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EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

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DIGITALIZATION, FINANCIAL KNOWLEDGE AND FINANCIAL DECISIONS

by Daniela Marconi*, Marco Marinucci** and Giovanna Paladino***

Abstract

Is the propensity to save and to invest related to digital skills and financial knowledge? Do digital skills and financial knowledge affect people's attitudes towards digital payments and digital financial services? Is there a gender gap? This paper addresses these issues by using a new dataset based on around 4,000 individuals interviewed in two waves between 2019 and 2021. We find that digital and financial skills are fundamental to shaping financial behaviours and attitudes, including those towards digital financial services. But there are some reservations to be made: digital skills complement financial ones in managing personal budgets, monitoring expenses and saving money at the end of the month, as well as helping people realize the benefits of making use digital financial services. On the other hand, digital skills do not affect investment decisions. We also show that both digital and financial skills are positively associated with educational and income levels and are characterized by a significant gender gap.

JEL Classification: D53, G11, G53, O16.

Keywords: financial knowledge, digital skills, financial behavior, digital payments, digitalization, financial inclusion.

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1. Introduction¹

Digital skills in the financial environment represent a tremendous opportunity to remove friction and make personal money management and investment choices easier.

The relationship between digitalization, economic choices, and the level of financial literacy of consumers is subject of specific attention because spillovers can foster greater inclusion of the unbanked but at the cost of exposing the most vulnerable people to risks (OECD- INFE, 2018).

Various surveys associate technology with simplification and improvement in the quality of life, including the domain of financial decisions.² Many researchers are confident that fintech will help bridge the gap in financial knowledge because the pervasiveness of digital tools might bring financial services even to remote areas.³ Over the last years, the diffusion of digital tools has paved the way for the creation of fintech apps that promote financial culture. Some of them turned out to be effective in helping people to keep track of their income and expenditures (see French et al., 2020). Viviano & Michelangeli (2021) – using a survey of the Italian population carried out by the Bank of Italy – find that Internet banking allowed Italian households, to begin to enter into financial markets, as well as fostering better understanding of financial concepts.

However, fintech and technology could also be detrimental to financial well-being in that they could trigger impulsive consumption behavior. The reduced time between the choice and the access to the financial service on an online platform could negatively affect consumers' welfare. Some studies show that apps and E-wallets can lead to impulsive consumption behaviors (Lee et al., 2022). Lyons & Kass-Hanna (2022) suggest that while digital solutions – such as robo-advising, virtual and hybrid advisor as well as personal finance communities – offer opportunities which may be more efficient or appealing compared to the traditional services, there may be barriers to access and usage which emphasize the need for digital financial literacy. Bu et al. (2021) find that financial education, self-control training, and budgeting programs effectively reduce the temptation of borrowing on online platforms. Panos et al. (2020) find that the possession of cryptocurrencies is negatively related to the level of financial education. This result is probably due to a better understanding of the associated

¹ The authors wish to thank Magda Bianco, Riccardo de Bonis and the participants of the International Federation of Finance Museums Conference on Digitalization and Financial Awareness for their comments and suggestions. The views expressed herein are those of the authors and do not necessarily reflect those of the institutions they are affiliated. Any error remains the responsibility of the authors.

² CENSIS “La vita digitale degli italiani (the digital life of Italians)” 2021 and TD American Trade “Financial Innovation and Technology survey” 2018.

³ 67% of the world population, 5.5 billion people, have a mobile phone; 63%, 5 billion people, have access to the internet. Data refers to April 2022. Source <https://datareportal.com/global-digital-overview>. See also (Varlamova, Larionova, & Kukushkina, 2021) and references therein.

risks and a higher ability to detect fraud, regardless of the personal level of digitization (Engels et al., 2020).

Focusing on Italy, from the point of view of digitization, the country shows some contradictions. According to the latest report by *We Are Social* (2022), Italy is a mature and connected country in terms of web and social media usage. Internet users make up 84% of the population, and the percentage of those who own a smartphone is also remarkably high (97.3%). In addition, users - aged between 16 and 64 years – spend, on average, 6 hours a day connected to the web, considering all activities and devices. People spend most of their time online searching for information (73.6% of respondents), and 33.4% spend time primarily managing finances. One in three people use insurance financial services every month, one in seven make digital payments, and one in fifteen own cryptocurrencies.

However, being an internet and social media user and growing up in a digital world do not necessarily make people digitally savvy. In fact, according to the DESI Index of Digitization of the Economy and Society (DESI, 2022) built by Eurostat using variables related to technological development, if one considers more sophisticated digital skills, Italy is still below the EU average, with a significant gap which is also gender-related.⁴ Overall, just over 40% of its internet users have at least basic digital skills.^{5,6}

The low level of digital competences among Italians goes hand in hand with their low level of financial literacy. According to the survey on the financial literacy and competence of Italian adults (IACOFI), conducted by the Bank of Italy in 2020, their average level of financial literacy was 11.2, on a scale ranging from 1 to 21, essentially in line with the value observed in 2017 and below the OECD average of 13.⁷ Considering only the financial knowledge score, despite a moderate improvement compared to 2017, still in 2020 less than 44% of the Italian adult population reached the minimum score for a financially knowledgeable person, against the OECD average of 57% (D'Alessio et al., 2020). Within the adult population, the worst performances are recorded by the

⁴ Even though the overall score shows clear signs of improvement (Italy moved up from twenty-fourth place of 2020, to eighteenth place out of twenty-seven EU countries in 2022), the progress is related to the better connectivity and the integration of digital technologies and is not due to digital skills, who do not show any signs of improvement during the last years.

⁵ More precisely, the measures where Italy is particularly lagging are “information and data literacy” or “digital content creation” and “safety”. For further details on each indicator definition see the DESI website https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/indicators.

⁶ Actually, in 2020 Italy was placed 25-th out of twenty-eight countries because at the time United Kingdom was still in the European Union. It is worth mentioning that such performance compared with other countries is not homogenous within the Italian territory but it is mainly due to the lower digitization level of the southern regions (Benecchi, et al., 2021).

⁷ The survey is based on the methodology developed by the OECD's International Network on Financial Education (INFE). For more information, see <https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/alfabetizzazione/index.html?com.dotmarketing.htmlpage.language=1>.

youngest cohorts (those aged between 18 and 35 years old) and women, particularly when they are unemployed. These unsatisfactory results and gaps are likely to reflect both social norms on gender roles (see for instance Guiso and Zaccaria, 2021) and the low participation of women to the labor market. A more recent survey carried out by Paladino (2022) finds that a more engaging wording mitigates the gender effect and reduces the probability of women choosing the “I do not know” option. However, the overall level of financial literacy does not show any signs of improvement. The cultural factor seems to be confirmed by the findings of the PISA survey on 15-year-old students (OECD 2020). Italian teenagers too lag behind their OECD peers. In Italy, about 25% of 15-year-old students do not reach the minimum level of financial literacy considered appropriate to their age (low performer), whereas the OECD average is 15%. Moreover, the gender gap among the 15-year-old Italian students is the highest amongst OECD countries.

Keeping in mind these features in financial literacy and the contrasting results in digitalization of the Italians, in this paper we analyze how digital skills and financial knowledge affect the financial behavior of the Italian population, specifically the propensity to save and then to invest. We also look at the attitudes towards digital payments and digital financial services. Finally, we describe the main characteristics of the financially knowledgeable as well as of the digitally skilled people and provide fresh evidence on the relevance of the gender gap and on its implications.

We base our analysis on two waves of a novel survey on the Italian adult population. The first wave was run just before the breakout of the Covid-19 pandemic in Italy (December 2019), the second wave was run two years later (December 2021). The timing of the two waves allow us to gauge the changes in self-perceived digital skills and financial knowledge (Dunning-Kruger effect) and more in general about the self confidence in dealing with digital financial services. The surveys were run over a sample of over 2,000 people representing the Italian population.⁸ The survey uses the CAWI (Computer Assisted Web Interviewing) method and each wave was based on a questionnaire made up of 47 multiple-choice questions; some refer to sociodemographic features, others refer to aspects that specifically address our research questions.

The econometric exercises show that digital and financial skills are fundamental to shaping financial behavior and attitudes, including those towards traceable payments and digital financial services, although with some qualifications. We find that digital skills are a useful complement to financial skills in managing personal budgets, monitoring expenses and therefore to saving money at the end of the month; they correlate positively with the likelihood of favoring traceable payments and with

⁸ The surveys were conducted on the field by CSA research. The sample is representative of the Italian population according to age, gender and geographical areas.

the perception of the benefits of the diffusion of digital financial services. However, differently from financial knowledge, digital skills appear irrelevant to investment decisions. We interpret this finding as novel evidence of the fact that the decision to invest is a complex task, which demands a high degree of financial knowledge, whereas digital skills alone are of little help. Finally, we find that digital and financial skills are both positively associated with educational and income levels and are characterized by a significant gender gap. Our results hold whether we consider the two waves separately or we pool them. Results are also robust to different measurements of digital skills.

