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the role for financial education and new directions

by Magda Bianco, Daniela Marconi, Angela Romagnoli and Massimiliano Stacchini

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CHALLENGES FOR FINANCIAL INCLUSION: THE ROLE FOR FINANCIAL EDUCATION AND NEW DIRECTIONS

by Magda Bianco*, Daniela Marconi*, Angela Romagnoli* and Massimiliano Stacchini*

Abstract

Financial inclusion has received growing attention over the years as an enabling factor for promoting growth, reducing inequalities, and addressing poverty. In order to support policy choices aimed at enhancing financial inclusion, we investigate its main drivers, with a special focus on demand-side factors; more specifically, we enquire as to whether financial education may enhance financial inclusion. A cross-country analysis shows that, controlling for per capita GDP, higher levels of participation of individuals in economic life, greater financial knowledge and the existence of financial education strategies reduce the likelihood of a country being in the low financial inclusion segment. Moreover, as digitalization offers great opportunities to expand inclusion (but also some challenges), we provide evidence on the relationship between financial literacy and digital skills, showing that (at least in more advanced countries) digital skills are positively correlated with financial literacy from a young age. Based on our findings, we suggest some directions for future research, measurement and data collection, and policy actions.

JEL Classification: D14, G53, O38.

Keywords: financial inclusion; financial literacy; financial education.

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1. Introduction¹

Financial inclusion, broadly defined as the proportion of individuals and firms that can access and use financial services, has been recognized as a major factor in improving well-being of individuals. It is also as a crucial element in driving business growth, with positive impact on aggregate economic growth and on the reduction of income inequality and poverty (Sahay et al., 2020; Sahay et al., 2015; Loukoianova and Yang, 2018; Bettini et al., 2020).^{2,3}

Financial inclusion is a multifaceted concept, whose boundaries are difficult to define as they change depending on the level of economic and financial development. According to the latest report based on the Global Findex database (Demirgüç-Kunt et al., 2018), financial inclusion, measured as the percentage of adult population holding an account, has grown significantly in the last few years. In 2017, 69% of adults population reported having an account, up from 51 percent in 2011.⁴ There is still ample variation between and within countries: in advanced economies, 94 percent of adults have an account; in developing ones 63 percent. Still, 1.7 billion people worldwide remained unbanked in 2017 and a large fraction of households underserved, as they have access only to a limited variety of financial services.

At the microeconomic level, being financially included is not only the result of the availability of and accessibility to financial services and products, but it also depends on the actual demand and the appropriate use of financial services. Indeed, some financial exclusion may be voluntary, that is, some individuals and firms may choose not to use financial services for cultural, religious and other economic and non-economic reasons (Barajas et al., 2020). In this respect, financial awareness/capability and individuals' participation to the formal economic life, which may also be enhanced by financial inclusion, are two key ingredients to stimulate an effective and responsible use of financial services.

We first explore the level of financial inclusion around the world and its correlated factors, with a specific focus on demand-side factors (including policies influencing financial awareness and capabilities, such as financial education policies). Preliminary results show that, controlling for supply-side constraints, demand-side factors, such as the level of economic inclusion (that is the active participation to the work force, or the engagement in education and training), financial knowledge and the existence of financial capability/education strategies, positively correlate with the probability of being financially included.

The strict interlinkages between these variables are not an indication of causal relationships: formal economic inclusion might be stimulated by financial inclusion, and financial knowledge enhanced by

¹ The views expressed herein are those of the authors and should not be interpreted as those of the Bank of Italy.

² The definition of financial inclusion is not unique, as it depends on the level of financial development, the scope of the analysis and the availability of data to measure it (Barajas et al., 2020). According to Raghuram Rajan, *financial inclusion is about (a) the broadening of financial services to those people and enterprises who do not have access to financial services sector; (b) the deepening of financial services for those who have minimal financial services; and (c) greater financial literacy and consumer protection so that those who are offered financial products can make appropriate choices.* Speech by Dr Raghuram Rajan, Governor of the Reserve Bank of India, at the National Seminar on “Equity, Access, and Inclusion – Transforming Rural India through Financial Inclusion”, organised by the National Institute of Rural Development and Panchayat Raj, Hyderabad, 18 July 2016.

³ Less explored is the link between financial inclusion and financial stability, also due to lack of reliable data to make such an assessment. One critical point is when greater financial inclusion is associated with over-borrowing which may increase the risks of banking crisis (Čihák et al, 2016).

⁴ In this paper, for the purpose of cross-country comparability, we use a basic definition of financial inclusion taken by the Global Findex database.

the use of financial services and products (Lusardi and Mitchell, 2011, Xu and Zia, 2012; Carpena and Zia, 2018; Buch, 2018). What these findings suggest is the importance to better understand the causal relationship between financial literacy, financial education policies and financial and economic inclusion. We will argue that in order to achieve this goal we need to integrate the different perspectives in data collection efforts.

In this vein, understanding the role of digital skills for financial literacy and financial inclusion is key at this time, particularly in light of the lessons learnt during the COVID-19 crisis. The pandemic crisis imposed a structural break to many economic sectors, including financial activities, making digitalization at the heart of the functioning of our economic and financial system. Implications of the crises for the supply and demand of digital financial services are sizable, also in connection with policy interventions. This suggests that for the purpose of investigating financial inclusion, the measurement of financial literacy should take into account also the dimension of digital knowledge.

