to be financially literate than those who studied other subjects (although it turns insignificant when additional controls are included). This means that those with a high level of education and with a focus on business studies obviously have a higher level of financial literacy. The result suggests that courses related to finance might have a significant impact on financial literacy in university education (see, for example, Chen and Volpe, 1998; Xiao *et al.,* 2007; and more recently Kaiser *et al.*, 2020). Models (1) and (5), reporting positive coefficients (*p-value*<0.10 and *p-value*<0.05 respectively) of the high income variable (HIGH INCOME), lend some credence to the notion that individuals with high income are more financially knowledgeable than those with low income.

An interesting result is that having a customer relationship with three or more financial institutions (MULTIPLE BANKS) and having a long customer relationship (seven years or longer) with a primary bank (LONG BANK) plays no significant role under the FK BANK, and only a marginally significant role under the FK OVERALL measure (*p-value*<0.10).

In terms of evaluating the importance of respondents' soft skills and traits, the results show that individuals who consider themselves good in mathematics (MATHS SKILLS) have higher financial knowledge under all measures (*p-values*<0.01 after controlling for many variables). Results do not support that there is a statistically significant relationship between seeking financial advice from professionals (ADVICE PROFESS) and financial knowledge, something that squares with the univariate evidence in Table 4. The same holds true for the HIGH SOCIAL MEDIA variable.

5 The banking services channels: branch visit or i-banking use

5.1 Probit regressions

The study investigates the factors that influence individuals' behaviour towards two types of banking services, i.e. branch visits or i-banking, and whether financial literacy plays a role in each case. The question "*How often are you using the following banking services within a month: visit to the branch and i-banking?*", as presented in Figure A1 of the Online Appendix, resulted in 33.83% of the respondents replying that they "rarely (or never)" use i-banking. Figures A2a, A2b of the Online Appendix show a breakdown of the frequency of this response by age group and gender. The likelihood of visiting a branch "rarely (or never)" is higher for young individuals while the reverse holds true for their likelihood of using i-banking "rarely (or never)". Given that the sample consists of people who have a bank account the next research question explores the determinants of this banking behaviour.

Table 6A reports the probit regressions results to estimate respondents' behaviour for the two different dependent variables: models (1) to (4) employ VISIT RARE that takes the value of one

when the respondent has answered "rarely (or never)" for visiting a branch within a month and zero otherwise; models (5) to (8) employ ONLINE RARE that takes the value of one when the respondent has answered "rarely (or never)" for using i-banking within a month and zero otherwise.

The vector of explanatory variables includes socio-demographic covariates, i.e. gender (GENDER), age (MILLENNIALS), area of residence (METROPOLITAN and URBAN), banking activity (MULTIPLE BANKS, LONG BANK and CHANGED BANK) and two variables capturing behavioural characteristics, i.e. tendency to take risks (RISK TAKING) and optimism (OPTIMISM). As our age variable, and for baseline probit regressions, we use MILLENNIALS rather than distinguishing between younger and older millennials, since the mean differences are only marginally significant in Table 4, and the two variables appear to have the same effect on financial knowledge (both in terms of magnitude and significance), as shown in Table 5. Other covariates included in the analysis are skills in using information technology (IT SKILLS), cognition in avoiding information involving numbers (AVOID NUMBERS) and two behavioural characteristics related to social media, i.e. daily social media engagement (HIGH SOCIAL MEDIA) and trust in social media (TRUST SOCIAL MEDIA). For completeness, Table A3 of the Online Appendix reports all pairwise correlations between dependent and independent variables.

[Insert Table 6A, here]

Model (1) shows the baseline probit model for VISIT RARE without any of our measures of financial literacy. Individuals who are younger are less likely to visit a branch while those that engage with multiple banks are more likely to often visit a branch within the last month. As shown in Table 6A, models (2) and (4) indicate that financial literacy (FK BIG3 and FK OVERALL) is significantly negatively associated with branch visits for receiving on-the-spot banking services. Specifically, as both FK BIG3 and FK OVERALL increase, respondents declare that they visit more rarely a branch. Other interesting results from model (4) show that being a young individual (MILLENNIALS) leads to an average increase of 12.6% (p-$value$<0.01) in the probability of visiting a branch "rarely (or never)" while, by contrast, having a relationship with three or more banks (MULTIPLE BANK) leads to an average decrease of 12.8% (p-$value$<0.01), and having changed primary bank in the last year (CHANGED BANK) leads to an average decrease of 9.1% (p-$value$<0.10) in the probability of visiting a branch "rarely (or never)".

Models (6) to (8) provide further evidence to support that financial literacy plays a pivotal role in the choice of channel for receiving banking services. As per these models, i-banking behaviour is largely driven by the financial literacy level (FK BIG3, FK BANK and FK OVERALL) of individuals, with strong statistical significance (p-$value$<0.01). Financially literate individuals have an increased probability of using i-banking and this result remains strong after including a large set of socio-demographic covariates, as well variables for skills, traits and behavioural characteristics. Specifically, in model (8), we evince that for one standard deviation increase in the respondents' mean financial knowledge score the average decrease in the probability of using i-banking "rarely (or never)" is 7.5% (p-$value$<0.01). This result suggests that people with high financial literacy

are more likely to frequently use i-banking, compared to those with low levels of financial literacy (holding other variables constant).[25]

Other factors that contribute to respondents' preference towards using i-banking as per models (5) to (8) are age, area of residence and soft skills. Millennials (MILLENNIALS) (*p-values*<0.01) and those that live in an urban area (URBAN) (*p-values*<0.10) are more inclined to use i-banking and the same holds truefor those with greater skills in using information technology (IT SKILLS) (*p-values*<0.01) and with risk-taking behaviour (RISK TAKING) (*p-values*<0.05). More specifically, in model (8) the likelihood of "rarely (or never)" using i-banking decreases on average by 19% for MILLENNIALS and by 7% for those living in an URBAN area. A one standard deviation increase in the mean score for skills in using information technology reduces by 14% on average the probability of "rarely (or never)" using i-banking. A one standard deviation increase in the mean score for risk-taking behaviour (RISK TAKING), reduces by 4% on average the probability of "rarely (or never)" using i-banking. High daily social media engagement (HIGH SOCIAL MEDIA) is not found to be a statistically significant influencing factor for i-banking use.