This paper makes three main contributions. First, we provide a first survey-based evidence for Italy on how digital and financial skills correlate with saving, investment decision and the attitudes towards digital payments and finance. To our knowledge, there are no similar studies nor any evidence readily available that investigate the role of both skills together. Second, we provide fresh evidence on the relative importance of these two skills in money-related decisions. Third, we provide solid evidence of the significant gender gap in financial decision-making, which increases as the complexity of the decision increases.

The paper is structured as follows. Section 2 briefly describes the data and compares self-perceived digital skills and attitudes towards digital financial services before and after the pandemic. Section 3 analyzes the impact of digital skills on selected financial behaviors and attitudes towards digital financial services. Section 4 discusses the impact of financial knowledge on the same variables. Section 5 concludes.

2. The impact of the pandemic on self-perceived digital skills and financial knowledge

Our study uses two waves of a novel survey on the financial and digital skills of the Italian population aged between 16 and 64 years. The first wave was collected in December 2019, involving 2,020 individuals; the second wave was run in the first half of December 2021, in the midst of a new Covid-19 pandemic wave, involving 2,001 subjects. The two waves have no panel component. Together with some demographic information (such as age, educational attainments, marital status and profession), the questionnaire of the survey contains questions capturing the economic status, the saving and investment propensity, and the attitudes towards digital payments.

Other questions aim to capture digital skills and the proficiency in digital finance. As for digital skills, the questionnaire contains two questions. The first one asks for an overall self-assessment on a scale from 1 to 10; the second one asks to evaluate his/her own personal skills in performing a set of specific

IT tasks. A number of questions concern the use of home banking, digital payments and web apps to make online investments and capture the proficiency in digital finance.

Finally, a group of questions tries to detect the attitude and the opinions about the expansion of digital financial services, especially from point of view of financial inclusion. These queries require a more elaborate thinking as the answer options are wide, spanning from social divide to the risk of making quick and reckless decisions.

Concerning the opinion towards digital technologies and their financial application, the answers of the interviewed show a quite positive attitude: almost 70% of the sample is in favor of the use of digital payment technologies. The same share of respondents thinks that digital financial services (DFSs) will improve the access to finance, while 60% of the respondents agree that DFSs will increase the knowledge of the mechanism behind finance and economics. These results do not differ between the two survey editions and the same occur for the other variables with some, notable exceptions.

Among them, we note a slight decrease in the self-assessment of digital skills after the pandemic crisis. In fact, the percentage of individuals assessing their knowledge as high or moderate reduces and the percentage of respondents that consider their level low or nil increases. The difference is statistically significant and concerns all the macro regions (except for the North East; see Figure 1, panel a), as well as people at all level of education. The reduced confidence in digital skills can have different explanations.

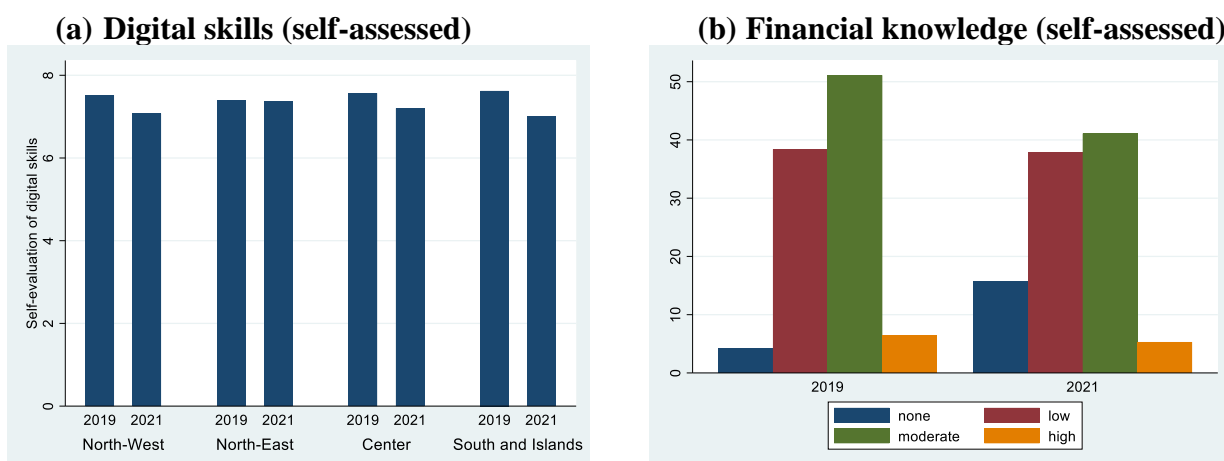
A first possible explanation lies in a reversed Dunning-Kruger effect due to the pandemic. The pandemic forced people to deal with digital technology in their everyday life much more than before, possibly making them more aware of their deficiencies in digital skills. This awareness appears stronger for people living together with others, possibly reflecting the fact that they could compare their digital skills with other housemates (cohabitation effect), maybe delegating some housemate to perform digital task, or being delegated by others (say the children or the parents) experiencing new challenges. Delegations of digital tasks could resemble the “leaning effect” described by Kuziemko (2014), namely the tendency to “lean on” (rather than “learn from”) the abilities of higher skilled person conduct some domestic or professional activity (e.g. paying bills, reading document, deal with bureaucracy etc.). A second explanation may be related with the social mood. The second wave of the survey was carried out after two years of pandemic with the number of infected people on a sharp upward trend. This experience likely may have influenced the mood of people, possibly leaving them less self-confident and less optimistic about the future. A third explanation could be the different sampling methodology used in the two waves. Although the sampling weights have been adjusted to account for the differences in the two samples, a different strategy of engagement may have created

a bias. In the first wave, the interviewed individuals applied themselves to the panel while the second wave was run on a proprietary panel representing in full the Italian households. However, given that the composition of the sample in the two surveys lacks of significant differences in their socio-demographic variables, we believe that this bias should be negligible.

Turning to financial knowledge, similarly to the digital skills, the pandemic seems to have negatively affected the self-assessment of financial knowledge. After the pandemic a larger share of respondents declare to have no financial knowledge at all (15.7%, compared to 4.2% before the pandemic; Figure 1, panel b). After the pandemic, people became more concerned about their ability of being able to distinguish between safe and risky financial products, as they declare more often than before that this is what matters in defining financial knowledge.

We have no definitive explanations to why people feel less confident on their financial knowledge, but again we can think that the pandemic may have affected people’s ability to understand the evolution of the economic and financial environment, leaving them more insecure on how to manage their personal finance, also in the context of growing digitalization of financial services which may create new forms of financial exclusion (Bianco, Marconi, Romagnoli, & Stacchini, 2022)).⁹ This is certainly something that is worth exploring further in the future.

Figure 1: Digital skills and financial knowledge before and after the pandemic



Note: the scale is from 1 to 10

Note: the level of financial knowledge is assessed on a likert scale form 1 (no knowledge) to 4 (high knowledge)

The reduced confidence in own digital skills and financial knowledge reverberates on the change in attitudes towards digital financial tools, such as home banking, the use of apps to invest money or to

⁹ A possible drawback of self-reported knowledge is the already mentioned Dunning-Kruger effect which. Even though in this survey we have no way to measure actual financial knowledge, we rely on the analysis carried out by others (D'Alessio, De Bonis, Neri, & Rampazzi, 2020) which have shown that Italians are more aware of their limits on financial literacy than their OECD counterparts and tend more often not to underestimate their financial knowledge.

control expenses. Notwithstanding the reduction in the use of cash people do not appear more familiar with digital payments and digital financial tools in general (see Table 1).¹⁰

Table 1. Descriptive statistics – use and attitude of digital instruments by year–