We address these questions shedding some light on the complementarity between digital and financial literacy skills, based on cross-country survey data for the young population drawn from PISA 2018, and for the Italian adult population, based on IACOFI 2020.

Based on our preliminary findings we draw conclusions suggesting new directions for the measurement of financial literacy required in financial inclusion investigation and for financial education policies⁵.

The remainder of the paper is organized as follows. Section 2 analyzes financial inclusion and its correlated factors around the world. Section 3 provides a first assessment of the relationship between financial literacy and digital skills. Section 4 discusses the implications for financial literacy and its measurement. Section 5 concludes the paper.

2. Financial inclusion and its correlated factors

Financial inclusion has received a lot of attention over the years as a fundamental instrument to favor growth, reduce inequalities, and address poverty (Sahay et al., 2015; Loukoianova and Yang, 2018; Sahay et al., 2020; Cihak et al., 2016). At microeconomic level, the benefit of financial inclusion in reducing rural poverty, increasing employment and saving has been established by several authors (Burgess and Pande, 2005; Yunus 2003); in particular, Banerjee et al. 2019 show that microcredit can facilitate low-wealth talented entrepreneurs to escape from poverty. Greater financial inclusion helps in coping with micro and macroeconomic shocks as it facilitates financial planning of expenses according to current and expected income and the intertemporal shift of financial resources.

Given the positive effects of financial inclusion, economists and policy makers have long debated on the determinants of financial inclusion. Earlier contributions saw financial inclusion as a byproduct (or one aspect) of financial development (see for instance, the seminal paper of Rajan and Zingales, 1998, the extensive review of Levine, 2005, and Beck et al., 2007). More recently, a specific attention has been given to demand-side factor and more specifically to the role of financial literacy. Financial inclusion and financial literacy/awareness are interdependent and mutually reinforcing: financial inclusion is a precondition for financial literacy to produce its beneficial effects, but at the same time, financial literacy can help in overcoming demand constraints for financial services.⁶ For instance,

⁵ See De Bonis et al. (2022) for an introduction to financial education.

⁶Xu and Zia (2012) suggest that financial awareness is “a major barrier to take-up financial products”, providing support for a broader concept of financial literacy.

financial literacy may help in reducing information asymmetries facilitating more cost-effective financial inclusion (Campbell, 2016). Yet, the interlinkages between these two dimensions are little explored (Grohmann et al., 2018), partly because there are large differences in the definition and measurement of financial literacy and financial inclusion, which makes it difficult to find robust causal relationship at more aggregate levels.⁷

Assessing financial inclusion and its drivers is not an easy task, as the definition of financial inclusion itself depends on the level of economic and financial development, and it changes over time, as digital technologies shape the demand and supply of financial products and services (Claessens and Rojas-Suarez, 2020). On the supply side, binding constraints such as lack of infrastructure, lack of competition, geographical dispersion of population may reduce the ability of financial service providers to reach the whole population. On the demand side, the uptake of financial services and products can be low for several reasons, even when prices and fees of financial services are low, including poverty, distrust and perceived low benefits.

In the remainder of this section, we provide a synthetic overview of the financial inclusion and its correlated factors. Compared to Grohmann et al., 2018, our analysis uses data for financial inclusion in 2017, while they use data for 2014; we also control for additional variables such as the existence of policies for financial inclusion, the financial sector development, which primarily aim at addressing supply-side constraints, and financial education policies, as well as indicators for formal economic inclusion, which instead work more in the direction of removing demand-side constraints. The classification of the variables in supply and demand constraints follows somewhat the suggestions given by Claessens and Rojas-Suarez (2020), even if constrained by data availability. We consider a sample of 110 countries, combining data from several databases from the World Bank (variable definition and data sources are described in Table A1 in the Appendix). Our variable of financial inclusion is taken from the Findex database, and corresponds to the percentage of adults (age 25+) who report having an account (by themselves or with someone else) at a bank or another type of financial institution or report using a mobile money service in the past 12 months. We consider only the latest available values gathered in 2017. We construct a binary variable taking value 1 if the rate of financial inclusion in country i belongs to the lowest two quartiles of the distribution. Working with binary variables allows us to have an easy interpretation of the results, in fact, financial inclusion as measured by the Findex database is bounded from above while the main control, GDP per capita, is not. All the regressions are also run in levels and the results for our key variables are in fact fundamentally unchanged. In our sample, a country belongs to this segment if the rate of financial inclusion of older adults is below 69%. This choice allows us to have the same number of observations above and below the threshold.⁸

A multivariate analysis of the relationship between financial inclusion, supply and demand factors is conducted by estimating a linear probability model (LPM) specified as follows

$$Y_i = \beta_1 X_{i1} + \dots + \beta_k X_{ik} + u_i$$

where the dependent variable Y_i is a binary variable taking value 1 if less than 69% of the adult population have an account and 0 otherwise. X is a vector of covariates. Some of them are more related to supply constraints: the degree of digital adoption; the existence of various types of financial

⁷ Klapper et al. (2015) suggest a bidirectional causality between financial knowledge and financial inclusion, noting that people that have a bank account tend to have better financial skills than rich adults who do not.