Overall, these results suggest that increasing financial literacy among Cyptiots would increase the use of i-banking services.

5.2 Instrumental variable (IV) estimates

Assessing the direction of causality between financial literacy and attitudes for receiving banking services (i.e. visiting a branch or using i-banking services) is a challenge, as financial literacy is potentially an endogenous variable. To address this problem, we rely on instrumental variable (IV) estimations using a set of two instruments, i.e. whether a respondent is employed in the financial services sector (FINANCIAL), and whether the respondent has a university degree (UNIVERSITY), to exogenously measure exposure to financial information or to an environment with individuals having (higher) financial knowledge. Similar instruments have been employed in the literature. For instance, van Rooij *et al.* (2011, 2012) use the level of economics education as an instrument. Both these variables are positively (and significantly) correlated with the main measure of financial knowledge FK OVERALL in Table 4 and are significant under all three financial knowledge measures in all specifications of Table 5.

At the same time, we argue that these instruments are expected to be exogenous: employment in the financial sector and a university degree should have no direct effect on i-banking use. First, the indicator that we use in our regression measures employment in the financial services in a broad sense, i.e. the current classification does not distinguish between different jobs in the same sector. Second, basic skills alone such as those taught in universities should not have a direct effect on i-banking use. Therefore, we believe that a university degree only affects attitudes for receiving

[25]Conversely, we could define the dependent variable as ONLINE FREQUENT by reversing the logical value in the variable ONLINE RARE; i.e. ONLINE FREQUENT defined to take the value of zero when the respondent has answered "rarely (or never)" for using i-banking within a month and one otherwise. In such a case, for a one standard deviation increase in the respondent's mean financial knowledge score, the average increase in the probability of frequently using i-banking is 10.2% (*p-value*<0.01).

banking services through financial literacy.

The first-stage regression results, columns (1) and (3) of Table 6B, show that the two instruments have a positive and statistically significant impact on financial literacy. Columns (2) and (4) present IV probit estimates of the probability of "rarely (or never)" visiting a branch and using i-banking, respectively. Wald statistics from the tests of exogeneity reject the null hypothesis (*p-values*<0.01). Additional instrument validity tests are shown at the bottom of Table 6B. The Kleibergen-Paap LM and Wald statistics reject the null hypothesis that the equation is underidentified or weakly identified. Moreover, the Hansen J test of overidentifying restriction for both models shows that the instruments are valid. Together, these tests suggest that FINANCIAL and UNIVERSITY are valid instruments for financial literacy in our study.

[Insert Table 6B, here]

The results in model (2) show that the relationship between financial knowledge and "rarely (or never)" visiting a branch remains positive and highly statistically significant (*p-value*<0.01), and the ones in model (4) show that the relationship between financial knowledge and using i-banking "rarely (or never)" remains negative and highly statistically significant (*p-value*<0.01).

As a further robustness check, we apply the IV method developed by Lewbel (2012) in addition to conventional IV methods. These IV results confirm our earlier inferences that financial literacy has a positive and significant impact on i-banking use (Table A4 in the Online Appendix).

5.3 Robustness and additional analyses

First, to shed more light on the robustness of our findings, in the probit regressions of Table 6A we include more control variables that have been suggested in the literature. Given the evidence that there is a notable difference in financial knowledge between younger and older millennials (Yakoboski *et al.*, 2018), we consider both younger millennials (YOUNG MILLENNIALS) and older millennials (OLD MILLENNIALS) as controls. Furthermore, income is observed to play an important role in explaining the level of financial knowledge in Cyprus (Andreou and Philip, 2018), so we also include individuals with higher income (HIGH INCOME). Table A5 of the Online Appendix reports the results from this additional analysis and Table A3 reports pairwise correlations between the control variables. Overall, the inference of the positive effect of financial knowledge on the likelihood of frequently using i-banking remain statistically strong (*p-values*<0.01) under the additional controls.

Second, as a further robustness test, we replicated the probit regression results of Table 6A whereby we use as our explanatory variables the number of (i) "Wrong" and (ii) "Don't Know/Don't Answer" replies out of all responses to the six financial knowledge questions. The results presented in Table A6 of the Online Appendix broadly confirm our finding that high financial literacy levels (i.e. the lowest number of "Wrong" and "Don't Know/Don't Answer" responses) are positively associated with the frequency of using i-banking.

Third, to gain more insight about the reasons for using i-banking "rarely (or never)", the survey participants are asked to provide on a scale of 1 to 10, where 1 means *totally disagree* and 10 means *totally agree*, to what extent they agree or disagree with four statements. Table 7, Panel A presents the summary statistics of the responses to those questions. The analysis of barriers to i-banking use shows that personal contact with a bank officer is the most prominent reason for 61.08% of the respondents that use i-banking "rarely (or never)". At the same time, 42.36% *totally agree* that lack of information technology skills is the reason for using i-banking "rarely (or never)", while 40.39% *totally agree* that lack of banking knowledge is the reason for using i-banking "rarely (or never)".