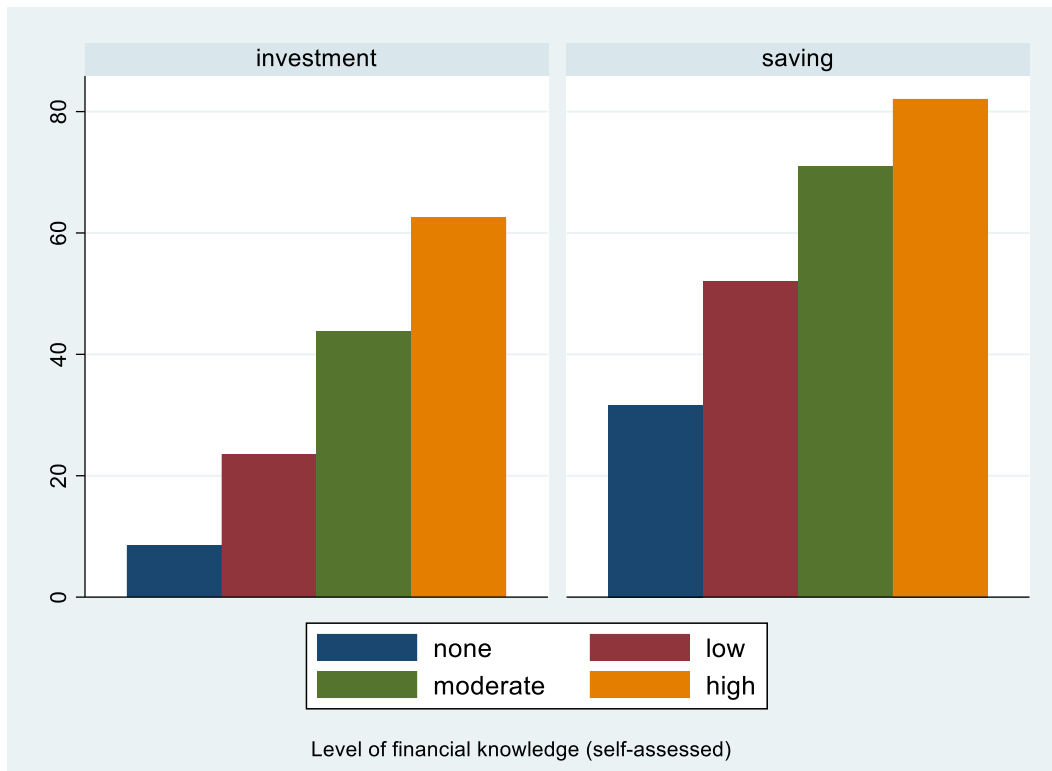
	year	
	2019	2021
home banking use		
yes	90.21%	85.58%
no	9.79%	14.42%
payment use: cash		
always/very often	34.60%	34.04%
often	37.03%	27.70%
sometimes	20.79%	21.54%
rarely	6.44%	12.46%
never/do not have	1.14%	4.26%
digital payment ⇒ allow better planning		
strongly agree	13.22%	11.71%
agree	45.89%	42.08%
disagree	32.77%	33.56%
strongly disagree	8.12%	12.65%
digital payment ⇔ need help		
strongly agree	7.57%	8.22%
agree	25.59%	32.25%
disagree	31.98%	27.76%
strongly disagree	34.85%	31.77%
app to manage every day expenses		
Very useful	25.25%	21.66%
useful	47.23%	43.62%
Not very useful	20.74%	22.27%
Not useful at all	6.78%	12.44%
app to foster investment saving		
Very useful	18.96%	14.58%
useful	48.12%	43.29%
Not very useful	24.46%	26.17%
Not useful at all	8.47%	15.96%

Finally, our data suggest that Italians are basically “savers” but not “investors”: while around 60% of the sample declares to save a positive amount regularly or variably at the end of the month, only 30% of the interviewed invest their money in real or financial assets, other than keeping them on their own checking account. Importantly, the percentage of people who declare to be able to save some money is relatively high at all level of financial knowledge, whereas the propensity to invest is more correlated to the financial knowledge. For instance, among those with no financial knowledge, 32% of the respondents declare to save some money at the end of the month, but only 27% of them decide

¹⁰ In 2019, 59% of the interviewees agreed or strongly agreed that digital payments allowed them to keep in check expenses better, in 2021 the percentage decreased to 54%. In 2019, 33% of the interviewees agreed or strongly agreed that they needed help to use digital payments instruments; in 2021, such a percentage increased to 40%.

to invest their money; on the contrary, 76% of the savers with high financial knowledge decide to invest their savings (Figure 2 and Appendix Table A1).¹¹

Figure 2. Percentage of people that declare to invest their money and to save at the end of the month by level of financial knowledge



3. Saving, investment and attitudes towards digital financial services

In this section, we investigate more closely the correlation between digital skills (our main independent variable) and a number of dependent variables that capture financial behavior and attitudes towards digital financial services, including digital payments.

First, we consider the saving behavior of individuals, who are asked to qualify their pattern of saving (save regularly, save variably, save almost nothing, don't save). Second, we consider the propensity to invest, recorded with a simple binary variable (yes or no). Third, we investigate whether people would favor a law that incentivize the traceability of payments (strongly agree, agree, disagree, strongly disagree). Finally, we explore two aspects of digital financial services. First, we look at whether digital financial services are perceived as elements conducive to more financial inclusion (strongly agree, agree, disagree, strongly disagree). Second, we look at whether digital financial services are perceived as something that improve the understanding of the economic and financial

¹¹ This finding is line with a cultural trait of Italians. Even though over time the propensity to save decreased, by international standards, Italy can be still considered a high-saving country (Ando et al. [1994]).

environment (strongly agree, agree, disagree, strongly disagree). We pooled the two waves together; to control for possible structural breaks we conducted robustness checks (Table A4) that basically confirms our results.

Our dependent variables are ordinal variables, that is, categorical and ordered variables, except for the propensity to invest, which is a binary variable. For ordinal variables we use ordered probit models (regression 1,3,4,5 in Table 2):

$$\Pr(\text{outcome}_j = i) = \Pr(\kappa_{i-1} < \beta_1 x_{1j} + \beta_2 x_{2j} + \dots + \beta_k x_{kj} + u_j \leq \kappa_i)$$

u_j is assumed to be normally distributed. We estimate the coefficients $\beta_1, \beta_2, \dots, \beta_k$, together with the cutpoints, $\kappa_1, \kappa_2, \dots, \kappa_i$, where i is the number of possible outcomes.

For the binary variable (propensity to invest, regression 2 in Table 2) we use a simple probit model:

$$\Pr(\text{invest} = 1) = \Phi(\beta_1 x_{1j} + \beta_2 x_{2j} + \dots + \beta_k x_{kj})$$

Results are summarized in Table 2, and Figures A1-A5 in Appendix A, where we report the coefficients of digital skills along with the most important controls, meaning financial knowledge, gender, age, income/wealth (captured by the variable life style), educational attainments. Additional controls included but not reported are family status, location, a dummy variable to capture whether the person is financially independent or not, and profession. All the coefficients are available from the authors upon request. In the graphs from A1 to A5 in Appendix A, we focus on the marginal impact of digital skills and financial knowledge on the probability of each outcome for each dependent variable.

Let us focus now on digital skills. The first thing to note in Table 2 is that self-assessed digital skills have always a positive impact on the probability of the best outcomes for each dependent variable, in fact the coefficient associated to this variable is always positive and statistically significant, except in regression 2. We will come back to this later.

In the case of saving behavior, we can see from Table 2, column 1, and figure A1 panel (a), that the probability of saving, either regularly or variably, increases as digital skills increases, while the probabilities of saving almost nothing or not saving at all decrease. The other explicative variables (apart from gender) are significant, and take the expected signs and relative size. In particular, the propensity to save decreases with age (in line with the life-cycle theory), while it increases with income/wealth, financial knowledge and educational levels (richer and more educated people are more likely to save money at the end of the month).

Table 2. Regression results: financial behavior and attitudes towards digital financial services (DFS)

VARIABLES	(1) saving behavior	(2) propensity to invest	(3) traceable payments	(4) DFS: conducive to more financial inclusion	(5) DFS: conducive to more financial knowledge
digital skills	0.040*** (0.012)	0.016 (0.016)	0.046*** (0.012)	0.071*** (0.013)	0.063*** (0.013)
financial knowledge (base=none)					
low	0.260*** (0.063)	0.481*** (0.110)	0.240*** (0.070)	0.310*** (0.071)	0.317*** (0.070)
moderate	0.517*** (0.066)	0.915*** (0.110)	0.405*** (0.072)	0.579*** (0.075)	0.667*** (0.073)
high	0.964*** (0.115)	1.300*** (0.145)	0.679*** (0.120)	1.019*** (0.122)	1.037*** (0.117)
gender (base=male)					
female	0.058 (0.039)	-0.148*** (0.050)	-0.071* (0.038)	-0.007 (0.039)	0.049 (0.038)
age	-0.014*** (0.002)	0.016*** (0.002)	-0.003* (0.002)	-0.005*** (0.002)	-0.010*** (0.002)
life style (base=very low)					
low	0.289*** (0.102)	0.340** (0.154)	0.215** (0.097)	0.115 (0.102)	0.120 (0.095)
average	0.877*** (0.100)	0.746*** (0.146)	0.416*** (0.093)	0.303*** (0.099)	0.211** (0.091)
high	1.276*** (0.116)	1.399*** (0.161)	0.465*** (0.109)	0.433*** (0.116)	0.336*** (0.108)
very high	1.374*** (0.181)	1.477*** (0.227)	0.825*** (0.147)	0.843*** (0.187)	0.480** (0.190)
education (base= compulsory or lower)					
diploma	0.089 (0.058)	0.319*** (0.083)	0.190*** (0.056)	0.104* (0.059)	-0.041 (0.056)
degree or higher	0.122* (0.064)	0.509*** (0.089)	0.266*** (0.064)	0.048 (0.067)	-0.118* (0.064)
family status	YES	YES	YES	YES	YES
location	YES	YES	YES	YES	YES
financially independent	YES	YES	YES	YES	YES
profession	YES	YES	YES	YES	YES
Observations	4021	4021	4021	4021	4021
Pseudo-R2	0.113	0.200	0.040	0.050	0.047