⁸ The choice of the threshold is arbitrary, as there is no threshold for low financial inclusion defined in the literature. We selected the threshold based on the distribution of the variable in our sample, so that we have half of the countries above and half of the countries below the threshold.

inclusion and financial development strategies; all these variables are highly correlated with GDP per capita, which we control for too. Another important policy variable that can capture both supply and demand-side constraints is the stringency of identification policies (ID). To this purpose we include a binary variable for the stringency of ID policies for opening an account with a financial institution, in particular we consider one of the most stringent, which is proof of income, more binding where informality is high⁹. Controlling for supply constraints, our focus is on demand constraints. To capture policies that can relax demand-side constraints related to awareness, we include a binary variable for the existence of financial capability/literacy/education policies. Moreover, we include a proxy for economic and social exclusion, summarized by the share of youth not in education, employment or training (in percentage of youth population).¹⁰ Financial literacy and economic inclusion/participation are our key variables. To better compare our results with Grohmann et al. (2018) we introduce in our regressions a variable that measures financial knowledge as proposed in Klapper et al. (2015). The measure is built on the Gallup World Poll Survey run in 2014. Financial knowledge was measured using questions assessing the degree of knowledge of basic financial concepts, such as interest rates, interest compounding, inflation and risk diversification. As we will explain more extensively in Section 4, according to the OECD/INFE definition, financial knowledge is only one component of financial literacy, which includes also attitudes and behaviors, but it is indeed the more robust component, especially for cross-country comparisons. We use the average score at country level, which is freely accessible from Klapper et al. (2015).¹¹ Finally, we control for incentives by including a binary variable capturing the existence of tax incentives for saving and for indicators of trust in the financial system, such as the existence of financial consumer protection regulation as surveyed by the World Bank, and governance indicators such as creditor legal rights and ease of doing business.

Results are summarized in Table 1, for brevity we show only the main variables of interest, but all the results are available from the authors upon request. Starting with the basic LPM regression in column 1, as expected we find that a strong relationship between the probability of being in a low financial inclusion segment and GDP per capita. The variable NEET, indicating the percentage of young people not in education and not in the labor force,¹² is also highly significant, indicating the importance of economic and social inclusion for having a greater uptake of account holdings. Finally, and interestingly, we find that having a national financial capability/literacy/education strategy is associated with a lower probability of being in a low financial inclusion country by 0.17. This policy variable is indeed very significant, and keeps its significance also controlling for other variables capturing governance levels, tax incentives for saving (and other unreported tax incentives for

⁹ As suggested by Classens and Rojas-Suarez (2020), identification requirements can be seen as both supply-side and demand-side constraints. ID policies can be more or less stringent, going from a simple identification document to proof of income or employment. Here we use proof of income, a policy that is more or less binding based on whether individuals can prove their income. In countries with high levels of informality, providing proof of income or employment may be problematic for most people, discouraging them to open an account. Similarly, AFI (2018) noted that documentation requirements can often affect more women than men for economic reasons, worsening the gender gap in financial access.

¹⁰ The variable NEET is used to measure social exclusion, economic inactivity and levels of disengagement from labour markets. An alternative variable is the rate of female participation to the labor market (results are available from the authors upon request).

¹¹ Microdata show that financial knowledge is lower among women and the poor.

¹² The coefficient of NEET implies that a 10% increase of NEET, that is, going from a percentage of NEET from 10 to 11, is associated with a 1% increase in the probability of being in the low financial inclusion group.

opening an account), various types of financial consumer protection policies¹³ or controls for creditors legal rights, aimed at capturing trust in the financial sector, as well as ID stringency.¹⁴

We include the additional variables in our linear probability model (LPM) and we compare the results with regressions in levels. Columns 2-4 show that the variable financial knowledge (FK) is significant. In the LPM a 10% increase in FK implies a decrease of probability of being in the low inclusion group by about 1%, in the model in levels, the same increase in FK, implies an increase in the percentage of people having an account by 7%. In column 4, the coefficients on FK, GDP per capita and Credit to GDP are comparable to that of Grohmann et al. (2018). We also confirm the significance of financial education policies and the importance of active participation to the social and economic life (NEET). In the last column we replace the variable NEET with the female participation rate to the labor market (two variables not considered in Grohmann et al. 2018). This replacement allows us to gain some observations and to introduce the issue of gender gap. The female participation rate to the labor market captures the degree of female participation to the formal economic life. This variable is very significant and positively correlated with financial inclusion. Given the high correlation between the degree of financial knowledge in a country and the female participation to the labor market, we transform the financial knowledge variable to make it orthogonal to the participation rate.¹⁵ The gender gap in financial knowledge is, in fact, partly driven by a lower participation rate of women to the labor market compared to men. Evidence on micro data shows that a more active participation to the economic and financial life is positively correlated with financial literacy (D'Alessio et al., 2020).¹⁶ In all the regressions the existence of financial education policies continues to be strongly positively correlated with more financial inclusion.¹⁷

To summarize, we find that, controlling a set of supply-side constraints, including some important policy variables, and the level of development, including GDP per capita and credit to GDP, some key demand constraints appear highly correlated with low financial inclusion. In particular, we pay attention to the level of economic inclusion/participation to the formal economic life as a factor that may influence the uptake of financial services. The formal participation to the economic life may be seen as an element of empowerment which may be highly correlated with all forms of self-inclusion. The existence of national strategies for financial capability/literacy/education seems to play a very positive role; the financial knowledge score is also significant and strongly correlated to other indicators of social and economic inclusions, particularly of young and women.