[Insert Table 7, here]

In fact, Panel B of Table 7 reports the mean and standard deviation of each statement's score, for the entire sample, then for the sample of financially illiterate and also for the sample of financially literate respondents. In general, results show that financially literate individuals are less inclined to report lack of skills (whether they are referring to information technology skills or necessary banking knowledge) as a reason for not using i-banking. The mean difference between the means of the two samples (financially literate vs. illiterate) is statistically significant both for information technology skills and necessary banking knowledge (*p-values*<0.01). Moreover, trust in i-banking services appears to be a significant dimension for i-banking use between the two samples. Financially literate respondents perceive the lack of trust in i-banking as a less significant factor for using i-banking "rarely (or never)" than their financially illiterate peers.

Overall, Table 7 highlights one basic consumer perception that prevents financially illiterate individuals from adopting and using i-banking: bank transactions can be realized better through personal contact with a bank officer. The results also indicate that most Cypriot bank customers are self-assessed as "low knowledgeable" regarding their "information technology skills" (i.e. pointing to low digital proficiency) and their "basic banking knowledge" (i.e. pointing to low financial literacy). These two characteristics prevent many consumers in Cyprus from using i-banking services and make them more inclined to visit a branch to receive banking services. Digital financial illiteracy therefore appears as a factor that undermines Cypriot consumer appetite for i-banking.

6 Conclusions and policy implications

The digital age and the advent of financial technologies have enabled access to a variety of financial products and services with only a click of a button. But little research to date has considered how the use of these new technologies is related to financial literacy. This study examines the level and antecedents of financial literacy and investigates its influence on i-banking behaviour.

The results show that only 37.33% of the respondents have a good level of financial knowledge, with the problem appearing significantly more severe among women and young individuals. Some of the interesting results of this study, include the gender gap, with males reporting higher levels of financial literacy than females, and an income and education channel affecting financial literacy.

Overall, the combined evidence shows that Cyprus ranks rather low in the global arena of financial literacy.

Moreover, the results reveal a strong positive relationship between financial literacy and i-banking behaviour. While 33.83% of the respondents replied that they "rarely (or never)" use i-banking, a higher financial knowledge score is positively associated with i-banking use for receiving on-the-spot banking services. Millennials tend to use i-banking more frequently and some skills are more important in explaining i-banking behaviour, namely skills in information technology.

Policy guidance suggests that greater financial literacy and consumer confidence may nurture more balanced behaviour with in regard to the management of wealth and budget in the long term (see, for example, OECD, 2015, 2016, 2018). This endeavour has now become even more imperative, as the OECD notes that "*in today's complex world, the development of an appropriate regulatory framework is essential, but not necessarily enough to guarantee the soundness of the financial system and the financial protection and wellbeing of individuals.... [hence] financial education should be developed hand-in-hand with an efficient regulatory framework*" (2009, pp. 9). Therefore, increased levels of digital financial literacy could enable individuals to make well-informed and sound decisions, to prevent irresponsible behaviour and to better judge the risks and benefits associated with products and services offered through financial technologies.

National strategies for financial education to improve digital financial literacy can equip and empower individuals with the required financial knowledge and skills as well as digital proficiency, to cultivate confidence in seeking appropriate financial advice, to avoid irrational behaviour and foster acumen to prudently evaluate economic conditions. In fact, digital financial literacy programmes not only educate and train consumers to effectively utilise digitalised financial products and services, but can also empower them to better manage digital financial risks and avoid malicious digital activity (e.g. phishing, hacking attacks and unauthorised use of data) (OECD, 2017b). Accordingly, policy interventions towards enhancing individuals' financial literacy could play an important role in ensuring financial and economic stability and in mitigating the risk and impact of future financial crises by making households more resilient to shocks.

Cyprus currently lacks a national strategy on financial literacy. Against this background, the findings from this study have some important implications for research and policy related to household finance. In the specific Cypriot context, the overall findings of this study in conjunction with the results of Andreou and Philips (2018), who show that students enter university without possessing essential financial knowledge and skillsets indicate that perhaps including a "Personal Finance" course in secondary and tertiary curricula could enable students to learn important financial concepts that would then help them make sound financial decisions later on life. This education could be followed up in more general training and life-long programmes. The financial industry could also be actively involved in programmes focusing on financial education. For example, organisations could offer free online training courses for teachers, design interactive activities and organise competitions for students to test their financial knowledge, sending newsletters to schools, etc.

However, in order to identify key areas and shape appropriate policy suggestions the develop-

ment of a wave of survey (e.g. every three years), in collaboration with a team of experts should be commenced. This would allow the regular monitoring of financial behaviour and evaluation of the effectiveness of financial education initiatives, something that could not be considered in this study. Moreover, with a view to improving consumer protection in the financial market, the government could also evaluate the impact and suitability of the various programmes launched over the years across countries so that best practices can be replicated in Cyprus (for an overview, see EBA, 2020). These include a call centre helpline that could offer free counselling to assist consumers in ensuring sound decision-making and preventing over-indebtedness or a website to gather and disseminate currently dispersed information using simple and educational language, as well to create a community for exchanging experiences. Interactive applications have also proven to be very useful in promoting financial education in other countries.

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Tables

Table 1: Financial knowledge questions

This table lists the survey questions to capture the financial knowledge of respondents. The second column lists the question topic, the third column reports the question source, the fourth column provides the detailed wording of the question and the fifth column lists the available answer options per question.