Note: Column headings indicate the dependent variable. In column (1) we consider the saving behavior of individuals, who are asked to qualify their pattern of saving (save regularly, save variably, save almost nothing, don't save). In column (2) we consider the propensity to invest, recorded with a simple binary variable (yes or no). In column (3) the dependent variable is the answer to a question that asks how much people would favor a law that incentivize traceable payments (strongly agree, agree, disagree, strongly disagree). In column (4) the dependent variable is the answer to a question that asks whether digital financial services are perceived as elements conducive to more financial inclusion (strongly agree, agree, disagree, strongly disagree). In column (5) the dependent variable is the answer to a question that asks whether digital financial services are perceived as something that improve the understanding of the economic and financial environment (strongly agree, agree, disagree, strongly disagree). Regressions (1), (3), (4) and (5) are estimated through an ordered probit. Regression (2) is estimated with a simple probit model since the dependent variable is a binary variable. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Turning to the propensity to invest, Table 2, column 2, and Figure A2, panel (a), show that as digital skills increase the probability to invest increases as well, however the confidence intervals around the point estimates are quite wide, indicating that the correlation is not statistically significant (see coefficient's significance in Table 2, column 2). Unsurprisingly, in the case of investment decisions, what matter the most are financial knowledge (better informed respondents are also investors), income levels (higher income is associated to a higher probability to invest), age (elderly people are

more likely to have invested money), and gender (women are less likely to have financial or real investments). Finally, education too play a positive role (more educated people are more likely to invest).

Turning to the propensity to favor a law that incentivize the traceability of payments, from Table 2, column 3, and from panel (a) of Figure A3 it emerges that the probability of attaining more positive outcomes is positively affected by digital skills. In particular, the probability of the outcome “strongly agree” increases from less than 0.2 to 0.3 and the probability of the worst outcomes both decrease sensibly, while the “agree” outcome, which is already the most popular, is unaffected (Figure A3, panel (a)). Financial knowledge, income, and education all play a positive role (Table 2, column 3).¹²

Finally, we consider the attitudes towards digital financial services. First, we look at whether digital financial services are perceived as a mean of financial inclusion (Table 2, column 4). As expected, digital financial skills matter in shaping the probability of the different outcomes. As digital financial skills increase the probability of the best outcomes, “strongly agree” and “agree”, increase and those of the worst outcomes decrease (Figure A4, panel (a)). Second, we look at whether the expansion of digital financial services is considered useful in improving the understanding of the economic and financial landscape (Table 2, column 5). Again, digital skills affect positively this perception and very similar patterns emerges also by looking at figure A5, panel (a).

Interestingly, both in equations (4) and (5), younger people and well-off respondents are more optimistic. Higher level of self-declared financial knowledge increases the probability of strongly agreeing about the effectiveness of digital financial services. Education, on the contrary, does not matter with the only exception of the lack of it that reduces significantly the probability of good perception outcomes.

Finally, it is important to note, that the role of digital skills is not statistically different between 2019 and 2021. The results of equations (4) and (5) run on single wave sample show a similar pattern (see Tables A5 and A6). We also estimated the whole set of equations using an index (Digital skill index) computed on 13 specific skills¹³ collected by the questionnaire.

¹² It is interesting to note that, for this item, the profession is also very important, retired people and dependent workers are more in favor than self-employed ones (unreported results, available upon request).

¹³ For each task we give a unit value whenever the interviewed declared he/she was able to accomplish it and zero otherwise. The index is then built as the sum of the answers provided for all the tasks. The result are available from the authors upon request.

Summing up and focusing on digital skills and financial knowledge, our analysis shows that they are both statistically significant: the financial knowledge does not crowd out digital skills. It is worth noting that, when it comes to investment decisions, financial knowledge is what really matters (Table 2, column 2). This means that digital skills are a useful complement to manage personal budgets, monitoring expenses and saving money at the end of the month. They are important in shaping personal propensities to favor traceable payments and to reap the benefits of digital finance, but they are irrelevant in making investment decisions beyond financial knowledge. The propensity to invest depends in fact primarily on the level of income and financial knowledge. This finding is very much in line with the body of literature that finds that financial literacy positively affects financial decision-making, investment choices and wealth outcomes (van Rooij et al., 2011; Behrman et al., 2012).

4. Financial knowledge, digital skills and gender gaps

The results in the previous section have shown the relevance of digital skills and financial knowledge in shaping saving and investment decisions, as well as attitudes towards digital payments and digital financial services more in general. In this section, we draw a descriptive identikit of digital skilled and financially knowledgeable people, also highlighting the correlation between the two skills. That is, we now take self-assessed financial knowledge and digital skills as our dependent variables and we check which personal characteristics correlate more with these two skills. Results are reported in Table 3.

Regression 1 in Table 3 shows that men are more likely to be financial knowledgeable than women; financially knowledgeable are more financially independent, richer, married or divorced, highly educated and acquired their knowledge through specialized media and specific training. Regression 2 depicts the characteristics of digital skilled. Again men are more likely to be digital skilled than women; income plays a positive role, but up to a point. Younger respondents, more educated people and more financially knowledgeable are more likely to be digital skilled. However, digital skilled and financially literate do not overlap: overall, only 8.68% of the digital skilled (with score between 8 and 10) define themselves as having a high level of financial knowledge.

It is worth noting that the gender gap emerges for both financial knowledge and digital skills, but even controlling for these two factors, women are still less likely to invest (Table 2, column 2) and are less likely to be in favor of traceable payments (Table 2, column 3). This finding is again in line with a body of literature that shows that women tend to be more risk-averse than men and, therefore, men are significantly more likely to hold investment products than women (OECD, 2013). Bucher-Koenen et al., 2021, also explain the lack of stock market participation of women as due to a mix of

poor financial knowledge and lack of self-confidence. Banner & Neubert (2016) looking at German households, find that standard investment decisions are positively associated with both actual and perceived financial knowledge for men, but only with actual knowledge for women.

Table 3. Regression results: identikit of financial knowledgeable and digital skilled individuals

VARIABLES	(1) financial knowledgeable	(2) digital skilled
digital skill	0.178*** (0.014)	
financial knowledge (base= none)		
Low		1.081*** (0.118)
Moderate		1.607*** (0.117)
High		2.296*** (0.155)
gender (base=male)		
Female	-0.164*** (0.042)	-0.159*** (0.053)
Age	-0.002 (0.002)	-0.019*** (0.003)
life style (base=very low)		
Low	0.157 (0.109)	0.260 (0.163)
Average	0.228** (0.104)	0.414*** (0.156)
High	0.462*** (0.121)	0.427** (0.169)
very high	0.860*** (0.259)	0.083 (0.289)
education (base= compulsory or lower)		
Diploma	0.153** (0.065)	0.414*** (0.090)
degree or higher	0.234*** (0.073)	0.599*** (0.097)
source of information		
mainstream media	0.170*** (0.045)	
specialized media	0.710*** (0.049)	
social media	0.293*** (0.050)	
courses/workshops	0.654*** (0.077)	
expert advice	0.235*** (0.054)	
word of mouth	-0.094* (0.050)	
none of the above	-1.134*** (0.070)	
family status	YES	YES
Location	YES	YES
financially independent	YES	YES
Profession	YES	YES
Observations	4021	4021
Pseudo-R2	0.113	0.193

Note: Colum headings indicate the dependent variable. In column (1) the dependent variable is the level of self-assessed financial knowledge (very low, low, moderate, high); in column (2) the dependent variable is the level of self-assessed digital skills (1-10). Regressions are estimated through ordered probit. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5. Conclusion

In this paper we analyzed the relationship between self-assessed digital and financial skills and some key aspects of the financial behavior of the Italian population, such as the propensity to save and to invest. We also looked into the relationship between both sets of skills and attitudes towards digital payments; finally, we investigated whether digital skills and financial knowledge affect the Italians' perception of digital financial services as a means to boost financial inclusion, as well as their understanding of the economic and financial environment. We based our analysis on two waves of a novel survey run on a representative sample of 2000 individuals in 2019 and 2021. We found that digital and financial skills are both important in shaping behavior and attitudes. Both skills are positively associated with educational and income levels and are characterized by a significant gender gap.

Financial knowledge, however, seems to matter beyond the level of digitalization when it comes to investment decision-making, since it helps people move from saving to investment decisions. Saving behavior is, indeed, easier to adopt and can be fostered by apps and digital devices. Investing, on the other hand, requires a higher level of money awareness, which is strictly linked to the self-confidence on one's understanding of the economy and the financial system. One direct policy implication is that financial education programs are crucial to create the right environment for an upgrade of the financial skills of Italians. This will help them rip the benefit of a coherent money management that includes investing, which is especially important in period of uncertainty and high inflation.