¹³ Financial consumer protection policies, were surveyed by the World Bank (World Bank Group, 2017). These policies are fundamental to build trust in the system and to safeguard consumers; however, it is not easy to capture the complexity of the issue with a binary variable. We considered two variables: stand-alone financial consumer protection regulation and stand-alone financial consumer protection law. While a stand-alone financial consumer protection regulation exists in half of our sample countries (in about 40% of the lower income countries and 55% of higher income countries), a specific financial consumer protection law exists only in higher income countries. The latter variable is positively correlated with financial inclusion, but it is also highly collinear with the level of financial and economic development. Using a more sophisticated measure of financial consumer protection, Klapper and Lusardi, 2019, show that there is a positive relationship between this measure and financial knowledge. We also confirm a strong positive relationship between financial knowledge and the existence of a stand-alone financial consumer protection law.

¹⁴ Results are available from the authors upon request.

¹⁵ The same transformation has been performed in the regression with the variable NEET, again highly correlated with financial knowledge.

¹⁶ Klapper and Lusardi (2019) also show that controlling for other individual characteristics, financial knowledge is significantly higher for employed and self-employed, relative to adults who are out of the workforce.

¹⁷ Contrary to Grohmann et al. (2018), we did not find a non-linear relationship between financial literacy and Credit to GDP. We also replicated other exercises carried-out in their paper with different results. Differences may depend on the different wave of the Findex survey and from the number of countries. All results are available from the authors upon request.

Table 1: Financial inclusion: financial knowledge, economic participation and financial education policies

Dependent variable: percentage of adults (age 25+) who report having an account

	LPM	LPM	LPM	Levels	Levels
	NEET	NEET&FK	CREDIT/GDP	NEET&FK	Female participation rate&FK
GDP per capita (high=1; low=0 for LPM; log for levels)	-0.469*** (0.124)	-0.330** (0.148)	-0.251* (0.136)	15.369*** (3.78)	14.317*** (2.63)
Credit to GDP (high=1; low=0 for LPM; % of GDP for levels)			-0.267** (0.105)	0.067*** (0.02)	0.084*** (0.01)
Financial knowledge rate		-0.007* (0.004)	-0.008** (0.004)	0.393*** (0.03)	0.247*** (0.02)
NEET (% of young)	0.010** (0.005)	0.016** (0.006)	0.013** (0.006)	-0.029*** (0.01)	
Female labor market participation rate					0.331** (0.15)
Financial Capability/Literacy/Education Strategy: if exists=1	-0.167** (0.087)	-0.180** (0.086)	-0.159** (0.076)	13.007*** (2.47)	7.355*** (1.53)
Constant	0.415** (0.168)	0.289 (0.173)	0.483*** (0.179)	70.524*** (1.334)	68.329*** (1.376)
Observations	81	79	79	73	90
R-squared	0.589	0.553	0.604	0.813	0.759

Note: OLS regressions; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is a binary variable for low financial inclusion in LPM regressions and the percentage of adults (age 25+) who report having an account for regressions in levels. The variable financial knowledge is transformed to make it orthogonal to the variable NEET in columns (2), (3) and (4). In column (5) it is orthogonal to the female participation rate. On the demand-side, all the regressions control for tax incentive saving schemes and the existence of financial protection policies; on the supply-side, for the existence of financial inclusion policies, financial sector development policies and for the level of digital adoption. The stringency of ID policies is also included.

3. Financial literacy and digital skills

In recent years, financial inclusion has been facilitated by the expansion of digital financial services. According to a new index released by the IMF for a number of emerging and developing economies (EMDEs), digital financial inclusion - mainly measured as access and usage of digital payments - had been growing fast before the COVID-19 crisis. Between 2014 and 2017, it almost doubled in Africa and showed a remarkable increase in other EMDEs¹⁸. Unfortunately, more recent and comprehensive data are missing and we have only scattered evidence on how the Covid-19 crisis influenced financial inclusion. Available evidence suggests that digital payments received an enormous push during the pandemic crisis, when a large number of consumers reported paying less with cash and more with contactless cards (CCAF et al., 2020). As for lending activities, the evidence is less univocal.

Digital financial services may offer great opportunities for inclusion and resilience, for instance by facilitating the flow of remittances to poor countries, or by facilitating the delivery of subsidies and emergency assistance to those most in need (G2P). However, opportunities for greater inclusion from digital financial services also come with new risks of exclusion, which may due to both supply

¹⁸ Digital lending has also grown fast in recent years, albeit from a very low base. Data on the overall size of digital lending are scarce. Cornelli et al. estimate that, in 2019, fintech and big tech credit (together “total alternative credit”) reached USD 795 billion globally (104 USD per capita), about 0.7% of total global lending (which equals 1,700 USD per capita).

constraints, for instance, when digital infrastructures are insufficient, and demand constraints, when digital and financial skills are poor.

Can financial literacy facilitate digital financial inclusion?

The benefits and risks arising from the application of digital innovation to the financial industry point to digital skills and financial literacy competences as complementary drivers of personal financial well-being in the digital era¹⁹. In fact, while digital acceleration has indubitably the power to enrich the supply of financial services and the number of potential consumers, new constraints on demand side could arise if digital and financial competences were considered in isolation, rather than as complements²⁰.

In this section we shed a light on those complementarities by exploring available evidence on the relationship between financial literacy and digital skills for young students in advanced countries and for the adult population in Italy.