No.	Question topic	Question source	Question wording	Answer options (correct answer with bold)
Q1	Compound interest calculation	QK6 from OECD/INFE (2015) and similar in spirit with Q1 from Lusardi and Mitchell (2011)	Suppose you put €100 into a (no fee, tax-free) savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of five years?	Exactly €110 Less than €110 **More than €110** Exactly €102 Don't know Don't answer
Q2	Understanding & consequences of inflation	Q2 from Lusardi and Mitchell (2011)	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After one year, how much would you be able to buy with the money in the account?	More than today Exactly the same **Less than today** Don't Know Don't Answer
Q3	Benefits of risk diversification	Q3 from Lusardi and Mitchell (2011)	Buying a single company's stock usually provides a safer return than a stock mutual fund.	True **False** Don't know/ Don't answer
Q4	Understanding of composition of APR	Authors' own question	The Annual Percentage Rate (APR) includes all relevant costs to determine the total cost of credit for a loan.	**True** False Don't know/ Don't answer
Q5	Usage of APR	Authors' own question	The Annual Percentage Rate (APR) is the appropriate tool to consider when assessing loans offered by different banks.	**True** False Don't know/ Don't answer
Q6	Awareness of crucial banking issues	Authors' own question	In Cyprus, deposit guarantee schemes protect depositors' savings by guaranteeing deposits of up to €_____.	Open response (**€100,000**) False Don't know/ Don't answer

Sources: (i) OECD/INFE (2016). International Survey of Adult Financial Literacy Competencies. OECD Publishing. Paris; (ii) Lusardi, A. & Mitchell, O.S. (2011). Financial literacy around the world: An overview. Journal of Pension Economics & Finance, 10(4), pp.497-508.

Table 2: Respondents' characteristics

This table reports summary statistics for the frequency and proportion of respondents' characteristics tabulated across female individuals, male individuals and for the entire sample.

	Female		Male		Entire sample	
	Frequency	%	Frequency	%	Frequency	%
A. Demographics						
1. Gender	301	50.17	299	49.83	600	100
2. District						
a) Lefkosia	125	20.83	121	20.17	246	41.00
b) Lemesos	85	14.17	84	14.00	169	28.17
c) Larnaka	51	8.50	53	8.83	104	17.33
d) Ammochostos	16	2.67	16	2.67	32	5.33
e) Paphos	24	4.00	25	4.17	49	8.17
3. Area						
a) Urban	236	39.33	235	39.17	471	78.50
b) Rural	65	10.83	64	10.67	129	21.50
4. Years of age						
a) 25 to 29	40	6.67	40	6.67	80	13.33
b) 30 to 39	75	12.50	76	12.67	151	25.17
c) 40 to 49	76	12.67	74	12.33	150	25.00
d) 50 to 59	74	12.33	74	12.33	148	24.67
e) 60 to 65	36	6.00	35	5.83	71	11.83
5. Family Income						
a) Lower than 20,000 euro	124	20.67	109	18.17	233	38.83
b) 20,001 to 40,000 euro	85	14.17	96	16.00	181	30.17
c) 40,001 to 60,000 euro	39	6.50	36	6.00	75	12.50
d) More than 60,001 euro	15	2.50	28	4.67	43	7.17
e) Don't Answer	38	6.33	30	5.00	68	11.33
B. Education & Sector of Employment						
1. Level of education						
a) Master or higher	76	12.67	81	13.50	157	26.17
b) Bachelor	94	15.67	87	14.50	181	30.17
c) Secondary	83	13.83	93	15.50	176	29.33
d) Technical	34	5.67	27	4.50	61	10.17
e) Lower than tertiary	14	2.33	11	1.83	25	4.17
2. University disciplines						
a) Business majors	38	6.33	58	9.67	96	16.00
b) Non-business majors	165	27.50	137	22.83	302	50.33

3. Sector of Employment						
a) Finance & insurance	23	3.83	35	5.83	58	9.67
b) Other	278	46.33	264	44.00	542	90.33
C. Bank Activity						
1. Number of bank relationships						
a) One bank	113	18.83	108	18.00	221	36.83
b) Two banks	131	21.83	110	18.33	241	40.17
c) Three banks	45	7.50	50	8.33	95	15.83
d) More than three banks	8	1.33	23	3.83	31	5.17
e) Don't Answer	4	0.67	8	1.33	12	2.00
2. Primary bank relationship duration						
a) Less than 1 year	27	4.50	23	3.83	50	8.33
b) 1 to 3 years	13	2.17	22	3.67	35	5.83
c) 4 to 7 years	46	7.67	44	7.33	90	15.00
d) More than 7 years	213	35.50	203	33.83	416	69.33
e) Don't Answer	2	0.33	7	1.17	9	1.50
3. Primary bank preference (recent 12 months)						
a) Yes, I have changed	47	7.83	47	7.83	94	15.67
b) I am thinking to change	22	3.67	22	3.67	44	7.33
c) No, I haven't changed	230	38.33	228	38.00	458	76.33
d) Don't Answer	2	0.33	2	0.33	4	0.67
D. Other						
1. Source of financial advice						
a) Parents or Friends	51	8.50	61	10.17	112	18.67
b) Bank clerk	64	10.67	51	8.50	115	19.17
c) Professionals	24	4.00	24	4.00	48	8.00
d) Internet/Media	115	19.17	134	22.33	249	41.51
e) Other	47	7.83	29	4.83	76	12.67
2. Social media activity (per day)						
a) No account	62	10.33	64	10.67	126	21.00
b) Less than 1 hour	102	17.00	106	17.67	208	34.67
c) 1 to 3 hours	92	15.33	87	14.50	179	29.83
d) More than 3 hours	45	7.50	42	7.00	87	14.50

Table 3: Patterns of responses to financial knowledge questions

This table presents the patterns of responses ("Correct", "Wrong" and "Don't Know / Don't Answer") to the six financial knowledge questions of Table 1. Panel A presents the distribution of answers regarding their frequency and proportion tabulated across female individuals, male individuals and the entire sample. Panels B to D present the number of "Correct", "Wrong" and "Don't Know / Don't Answer" for financial knowledge questions Q1 to Q3, Q4 to Q6 and Q1 to Q6, respectively.