We also showed that both digital and financial skills are positively associated with educational and income levels and are characterized by a significant gender gap. Improving educational attainment from young ages - especially in terms of financial and digital skills - and closing the gender gap are the promising pathways to upgrading financial behaviors and attitudes towards digital financial services. However, this paper proved that in order to turn people from savers into investors, digital transition needs to be accompanied by targeted educational intervention aimed at raising the general level of financial literacy.

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Appendix

A. Additional tables and figures

Table A1. Descriptive statistics – main dependent variables by year–

	year	
	2019	2021
Saving behavior		
don't save	7.23%	7.59%
save almost nothing	31.09%	34.82%
save variably	43.22%	41.28%
save regularly	18.47%	16.31%
Invested money 0/1		
no	65.00%	69.17%
yes	35.00%	30.83%
Traceable payments law		
strongly disagree	8.47%	11.47%
disagree	19.01%	18.36%
agree	44.70%	45.54%
strongly agree	27.82%	24.63%
Digital financial services > financial inclusion		
strongly disagree	4.06%	6.65%
disagree	24.06%	22.92%
agree	55.10%	54.05%
strongly agree	16.78%	16.38%
Digital financial services > economic knowledge		
strongly disagree	7.87%	9.72%
disagree	33.17%	34.08%
agree	47.08%	43.97%
strongly agree	11.88%	12.23%

Table A2. Descriptive statistics – main qualitative independent variables by year–

	year	
	2019	2021
Gender		
male	49.06%	49.10%
female	50.94%	50.90%
Economic independence		
no	21.68%	25.47%
partially	27.97%	22.94%
yes	50.35%	51.59%
Location		
North West	26.14%	26.13%
North East	18.91%	18.92%
Centre	19.90%	19.92%
South and islands	35.05%	35.04%
Life style		
very low	4.70%	5.69%
low	20.45%	20.92%
average	61.93%	62.87%
high	11.24%	8.79%
very high	1.68%	1.74%
Marital status		
Single	40.45%	39.25%
Married	51.93%	55.48%
Separated	2.97%	1.88%
Divorced	3.81%	2.28%
Widow	0.84%	1.10%
Financial knowledge (self-assessed)		
none	4.16%	16.62%
low	38.37%	38.23%
moderate	51.09%	40.26%
high	6.39%	4.89%
Profession		
Self-employed	14.90%	11.39%
Employees	52.23%	50.24%
Student	10.59%	14.09%
Homemaker	10.05%	10.84%
Unemployed	9.11%	9.13%
Retired	3.12%	4.31%
Degree		
compulsory education or lower	10.84%	15.32%
high school degree	57.08%	55.36%
tertiary degree or higher	32.08%	29.32%
Digital skills (self-assessed)		
≤ 5	8.53%	16.08%
6	12.57%	17.15%
7	23.76%	22.08%
8	30.35%	24.13%
9	15.45%	11.82%
10	9.36%	8.75%

Table A3. Descriptive statistics – main quantitative independent variables by year–

	year			
	2019		2021	
	mean	(s.d.)	mean	(s.d.)
Age	41.57	(13.19)	41.64	(13.49)
Digital skills (self-assessed)	7.54	(1.52)	7.09	(1.85)
Digital skill index: equal weights	7.89	(2.93)	6.90	(3.93)
Digital skill index: probability weights	2.74	(1.46)	2.42	(1.84)

Table A4. Regression results: financial behavior and attitudes towards digital financial services - dummy year

VARIABLES	(1) saving behavior	(2) propensity to invest	(3) traceable payments	(4) DFS: financial inclusion	(5) DFS: financial knowledge
digital skills	0.037** (0.018)	0.022 (0.022)	0.045*** (0.017)	0.056*** (0.018)	0.059*** (0.018)
digital skills * year	0.007 (0.022)	-0.011 (0.030)	0.001 (0.023)	0.029 (0.024)	0.010 (0.024)
year	-0.024 (0.166)	0.085 (0.227)	-0.027 (0.171)	-0.139 (0.182)	-0.003 (0.179)
financial knowledge (base= none)					
low	0.266*** (0.064)	0.485*** (0.113)	0.234*** (0.072)	0.321*** (0.073)	0.333*** (0.072)
moderate	0.525*** (0.067)	0.919*** (0.113)	0.398*** (0.074)	0.596*** (0.077)	0.687*** (0.075)
high	0.972*** (0.115)	1.305*** (0.147)	0.672*** (0.121)	1.036*** (0.123)	1.056*** (0.118)
gender (base=male)					
female	0.059 (0.039)	-0.148*** (0.050)	-0.071* (0.038)	-0.006 (0.039)	0.050 (0.038)
age	-0.014*** (0.002)	0.016*** (0.002)	-0.003* (0.002)	-0.005*** (0.002)	-0.010*** (0.002)
life style (base=very low)					
low	0.288*** (0.102)	0.342** (0.154)	0.215** (0.097)	0.111 (0.102)	0.119 (0.095)
average	0.875*** (0.100)	0.747*** (0.146)	0.416*** (0.093)	0.298*** (0.099)	0.209** (0.091)
high	1.277*** (0.117)	1.400*** (0.161)	0.464*** (0.109)	0.433*** (0.116)	0.338*** (0.108)
very high	1.370*** (0.181)	1.482*** (0.227)	0.824*** (0.147)	0.831*** (0.186)	0.474** (0.190)
education (base= compulsory or lower)					
diploma	0.087 (0.058)	0.319*** (0.083)	0.191*** (0.056)	0.101* (0.059)	-0.044 (0.056)
degree or higher	0.120* (0.064)	0.510*** (0.089)	0.267*** (0.064)	0.042 (0.067)	-0.123* (0.064)
financial knowledge (base= none)					
low	0.266*** (0.064)	0.485*** (0.113)	0.234*** (0.072)	0.321*** (0.073)	0.333*** (0.072)
moderate	0.525*** (0.067)	0.919*** (0.113)	0.398*** (0.074)	0.596*** (0.077)	0.687*** (0.075)
high	0.972*** (0.115)	1.305*** (0.147)	0.672*** (0.121)	1.036*** (0.123)	1.056*** (0.118)
family status	YES	YES	YES	YES	YES
location	YES	YES	YES	YES	YES
financially independent	YES	YES	YES	YES	YES
profession	YES	YES	YES	YES	YES
Observations	4021	4021	4021	4021	4021
Pseudo-R2	0.113	0.200	0.040	0.051	0.048

Note: Colum headings indicate the dependent variable. In column (1) we consider the saving behavior of individuals, who are asked to qualify their pattern of saving (save regularly, save variably, save almost nothing, don't save). In column (2) we consider the propensity to invest, recorded with a simple binary variable (yes or no). In column (3) the dependent variable is the answer to a question that asks how much people would favor a law that incentivize traceable payments (strongly agree, agree, disagree, strongly disagree). In column (4) the dependent variable is the answer to a question that asks whether digital financial services are perceived as elements conducive to more financial inclusion (strongly agree, agree, disagree, strongly disagree). In column (5) the dependent variable is the answer to a question that asks whether digital financial services are perceived as something that improve the understanding of the economic and financial environment (strongly agree, agree, disagree, strongly disagree). Regressions (1), (3), (4) and (5) are estimated through an ordered probit. Regression (2) is estimated with a simple probit model since the dependent variable is a binary variable. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A5. Regression results: financial behavior and attitudes towards digital financial services in 2019

VARIABLES	(1) saving behavior	(2) propensity to invest	(3) traceable payments	(4) DFS: financial inclusion	(5) DFS: financial knowledge
digital skills	0.035* (0.018)	0.013 (0.023)	0.043** (0.018)	0.062*** (0.019)	0.052*** (0.019)
financial knowledge (base= none)					
low	0.343*** (0.118)	0.299 (0.224)	0.165 (0.148)	0.318** (0.157)	0.453*** (0.160)
moderate	0.553*** (0.120)	0.813*** (0.222)	0.292* (0.150)	0.594*** (0.158)	0.875*** (0.161)
high	0.775*** (0.165)	1.090*** (0.250)	0.593*** (0.193)	0.988*** (0.199)	1.323*** (0.199)
gender (base=male)					
female	-0.022 (0.054)	-0.228*** (0.069)	-0.114** (0.053)	-0.011 (0.054)	-0.000 (0.052)
age	-0.020*** (0.003)	0.015*** (0.003)	-0.004* (0.003)	-0.002 (0.003)	-0.010*** (0.003)
life style (base=very low)					
low	0.247* (0.149)	0.583** (0.249)	0.111 (0.141)	0.029 (0.138)	0.125 (0.132)
average	0.797*** (0.146)	1.001*** (0.240)	0.358*** (0.137)	0.296** (0.134)	0.212* (0.127)
high	1.239*** (0.164)	1.535*** (0.255)	0.270* (0.159)	0.436*** (0.155)	0.371** (0.150)
very high	1.695*** (0.232)	1.566*** (0.329)	0.474** (0.203)	0.590*** (0.226)	0.512* (0.266)
education (base= compulsory or lower)					
diploma	0.051 (0.084)	0.391*** (0.125)	0.315*** (0.083)	0.128 (0.090)	-0.061 (0.087)
degree or higher	0.123 (0.093)	0.618*** (0.132)	0.417*** (0.093)	0.055 (0.101)	-0.196** (0.097)
family status	YES	YES	YES	YES	YES
location	YES	YES	YES	YES	YES
financially independent	YES	YES	YES	YES	YES
profession	YES	YES	YES	YES	YES
Observations	2020	2020	2020	2020	2020
Pseudo-R2	0.107	0.198	0.042	0.042	0.053