Why experience with digital media can foster financial competences? It is known that the use of digital media can activate cognitive functions and critical thinking, under certain (desirable) conditions²¹. We hypothesize that experience with digital media, especially if oriented toward valuable goals, can stimulate open-minded approaches toward planning, facilitate search for information and stimulate financial capabilities²².

3.1 Evidence from PISA

To analyze the relation between financial and digital literacy, we consider 15 years old students participating to the 2018 Program for International Student Assessment (PISA). PISA provides a rich source of data collected from questionnaires submitted to students, parents and school principals. Importantly, PISA has detailed information on either performance in financial literacy²³ and confidence with digital media. The latter dimension is tracked through a specific ICT questionnaire that complements information available on cognitive abilities (such as math and reading). The sample includes more than 40,000 students resident in the following countries: Estonia, Finland, Poland,

¹⁹ These dimensions enter the broad concept of ‘digital financial literacy’, which has been recently considered by scholars and institutions. See [OECD, G20/OECD INFE Policy Guidance on Digitalisation and Financial Literacy \(2018a\)](#).

²⁰ While lack of digital skill prevents the use of digital financial products, lack of financial literacy might rise risks associated with use of digital media as well as hamper financial capability and a full-fledged financial inclusion. Yakoboski, Lusardi, and Hasler (2018) show that fintech millennial users strongly benefit from being financially literate as it reduces their propensity to engage in a vast array of suboptimal financial management practices.

²¹ As for children, recent literature shows that benefits and risks implied by the use of digital media depend on the quality of the content that is channeled, as well as of the (social) environment in which media are used. See Smith, H. (2020) [Children, executive functioning, and digital media: A review](#).

²² The (sparse) evidence on the influence of digital skills on financial capabilities is mixed. French, McKillop, and Stewart (2020) show how mobile apps tailored on the management of personal finance improve basic financial skills and behaviors of users. Conversely, risks arising from the application of digital technologies might exist especially for financially unsophisticated individuals. An easier access to financial products allowed by apps or on-line platforms might rise suboptimal behavior associated with excessive delegation to algorithms, myopia or short-termism potentially responsible for over-borrowing or over-investments. Lusardi, de Bassa Scheresberg, and Avery (2018) show empirically how users of mobile payment instruments engage into overdrawing of their checking accounts, expensive use of credit cards and withdrawing from their retirement accounts.

²³ The framework used by PISA 2018 to assess students’ financial skills encompasses different dimensions. Some of them relate to the availability of competences that are essential for financial literacy (content); others point to the ability to apply concepts, make evaluations and suggest solutions to specific financial issues (cognitive abilities).

USA, Latvia, Lithuania, Spain, Slovak Republic, Italy and Chile. For these students, data on financial literacy can be merged with answers provided to the ICT familiarity questionnaire.

Three (not mutually exclusive) hypotheses are under investigation. We start with the following:

H0: students endowed with higher levels of digital skills are more likely to exhibit a higher performance in financial literacy

To capture digital skills, we consider age at which students start to use a digital device. On this account, we assume familiarity with digitalization to be decreasing in the age when individuals begin to use digital technology²⁴.

Secondly, we take into account how students characterize use of technology. In particular, we seek to capture applications of technology that envisage conditions for a fruitful and valuable use of digital media; hence, we look at the intensity with which digitalization is exploited with the aim of *stay informed and reading news*. The hypothesis under investigation is:

H1: students using digital skills for staying informed are more likely to exhibit a higher performance in financial literacy

Finally, we address students' familiarity with digital finance. We verify the significance of the following:

H2: students having greater confidence with digital finance are more likely to exhibit a higher performance in financial literacy

We use an indicator that synthetically proxies confidence with use of technology for each of the following activities: transferring money, paying with debit card and mobile device, keeping track of personal balance, ensuring safety of sensitive information when making electronic payments or using on-line banking²⁵.

We start by presenting illustrative evidence on the link between digital and financial skills (Figures 1-3). Then we formally test our hypotheses through multivariate empirical models (Table 2).

Figure 1 presents the distribution of students by age when individuals start to use digital media. The data highlight the differences between Italy and the other OECD countries and presents a breakdown by gender. As for OECD countries (except Italy), 77 per cent of males began to use technology before the age of 10; as for females, the figure is lower and equal to 72. As far as Italy is concerned, percentages of students starting to use digital media before the age of 10 equal 65 for males and 60 for females.