	Female		Male		Entire sample	
	Frequency	%	Frequency	%	Frequency	%
Panel A: Distribution of answers across the six questions						
Q1. Compound interest calculation						
Correct	93	15.50	159	26.50	252	42.00
Wrong	155	25.83	113	18.83	268	44.67
Don't Know / Don't Answer	53	8.83	27	4.50	80	13.33
Q2. Understanding & consequences of inflation						
Correct	160	26.67	190	31.67	350	58.33
Wrong	53	8.83	45	7.50	98	16.33
Don't Know / Don't Answer	88	14.67	64	10.67	152	25.33
Q3. Benefits of risk diversification						
Correct	146	24.33	158	26.33	304	50.67
Wrong	124	20.67	118	19.67	242	40.33
Don't Know / Don't Answer	31	5.17	23	3.83	54	9.00
Q4. Understanding of the composition of APR						
Correct	150	25.00	148	24.67	298	49.67
Wrong	92	15.33	102	17.00	194	32.33
Don't Know / Don't Answer	59	9.83	49	8.17	108	18.00
Q5. Usage of APR						
Correct	128	21.33	127	21.17	255	42.50
Wrong	65	10.83	86	14.33	151	25.17
Don't Know / Don't Answer	108	18.00	86	14.33	194	32.33
Q6. Awareness of crucial banking issues						
Correct	145	24.17	190	31.67	335	55.83
Wrong	34	5.67	22	3.67	56	9.33
Don't Know /Don't Answer	122	20.33	87	14.50	209	34.83

Panel B: Number of correct, wrong, and don't know/ don't answer for financial knowledge questions Q1 to Q3

	None	One	Two	All
Correct	107	191	191	111
Wrong	177	258	145	20
Don't Know /Don't Answer	403	125	55	17

Panel C: Number of correct, wrong, and don't know/ don't answer for financial knowledge questions Q4 to Q6

	None	One	Two	All
Correct	110	198	186	106
Wrong	317	171	106	6
Don't Know /Don't Answer	254	222	83	41

Panel D: Number of correct, wrong, and don't know/ don't answer for financial knowledge questions Q1 to Q6

	None	One	Two	Three	Four	Five	All
Correct	34	70	127	145	117	75	32
Wrong	106	172	167	118	36	1	0
Don't Know /Don't Answer	203	195	88	61	31	13	9

Table 4: Summary statistics

Summary statistics of the variables used in regression analyses. Columns (1) and (2) report the mean and standard deviation (S.D.) of the variables for the entire sample. Columns (3) and (4) report the mean and standard deviation of the variables for the sample of respondents who answered fewer than four questions correctly (perceived as *financially illiterate* individuals). Columns (5) and (6) report the mean and standard deviation of the variables for the sample of respondents who answered at least four questions correctly (perceived as *financially literate* individuals). Column (7) reports *p-values* statistical significance resulting from *t*-tests that are testing the difference of means between columns (5) and (3), i.e., mean difference between *financially literate* vs *financially illiterate* individuals. Column (8) reports *p-values* statistical significance resulting from Mann –Whitney or the Kruskal –Wallis test (adjusted for ties) that are testing the difference for a given binary or ordinal variable respectively between *financially illiterate* and *financially literate* individuals. Column (9) reports Pearson correlation coefficients of the variables with the main financial knowledge score (FK OVERALL). All the variables are defined in Table A1 of the Online Appendix. * denotes *p-value*<0.10; ** denotes *p-value*<0.05; *** denotes *p-value*<0.01.

	Entire Sample		Financially illiterate individuals		Financially literate individuals		*t*-test	Mann –Whitney or Kruskal –Wallis test	Correl. with FK OVERALL
	Mean	S.D.	Mean	S.D.	Mean	S.D.			Corr. Coef.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial literacy									
FK BIG3	0.503	0.329	n.a	n.a	n.a	n.a	n.a	n.a	0.780***
FK BANK	0.493	0.328	n.a	n.a	n.a	n.a	n.a	n.a	0.778***
FK OVERALL	0.498	0.256	0.336	0.161	0.770	0.121	***	***	1.000
Demographics									
GENDER	0.498	0.500	0.460	0.499	0.563	0.497	**	**	0.169***
MILLENNIALS	0.385	0.487	0.428	0.495	0.313	0.465	***	***	-0.146***
YOUNG MILLENNIALS	0.133	0.340	0.154	0.362	0.098	0.298	*	*	-0.080*
OLD MILLENNIALS	0.252	0.434	0.274	0.446	0.214	0.411			-0.101*
METROPOLITAN	0.410	0.492	0.383	0.487	0.455	0.499	*	*	0.029
URBAN	0.785	0.411	0.769	0.422	0.813	0.391			0.049
FINANCIAL	0.097	0.296	0.051	0.219	0.174	0.380	***	***	0.215***
UNIVERSITY	0.563	0.496	0.495	0.501	0.679	0.468	***	***	0.178***
BUSINESS MAJOR	0.160	0.367	0.109	0.312	0.246	0.431	**	***	0.198***
HIGH INCOME	0.072	0.258	0.037	0.190	0.129	0.336	***	***	0.195***
Banking activity									
MULTIPLE BANKS	0.210	0.408	0.170	0.376	0.277	0.448	***	***	0.123***
LONG BANK	0.693	0.461	0.662	0.474	0.746	0.437	**	**	0.134***