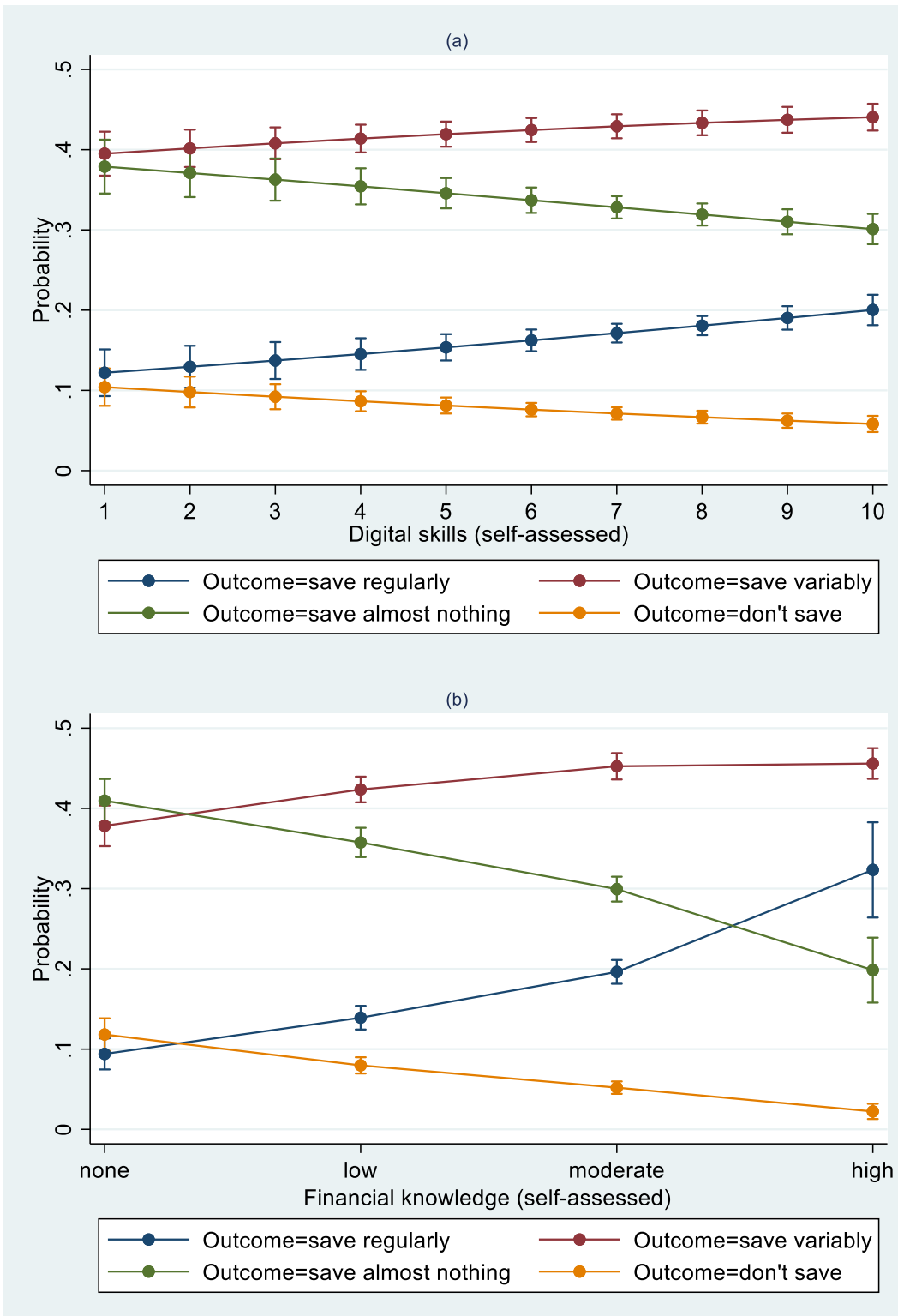
Note: Column headings indicate the dependent variable. In column (1) we consider the saving behavior of individuals, who are asked to qualify their pattern of saving (save regularly, save variably, save almost nothing, don't save). In column (2) we consider the propensity to invest, recorded with a simple binary variable (yes or no). In column (3) the dependent variable is the answer to a question that asks how much people would favor a law that incentivize traceable payments (strongly agree, agree, disagree, strongly disagree). In column (4) the dependent variable is the answer to a question that asks whether digital financial services are perceived as elements conducive to more financial inclusion (strongly agree, agree, disagree, strongly disagree). In column (5) the dependent variable is the answer to a question that asks whether digital financial services are perceived as something that improve the understanding of the economic and financial environment (strongly agree, agree, disagree, strongly disagree). Regressions (1), (3), (4) and (5) are estimated through an ordered probit. Regression (2) is estimated with a simple probit model since the dependent variable is a binary variable. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A6. Regression results: financial behavior and attitudes towards digital financial services in 2021

VARIABLES	(1) saving behavior	(2) propensity to invest	(3) traceable payments	(4) DFS: financial inclusion	(5) DFS: financial knowledge
digital skills	0.048*** (0.016)	0.023 (0.022)	0.049*** (0.017)	0.081*** (0.019)	0.077*** (0.018)
financial knowledge (base= none)					
low	0.191** (0.077)	0.585*** (0.131)	0.255*** (0.083)	0.321*** (0.083)	0.305*** (0.081)
moderate	0.519*** (0.084)	0.937*** (0.133)	0.458*** (0.087)	0.601*** (0.092)	0.595*** (0.086)
high	1.248*** (0.178)	1.429*** (0.202)	0.689*** (0.176)	1.109*** (0.177)	0.865*** (0.166)
gender (base=male)					
female	0.116** (0.056)	-0.063 (0.072)	-0.021 (0.056)	0.005 (0.057)	0.098* (0.055)
age	-0.008*** (0.003)	0.017*** (0.004)	-0.003 (0.003)	-0.008*** (0.003)	-0.010*** (0.003)
life style (base=very low)					
low	0.348** (0.140)	0.177 (0.199)	0.292** (0.134)	0.182 (0.148)	0.126 (0.132)
average	0.981*** (0.136)	0.563*** (0.185)	0.441*** (0.128)	0.298** (0.143)	0.225* (0.128)
high	1.328*** (0.167)	1.370*** (0.217)	0.640*** (0.151)	0.431** (0.171)	0.327** (0.153)
very high	1.124*** (0.261)	1.452*** (0.324)	1.130*** (0.209)	1.055*** (0.287)	0.477* (0.267)
education (base= compulsory or lower)					
diploma	0.135* (0.077)	0.242** (0.111)	0.061 (0.075)	0.070 (0.077)	-0.039 (0.070)
degree or higher	0.149* (0.089)	0.403*** (0.122)	0.113 (0.087)	0.016 (0.088)	-0.060 (0.082)
family status	YES	YES	YES	YES	YES
location	YES	YES	YES	YES	YES
financially independent	YES	YES	YES	YES	YES
profession	YES	YES	YES	YES	YES
Observations	2001	2001	2001	2001	2001
Pseudo-R2	0.133	0.209	0.043	0.065	0.048