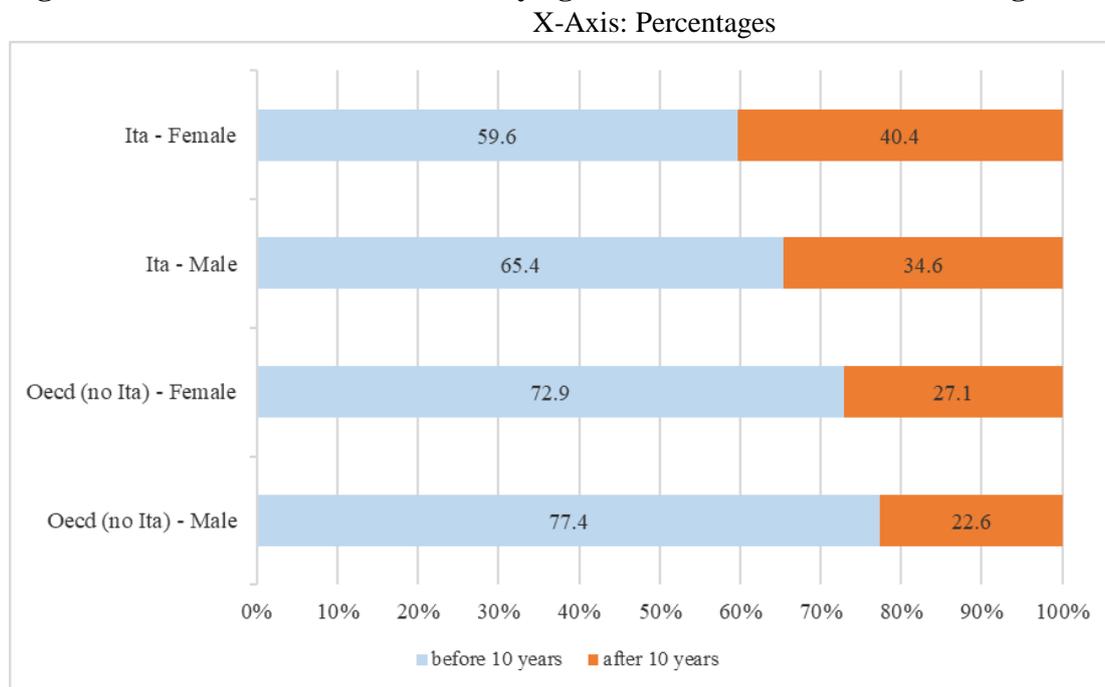
Figure 2 presents the link between digital skills and financial literacy for the whole sample of OECD students. The performance in financial literacy negatively correlates with the age at which students start to use digital devices. That is, students starting later to use digital devices show a lower level of financial literacy. The pattern is more visible for students starting at the age of 10 and later and holds for both female and male students. Further, the figure shows a gender gap in the performance of financial literacy that penalizes females at each bin of the distribution by digital skills.

²⁴ The question submitted to students is "How old were you when you first used a digital device?"

²⁵ The indicator, FLCONICT, is elaborated by OECD and consists of a normalized variable having mean and standard deviation equal to 0 and 1, respectively.

We also track the distribution of students' financial literacy by considering the role of using technology to *stay informed*; here the bins range from 'never or hardly ever' to 'every day'. Figure 3 shows that the performance in financial literacy is increasing in the intensity of use of technology for that goal. Further, a gender gap in financial skills emerges along such dimension.

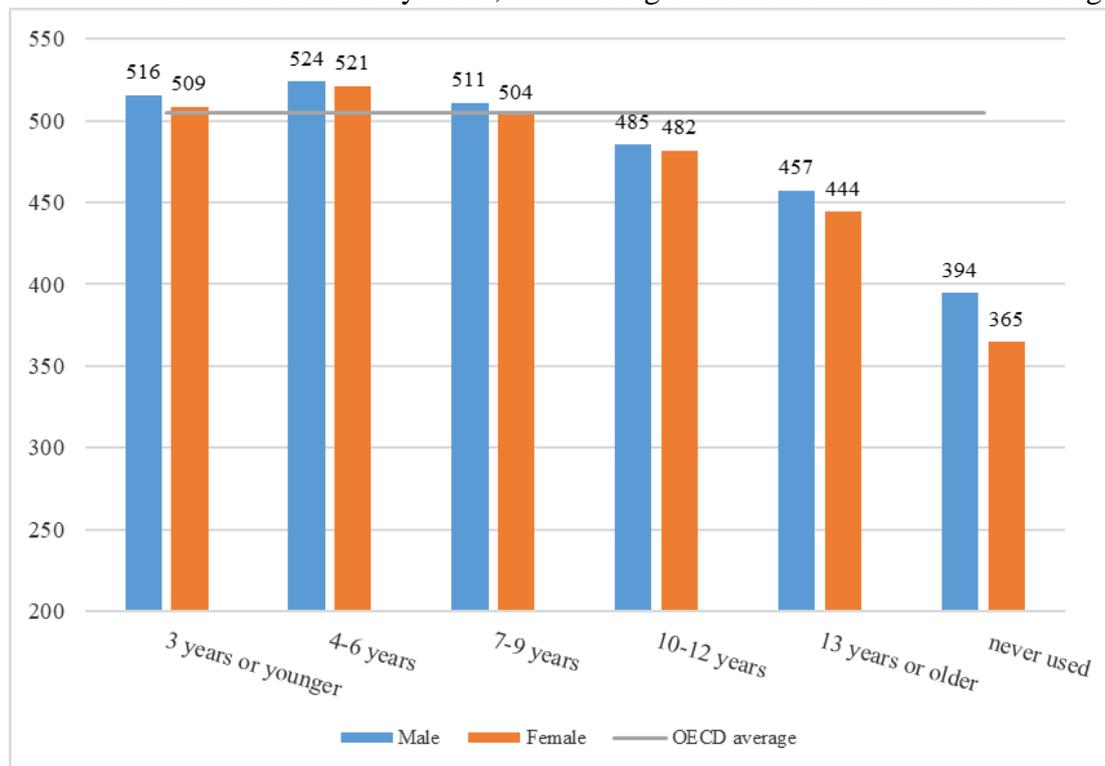
Fig 1 – The distribution of students by age when student starts to use a digital device



Source: PISA 2018. Data refer to 15 years old students based in OECD countries.