CHANGED BANK	0.157	0.364	0.170	0.376	0.134	0.341			-0.036
Skills and traits									
MATHS SKILLS	7.107	2.226	6.649	2.321	7.875	1.820	***	***	0.275***
IT SKILLS	6.783	2.630	6.566	2.793	7.147	2.291	***	*	0.128***
AVOID NUMBERS	5.032	2.974	5.045	2.974	5.009	2.981			-0.054
RISK TAKING	4.737	2.784	4.662	2.865	4.862	2.644			0.017
OPTIMISM	7.778	2.156	7.777	2.239	7.781	2.014			-0.029
Other traits									
ADVICE PROFESS	0.080	0.272	0.066	0.249	0.103	0.304			0.081**
HIGH SOCIAL MEDIA	0.145	0.352	0.157	0.364	0.125	0.331			-0.083**
TRUST SOCIAL MEDIA	4.530	2.913	4.705	2.961	4.237	2.813	*	*	-0.106***

Table 5: Determinants of financial literacy

OLS regression results of the determinants influencing respondents' level of financial literacy, operationalised by questions Q1 to Q6 of Table 1. The dependent variable FK BIG3 in models (1) and (2) is the average score from the respondents' correct responses to questions Q1-Q3, FK BANK in models (3) and (4) is the average score from the respondents' correct responses to questions Q4-Q6, and FK OVERALL in models (5) and (6) is the average score from the respondents' correct responses to questions Q1-Q6, where in all cases each correct answer takes a score of one, while all other answers take a score of zero. A constant term is always included in the regressions. All the variables are defined in Table A1 of the Online Appendix. Huber-White robust standard errors are displayed in parentheses. All continuous variables are *z*-score standardised (mean value of zero and standard deviation of one).The bottom part of the table displays for each model: the number of observations (Obs.), the adjusted R-squared (Rsq. adj.), the *F*-test of regression models' overall significance and the variance inflation factor (VIF). * denotes *p-value*<0.10; ** denotes *p-value*<0.05; *** denotes *p-value*<0.01.

	FK BIG3		FK BANK		FK OVERALL	
	(1)	(2)	(3)	(4)	(5)	(6)
GENDER	0.314***	0.296***	0.111	0.098	0.273***	0.253***
	(0.077)	(0.077)	(0.078)	(0.079)	(0.075)	(0.075)
YOUNG	-0.242*	-0.186	-0.696***	-0.738***	-0.602***	-0.592***
MILLENNIALS	(0.130)	(0.134)	(0.126)	(0.136)	(0.125)	(0.132)
OLD	-0.156	-0.120	-0.532***	-0.558***	-0.441***	-0.435***
MILLENNIALS	(0.097)	(0.109)	(0.092)	(0.100)	(0.092)	(0.103)
METROPOLITAN		-0.074		-0.058		-0.084
		(0.082)		(0.084)		(0.081)
URBAN		0.054		-0.053		0.001
		(0.096)		(0.101)		(0.094)
FINANCIAL		0.435***		0.313**		0.480***
		(0.130)		(0.134)		(0.125)
UNIVERSITY	0.333***	0.350***	0.252***	0.223**	0.375***	0.367***
	(0.089)	(0.093)	(0.091)	(0.096)	(0.089)	(0.093)
BUSINESS MAJOR	0.274**	0.090	0.341***	0.202*	0.394***	0.187
	(0.115)	(0.130)	(0.106)	(0.116)	(0.105)	(0.115)
HIGH INCOME	0.335*	0.271	0.182	0.154	0.332**	0.273
	(0.153)	(0.152)	(0.157)	(0.158)	(0.151)	(0.150)
MULTIPLE BANKS		0.347***		-0.099		0.159*
		(0.086)		(0.089)		(0.081)
LONG BANK		0.191**		0.062		0.162*
		(0.086)		(0.089)		(0.085)
CHANGED BANK		-0.148		0.022		-0.081
		(0.106)		(0.110)		(0.104)
MATHS SKILLS	0.209***	0.195***	0.106***	0.084**	0.202***	0.179***
	(0.038)	(0.038)	(0.039)	(0.040)	(0.037)	(0.037)
IT SKILLS		-0.015		0.093*		0.050
		(0.047)		(0.049)		(0.046)
AVOID NUMBERS	-0.108	-0.093	0.031	0.028	-0.050	-0.042
	(0.040)	(0.039)	(0.041)	(0.041)	(0.039)	(0.039)
ADVICE PROFESS		0.123		0.219		0.219
		(0.142)		(0.137)		(0.136)

HIGH SOCIAL		0.038		-0.146		-0.069
MEDIA		(0.117)		(0.120)		(0.117)
Obs.	600	600	600	600	600	600
Rsq. adj.	0.131	0.166	0.101	0.111	0.168	0.194
F-test	16.365***	13.948***	13.525***	7.042***	20.754***	13.925***
Mean VIF	1.191	1.308	1.191	1.308	1.191	1.308

Table 6A: Probit analysis (marginal effects) of the determinants influencing respondents' behaviour for receiving banking services