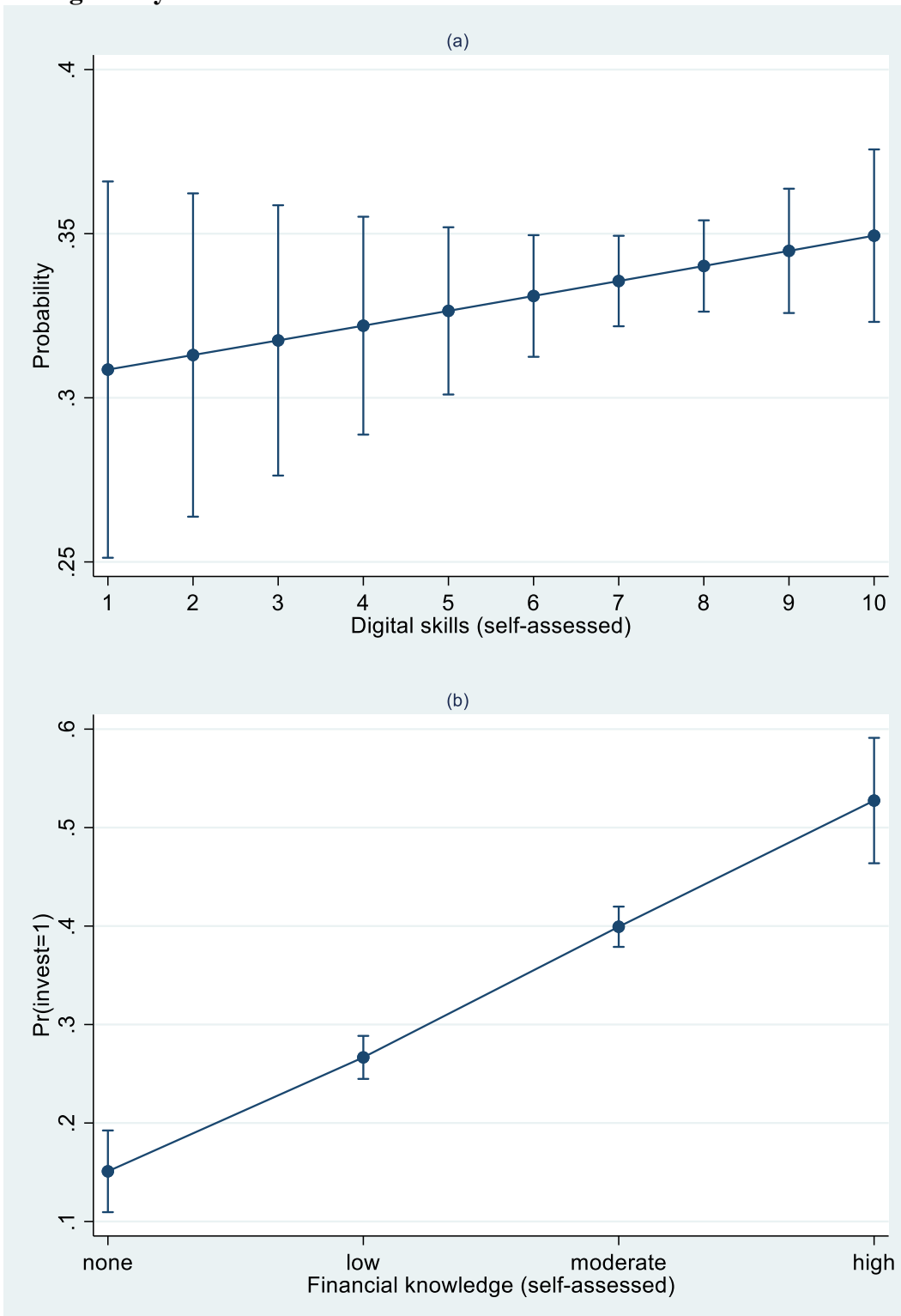
Note: Colum headings indicate the dependent variable. In column (1) we consider the saving behavior of individuals, who are asked to qualify their pattern of saving (save regularly, save variably, save almost nothing, don't save). In column (2) we consider the propensity to invest, recorded with a simple binary variable (yes or no). In column (3) the dependent variable is the answer to a question that asks how much people would favor a law that incentivize traceable payments (strongly agree, agree, disagree, strongly disagree). In column (4) the dependent variable is the answer to a question that asks whether digital financial services are perceived as elements conducive to more financial inclusion (strongly agree, agree, disagree, strongly disagree). In column (5) the dependent variable is the answer to a question that asks whether digital financial services are perceived as something that improve the understanding of the economic and financial environment (strongly agree, agree, disagree, strongly disagree). Regressions (1), (3), (4) and (5) are estimated through an ordered probit. Regression (2) is estimated with a simple probit model since the dependent variable is a binary variable. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure A1: marginal effect of digital skills and financial knowledge on saving behavior outcomes



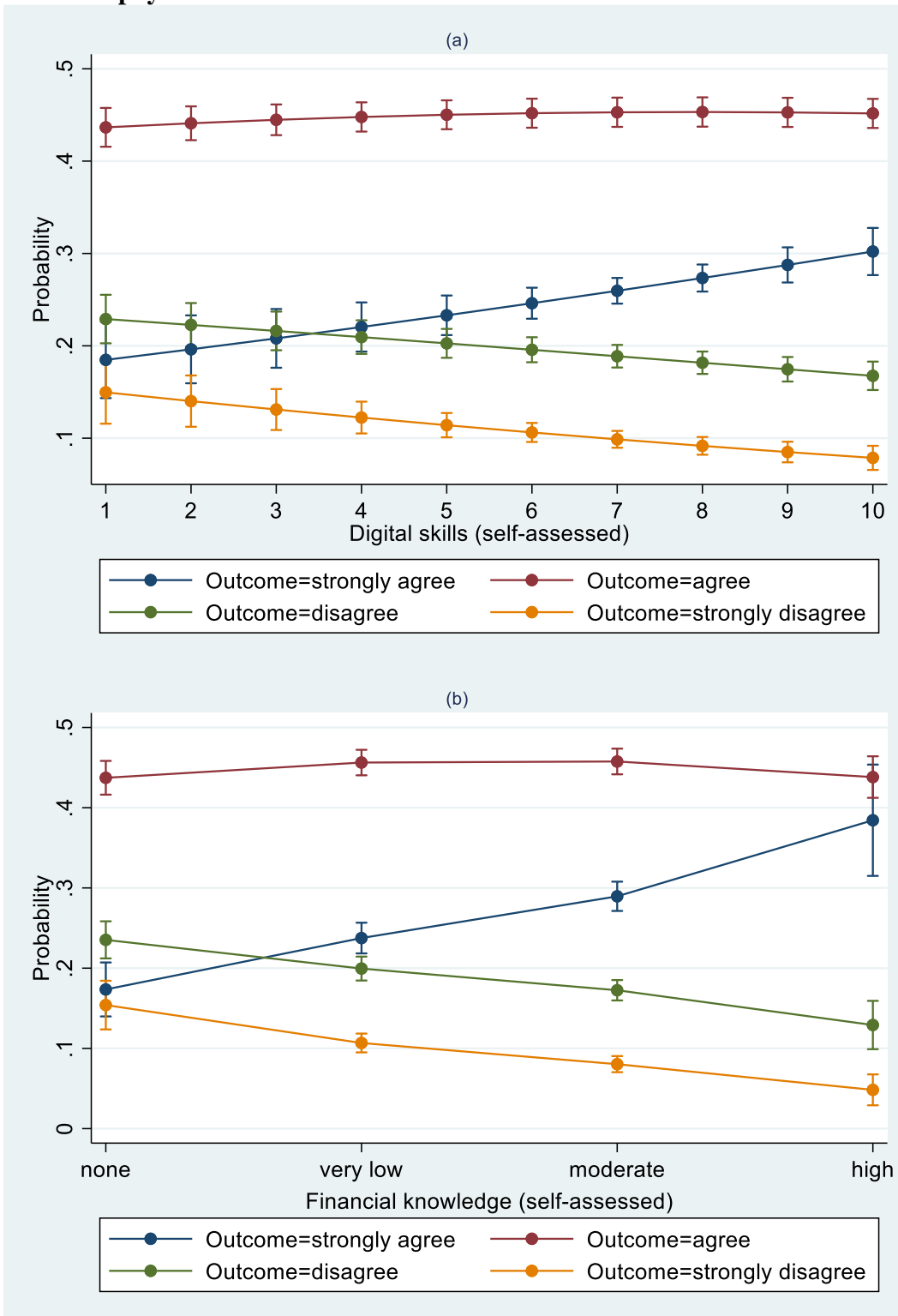
Note: Predictive margins with 95% confidence intervals based on regression (1) Table 2.