Fig 2 – Financial literacy is lower for students starting later the use of digital devices

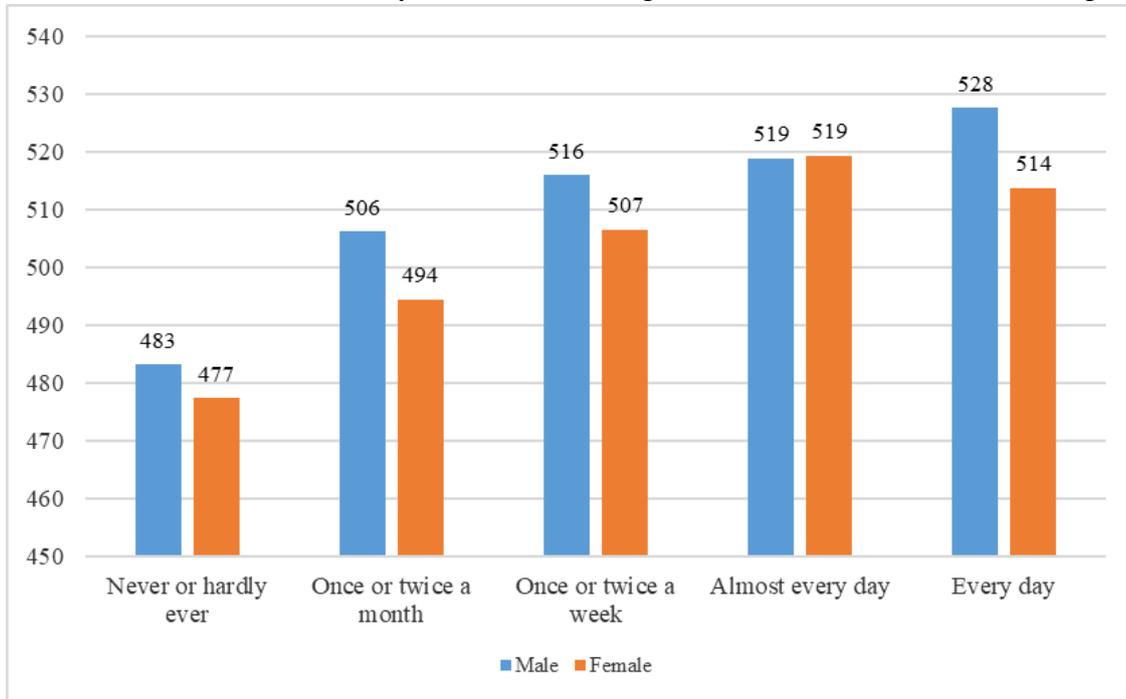
Y- Axis: Financial literacy score; X- Axis: age at which student starts to use digital device



Source: PISA 2018. Data refer to 15 years old students based in OECD countries.

Fig 3 – There is a positive correlation between financial literacy and use of device to stay informed

Y- Axis: Financial literacy score; X- Axis: age at which student starts to use digital device



Source: PISA 2018. Data refer to 15 years old students based in OECD countries.

We scrutinize the relevance of these correlations in the context of multivariate regressions. To single out the link between digital and financial skills, we estimate alternatives of the following empirical model

$$FL_i = \alpha + \beta_1 math_i + \beta_2 reading_i + \beta_3 digital_i + \beta_4 ESCS_i + \beta_5 school_i + \beta_6 country_i + \varepsilon_i$$

where FL_i is the score in financial literacy achieved by the i -th student, $digital_i$, our key covariate, captures the age when students started to use digital device (when H_0 is tested)²⁶. Our controls include the terms $math_i$ and $reading_i$, which indicate student performances in mathematical and reading abilities²⁷, and the indicator $ESCS_i$ that controls for student socio-economic and cultural background. Finally, we include school- and country- dummies to control for confounding factors at the country and school levels. In our more severe specifications, identification comes solely from the variation in the digital skills among students of the same school (and of the same country) after controlling for students' family background, and mathematical and reading abilities²⁸.

Table 2 presents our results with regard to the two hypotheses under investigation. To begin with, similarly to Lamboglia and Stacchini (2022) and as expected, all columns show a positive link between the performance in financial literacy and the scores in mathematical and reading abilities

²⁶ Alternatively, $digital_i$ refers to the use of digital device for staying informed when H_1 is investigated.

²⁷ The performance in financial literacy, mathematical and reading abilities, provided by PISA consists of standardized values having mean and standard deviation equal to 500 and 100, respectively.

²⁸ Our analysis rests on the assumptions that unobservable individual characteristics are uncorrelated with availability (yes or not) of information on ICT familiarity, and that residuals of regressions (controlling for mathematical and reading abilities, family background and school or, alternatively, country dummies) are uncorrelated with the variables capturing digital skills.

(columns 1-2). With regard to magnitude, the coefficient for math more than doubles the one estimated for reading abilities. The model also confirms the relevance of a gender gap, which penalizes females by around 7 points.

As far as digital skills are concerned, and with regard to H0, columns 3-4 omit the group of students starting to use digital devices before the age of 10. Hence, the coefficients show the differences in the performance of financial literacy between these students and those belonging to the specified clusters. The estimates show that the performance in financial literacy for students starting to use digital device at the age of 13 is lower than that for their peers by 7 points. The gap in financial literacy arising from delay in the use of digital media is comparable (in size) to the one we observe by gender.