Probit regression results (marginal effects) of the determinants influencing respondents' behaviour for receiving banking services (visiting a branch or using i-banking services). Models (1) to (4) report probit regression results (marginal effects), whereby the dependent variable takes the value of one when the respondent has answered "rarely (or never)" to the question "*How often are you visiting a branch within a month?*", and zero otherwise. Models (5) to (8) report probit regression results (marginal effects), whereby the dependent variable takes the value of one when the respondent has answered "rarely (or never)" to the question "*How often are you using i-banking services within a month?*", and zero otherwise. The definitions for independent variables appear in Table A1 of the Online Appendix. A constant term is included in the regressions. Robust standard errors are displayed in parentheses. All continuous variables are *z*-score standardised (mean value of zero and standard deviation of one). The bottom part of the table displays for each model: the number of observations (Obs.), the pseudo R-squared (Pseudo Rsq.), the Wald Chi-Square test (Chi-sq.) and the log pseudolikelihood value. * denotes *p-value*<0.10; ** denotes *p-value*<0.05; *** denotes *p-value*<0.01.

	VISIT RARE				ONLINE RARE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FK BIG3		0.054***				-0.062***		
		(0.019)				(0.016)		
FK BANK			-0.001				-0.053***	
			(0.019)				(0.016)	
FK OVERALL				0.034*				-0.075***
				(0.019)				(0.017)
GENDER	-0.009	-0.028	-0.008	-0.019	0.146	0.031	0.022	0.033
	(0.039)	(0.039)	(0.038)	(0.039)	(0.033)	(0.033)	(0.033)	(0.033)
MILLENNIALS	0.127***	0.124***	0.126***	0.135***	-0.155***	-0.170***	-0.186***	-0.194***
	(0.039)	(0.039)	(0.041)	(0.040)	(0.041)	(0.040)	(0.041)	(0.040)
METROPOLITAN	0.061	0.060	0.061	0.060	-0.022	-0.022	-0.025	-0.025
	(0.040)	(0.039)	(0.040)	(0.040)	(0.036)	(0.035)	(0.035)	(0.035)
URBAN	0.035	0.028	0.035	0.032	-0.082**	-0.074*	-0.079**	-0.073*
	(0.048)	(0.048)	(0.048)	(0.048)	(0.039)	(0.039)	(0.039)	(0.038)
MULTIPLE BANKS	-0.128***	-0.150***	-0.128***	-0.136***	-0.088**	-0.068	-0.095**	-0.078*
	(0.045)	(0.045)	(0.045)	(0.045)	(0.042)	(0.042)	(0.041)	(0.042)
LONG BANK	0.003	-0.008	0.003	-0.004	-0.031	-0.023	-0.025	-0.019
	(0.044)	(0.044)	(0.044)	(0.044)	(0.037)	(0.037)	(0.037)	(0.037)
CHANGED BANK	-0.091*	-0.083	-0.091*	-0.088*	-0.039	0.034	0.045	0.041
	(0.051)	(0.051)	(0.051)	(0.051)	(0.045)	(0.044)	(0.045)	(0.044)
IT SKILLS						-0.146***	-0.143***	-0.138***
						(0.016)	(0.016)	(0.016)
AVOID NUMBERS					-0.033*	0.027	0.034*	0.029*
					(0.018)	(0.017)	(0.017)	(0.017)
RISK TAKING	-0.023	-0.024	-0.023	-0.024	-0.039**	-0.036**	-0.039**	-0.037**
	(0.019)	(0.019)	(0.019)	(0.019)	(0.017)	(0.017)	(0.017)	(0.017)
OPTIMISM	-0.033*	-0.029	-0.033*	-0.031	-0.023	0.019	0.023	0.019
	(0.019)	(0.019)	(0.019)	(0.019)	(0.017)	(0.017)	(0.016)	(0.016)
HIGH SOCIAL					-0.031	-0.042	-0.042	-0.050
MEDIA					(0.057)	(0.056)	(0.057)	(0.057)

TRUST SOCIAL MEDIA					-0.009 (0.017)	-0.018 (0.017)	-0.009 (0.017)	-0.016 (0.017)
Obs	600	600	600	600	600	600	600	600
Pseudo Rsq.	0.045	0.054	0.045	0.048	0.245	0.262	0.257	0.269
Chi-sq	32.26***	38.72***	32.25***	35.31***	167.73***	167.13***	147.38***	163.69***
Log pseudolikelihood	-371.15	-367.38	-371.14	-369.68	-290.08	-283.41	-285.17	-280.44

Table 6B: IV Probit analysis (marginal effects) of the determinants influencing respondents' behaviour for receiving banking services

Probit regression results (marginal effects) of the determinants influencing respondents' behaviour for receiving banking services (visiting a branch or using i-banking services). Models (1) and (3) report first stage regression results, whereas models (2) and (4) report IV probit regression results (marginal effects), whereby FK OVERALL is instrumented by: (i) a binary variable that takes the value of one if the respondent is employed in the financial services industry, and zero otherwise (FINANCIAL), and (ii) by a binary variable that takes the value of one if the respondent has attained tertiary education (bachelor's degree or higher), and zero otherwise (UNIVERSITY). In models (1) and (2) the dependent variable takes the value of one when the respondent has answered "rarely (or never)" to the question "*How often are you visiting a branch within a month?*", and zero otherwise. In models (3) and (4) the dependent variable takes the value of one when the respondent has answered "rarely (or never)" to the question "*How often are you using i-banking services within a month?*", and zero otherwise. The definitions for independent and dependent variables appear in Table A1 of the Online Appendix. A constant term is included in the regressions. Robust standard errors are displayed in parentheses. All continuous variables are z-score standardised (mean value of zero and standard deviation of one). The bottom part of the table displays for each IV probit model: the number of observations (Obs.), the Wald Chi-Square test (Chi-sq.), the log pseudolikelihood value and the Wald test of exogeneity. Additional statistics based on IV LPM model: (a) Underidentification tests: Kleibergen–Paap rk LM statistic; (b) Weak identification test: Kleibergen–Paap Wald rk *F* statistic; (c) Weak-instrument-robust inference tests: Anderson-Rubin Wald test *F* (2,588); Anderson-Rubin Wald test Chi-sq (2); Stock-Wright LM *S* statistic; (d) Overidentification tests: Hansen J statistic. Stock-Yogo critical values: 19.93 (10%). * denotes *p-value*<0.10; ** denotes *p-value*<0.05; *** denotes *p-value*<0.01.