Figure A2: marginal effect of digital skills and financial knowledge on the probability of having money invested



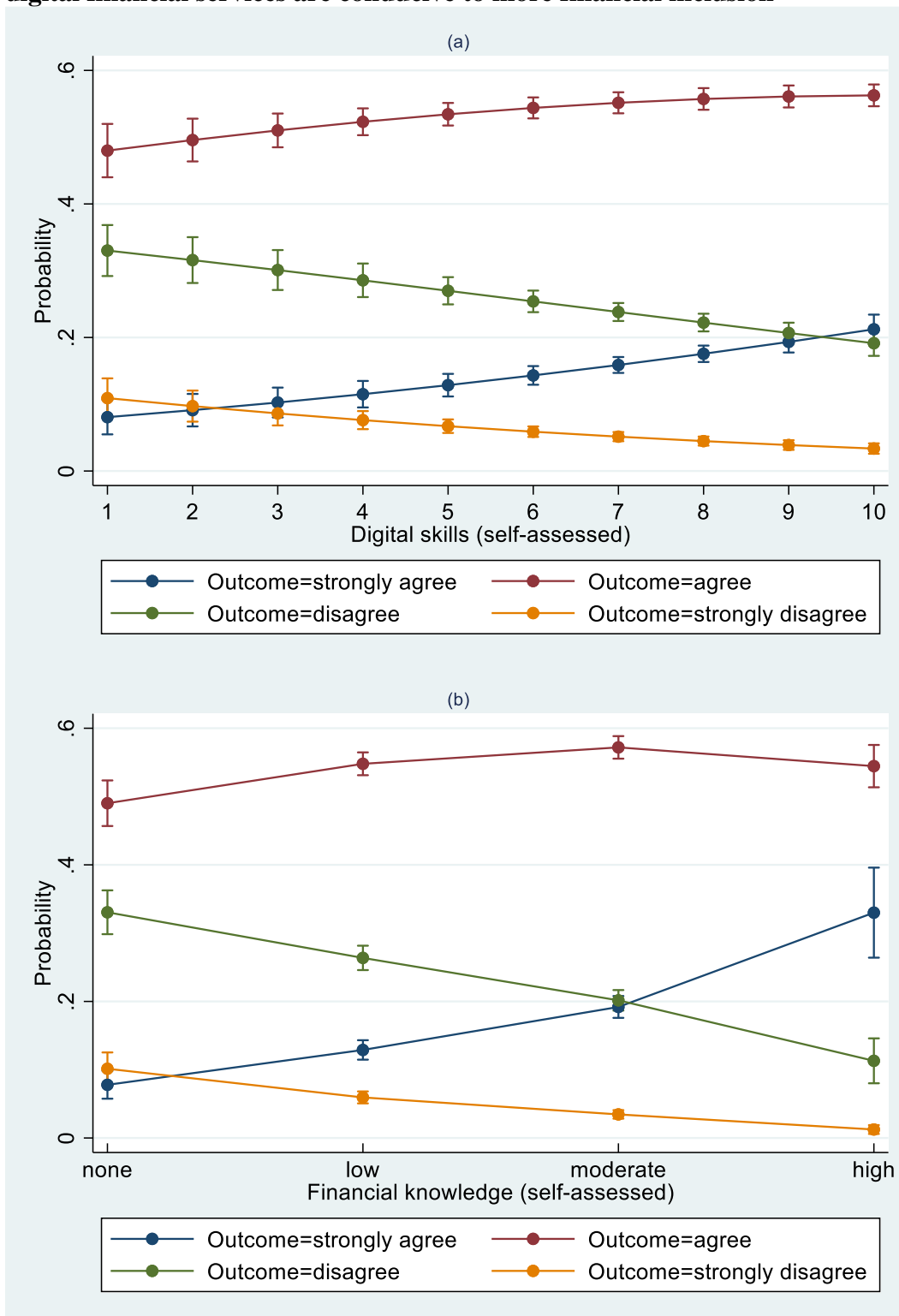
Note: Predictive margins with 95% confidence intervals based on regression (2) Table 2.

Figure A3: marginal effect of digital skills and financial knowledge on the probability of traceable payment outcomes



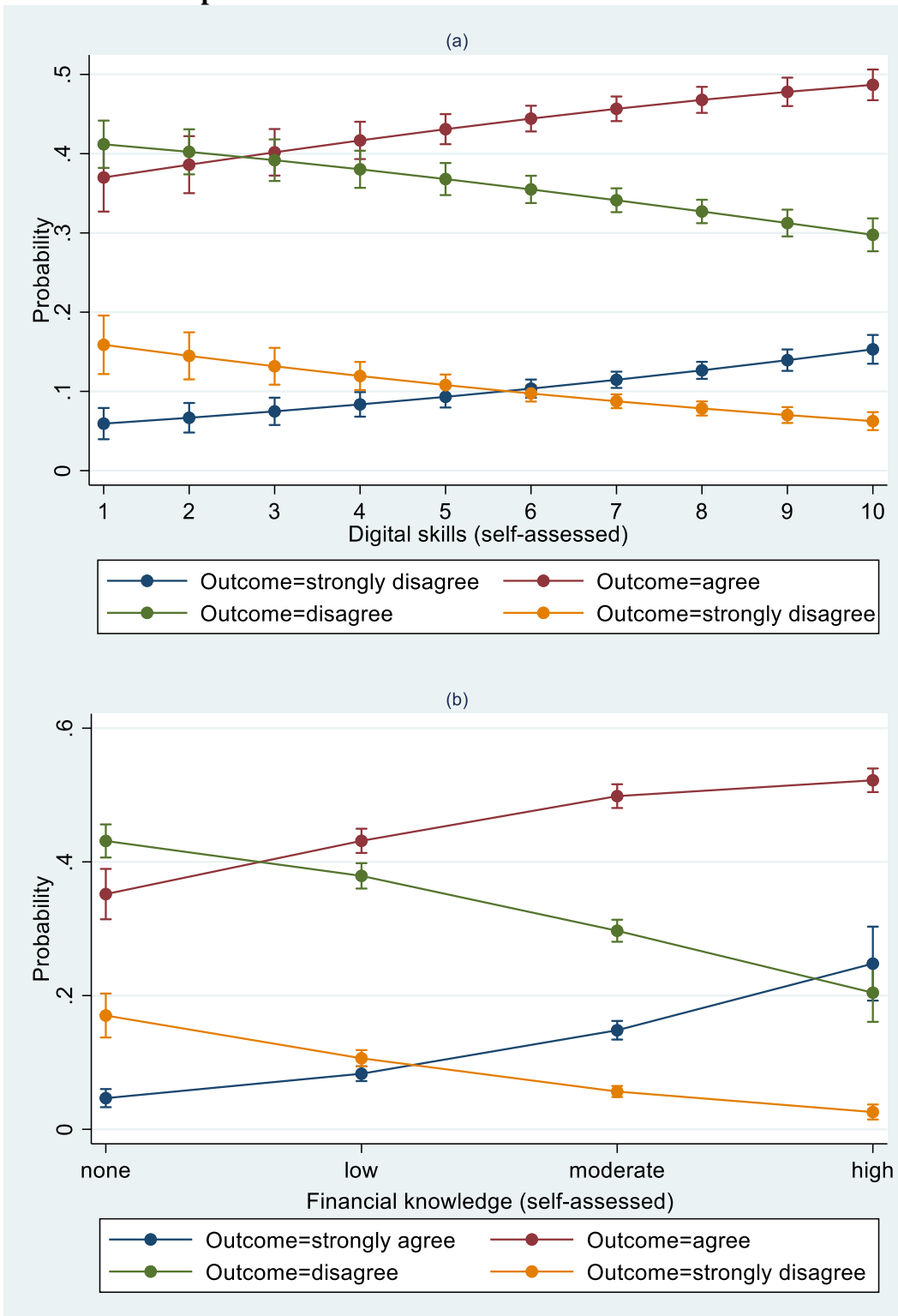
Note: Predictive margins with 95% confidence intervals based on regression (3) Table 2.

Figure A4: marginal effect of digital skills and financial knowledge on the probability that digital financial services are conducive to more financial inclusion



Note: Predictive margins with 95% confidence intervals based on regression (4) Table 2.

Figure A5: marginal effect of digital skills and financial knowledge on the probability that digital financial services are conducive to a better understanding of the economic and financial landscape



Note: Predictive margins with 95% confidence intervals based on regression (5) Table 2.

B. Description of the variables

In this section we describe (in alphabetical order) the variables used in the paper with particular relevance for our analysis. Further details on these or other variables are available upon request to the authors.

Digital skill index (self-assessed): this variable captures the self-assessed skill perceived by the interviewed. It is directly taken from an answer of the survey and it is scaled from 1 to 10.

Digital skill index (task-assessed): The variable is based on the answers provided from a list of 13 tasks (available upon request) shown to the subjects. For each task we give a unit value whenever the interviewed declared she was able to accomplish it and zero otherwise. The index is then built as the sum of the answers provided for all the tasks.¹⁴

Financial inclusion opinion: the variable measures how much people agreed with the fact that digital financial services will help people to get access financial services that are now unavailable.

Financial knowledge opinion: the variable measures how much people agreed with the fact that digital financial services will increase the knowledge on the mechanism behind economics and financial markets

Investment propensity: binary variable that is equal to one when the person declared she has some investment and zero otherwise.

Saving pattern: the variable measures the capacity of the interviewed to save money by the end of each month. The scale goes from the incapacity of saving to regularly savings.

Traceability of payments support: the variable is directly taken from the survey and captures the attitude of the interview towards the traceability of payments. On one hand this topic may in fact elicit a negative opinion given the possible concerns from the privacy point of view. On the other hand, it may be looked more favorably because traceability may be extremely useful to capture phenomenon like tax evasion and money laundering.

¹⁴ We also performed a weighted version of this digital skill index, where weights are given by the share of people not able to perform the considered task. In this way, a person able to make a non-common task is prized with a higher value. We do not show the results of this weighted index as they do not differ significantly from the simpler digital skill index as well as because they are highly correlated ($\rho = 0.97$).