	VISIT RARE		ONLINE RARE	
	(1)	(2)	(3)	(4)
FK OVERALL		0.133***		-0.208***
		(0.049)		(0.043)
FINANCIAL	0.629***		0.686***	
	(0.119)		(0.105)	
UNIVERSITY	0.527***		0.373***	
	(0.083)		(0.106)	
GENDER	0.302***	-0.051	0.259***	0.061*
	(0.077)	(0.039)	(0.078)	(0.031)
MILLENNIALS	-0.522***	0.148***	-0.553***	-0.219***
	(0.087)	(0.038)	(0.095)	(0.037)
METROPOLITAN	-0.067	0.051	-0.077	-0.022
	(0.081)	(0.038)	(0.081)	(0.031)
URBAN	0.025	0.019	-0.302**	-0.051
	(0.096)	(0.048)	(0.148)	(0.035)
MULTIPLE BANKS	0.213***	-0.148***	0.179**	-0.043
	(0.082)	(0.042)	(0.082)	(0.041)
LONG BANK	0.144*	-0.026	-0.043	0.014
	(0.085)	(0.043)	(0.084)	(0.034)
CHANGED BANK	-0.085	-0.071	-0.043	0.029
	(0.099)	(0.052)	(0.099)	(0.039)
IT SKILLS			0.100**	-0.086***
			(0.046)	(0.031)
AVOID NUMBERS			-0.024	0.017
			(0.042)	(0.017)

RISK TAKING	0.015	-0.023	-0.016	-0.029*
	(0.039)	(0.019)	(0.039)	(0.017)
OPTIMISM	-0.030	-0.025	-0.026	0.012
	(0.037)	(0.019)	(0.038)	(0.016)
HIGH SOCIAL MEDIA			-0.084	-0.059
			(0.119)	(0.049)
TRUST SOCIAL MEDIA			-0.066	-0.059*
			(0.043)	(0.049)
Obs	600	600	600	600
Rsq. adj.	0.120		0.162	
Chi-sq		45.14***		258.69***
Log pseudolikelihood		-1162.56		-1068.19
Wald test of exogeneity		3.34*		5.29**
Kleibergen-Paap rk LM statistic		58.19***		43.37***
Kleibergen-Paap Wald rk F statistic		41.19***		28.48***
Anderson-Rubin Wald test F (2,588)		3.16**		10.42***
Anderson-Rubin Wald test Chi-sq (2)		6.85**		21.41***
Stock-Wright LM S statistic		6.70**		18.64**
Hansen's J test		6.18		0.99

Table 7: Analysis to understand why respondet's are using i-banking "rarely (or never)"

Summary statistics of the reasons why respondents are using i-banking services "rarely (or never)". Panel A reports the distribution of agreement with four statements taking a score ranging from 1 (indicating that the respondent *totally disagrees* with the statement) to 10 (indicating that the respondent *totally agrees* with the statement). The top part of Panel B reports the summary statistics of observationsof the respondents' answers as follows: Columns (1) and (2) report the mean and standard deviation (S.D.) of the statements' score for the entire sample. Columns (3) and (4) report the mean and standard deviation of the statements' score for the sample of respondents who answered fewer than four questions correctly (perceived as *financially illiterate* individuals). Columns (5) and (6) report the mean and standard deviation of the statements' score for the sample of respondents who answered at least four questions correctly (perceived as *financially literate* individuals). Column (7) reports the difference of means between columns (5) and (3), i.e. mean difference between *financially literate* vs *financially illiterate* individuals accompanied by the *t*-statistic value. * denotes *p-value* <0.10; ** denotes *p-value* <0.05; *** denotes *p-value* <0.01.

Panel A: Reasons for using i-banking service "rarely (or never)"

Question: "*On a scale of 1 to 10, where 1 means totally disagree and 10 means totally agree, to what extent do you agree or disagree with the following statements?*"

	Level of agreement			
Statement	Totally Disagree (score = 1)	(score = 2 to 9)	Totally Agree (score = 10)	Don't Answer
I don't trust i-banking	26.60	32.50	35.47	5.42
I don't have the necessary IT skills	28.08	27.60	42.36	1.96
I don't have the necessary banking knowledge	24.63	32.52	40.39	2.46
I want to have personal contact with bank officer	10.34	27.10	61.08	1.48

Panel B: Summary statistics of the respondents' answers

	Entire sample		Financially illiterate individuals		Financially literate individuals		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Diff. (5)-(3)
Statement	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I don't trust i-banking	5.958	3.838	6.309	3.743	5.107	3.967	-1.202**
I don't have the necessary IT skills	6.246	3.897	6.853	3.726	4.696	3.926	-2.157***
I don't have the necessary banking knowledge	6.394	3.741	7.077	3.423	4.661	3.978	-2.417***
I want to have personal contact with bank officer	8.165	2.974	8.313	2.854	7.786	3.257	-0.527