We augment the model by considering the intensity with which students use digital devices for staying informed (H1). Specifically, we include a dummy equal to 1 for individuals using technology for reading news every day or almost (READNEWS). Columns 5-6 confirm the significance of mathematical and reading abilities and a gender gap in financial literacy. With regard to digital skills, the model indicates a positive and significant association between financial literacy and the intensity of the use of digital technology for staying informed (5 points).

The analysis continues by tracking student confidence with digital finance and its relation with financial achievements (H2). Columns 7-8 present the evidence. The coefficient of FLCONICT is positive and statistically significant; in terms of magnitude, an increase of confidence in digital financial activities by one standard deviation correlates with a rise in financial literacy by 7 points.

Summing up, evidence from PISA confirms the importance of numeracy for financial literacy. It also points to a positive relationship between digital skills on the one hand, and (confidence with) digital finance and financial literacy on the other hand.

Table 2 - There is a positive correlation between financial literacy and digital skills
Dependent variable: Financial literacy score.

	1	2	3	4	5	6	7	8
math	0.667*** (0.0178)	0.657*** (0.0175)	0.666*** (0.0173)	0.656*** (0.0172)	0.667*** (0.019)	0.657*** (0.0183)	0.662*** (0.0191)	0.653*** (0.0182)
reading	0.308*** (0.0142)	0.316*** (0.0144)	0.307*** (0.0142)	0.314*** (0.0144)	0.304*** (0.0155)	0.312*** (0.0153)	0.308*** (0.0158)	0.316*** (0.0152)
female	-7.404*** (1.763)	-7.688*** (1.719)	-7.213*** (1.760)	-7.485*** (1.716)	-7.042*** (1.921)	-7.524*** (1.858)	-6.189*** (1.963)	-6.496*** (1.891)
ESCS	1.961** (0.904)	1.891** (0.789)	1.778* (0.907)	1.702** (0.799)	1.303 (0.972)	1.373* (0.833)	1.027 (1.005)	1.017 (0.876)
Age when student starts to use digital media								
10-12 years			-2.497 (1.914)	-3.007 (2.052)	-2.416 (1.877)	-3.01 (2.00)	-1.642 (1.951)	-2.199 (2.065)
13 years or later			-7.046** (3.505)	-7.286** (3.551)	-5.401 (4.076)	-6.076 (4.089)	-5.261 (4.211)	-5.848 (4.191)
Use of digital media for staying informed (READNEWS)					4.788*** (1.405)	4.046*** (1.432)	3.322** (1.463)	2.522* (1.494)
FLCONICT							6.432*** (0.816)	6.527*** (0.772)
Obs	46248	46248	46248	46248	42782	42782	39093	39093
R2	0.822	0.82	0.822	0.821	0.821	0.819	0.826	0.825
School FE	YES		YES		YES		YES	
Country FE		YES		YES		YES		YES

Source: Authors' elaborations on PISA 2018. Data refer to 15 years old students based in OECD countries. Columns 1-6 report estimates based on students resident in the following countries: Estonia, Finland, Poland, USA, Latvia, Lithuania, Spain, Slovak Republic, Italy and Chile. In columns (3-8) the omitted group includes students who started to use digital media before the age of 10. READNEWS is a dummy variable equal to one for students declaring to use digital device for staying informed every day (or almost). FLCONICT is elaborated by OECD and aggregates the data on confidence with the following activities: transferring money, paying with debit card and mobile device, keeping track of personal balance, ensuring safety of sensitive information when making electronic payments or using on-line banking; data have been normalized (the mean and standard deviation equal to 0 and 1, respectively). *** p<0.01, ** p<0.05, * p<0.1

3.2 Evidence from the Italian survey on adult financial competences

Unfortunately, cross-country comparable micro-data on financial literacy among adults are not freely accessible. For this reason, for adult population we focus only on Italy, for which our institution has the data. The Italian survey is part of a larger survey conducted by the International Network for Financial Education (INFE), run by the OECD (OECD, 2018 a).

In order to have a gauge of the relationship between financial literacy and digitalization of adult population, we use the survey on adult financial competences for Italy, run in 2020 on more than

2000 individuals aged 18+.²⁹ The survey has a few questions related to the level of digitalization of individuals, some of which enter into the score for financial attitudes or financial behavior. Hence, we relate digital competences to the score of financial knowledge, to avoid spurious correlations. To capture the level of digital skills we construct a dummy variable taking value one if a person uses digital means to access financial services, if he/she uses digital payment instruments other than the debit card, and if he/she invests in cryptoassets. By running simple OLS regressions, we confirm the strong correlation between the level of digitalization and financial knowledge; the relationship holds even controlling for income and educational levels (Table 3). It remains equally strong and statistically significant also restricting the sample to the youngest population (aged 18-26).

This finding is not surprising since the variable digitalization is capturing digital financially included people. The result resembles somewhat the finding by OECD (2020) and Klapper et al. (2015), which show that financial knowledge is higher among the more financially included, and, recently, by Michelangeli and Viviano (2021), who find that Italian households that use internet banking have a better understanding of financial concepts.

Table 3: Correlation between financial knowledge and digitalization of adult population in Italy

Dependent variable: Financial knowledge score

VARIABLES	IACOFI_all	IACOFI_young (age 18-26)
Female	-0.230*** (0.088)	-0.704** (0.277)
Digitalization	0.764*** (0.101)	0.717** (0.291)
Income	0.176*** (0.018)	0.133*** (0.048)
Employed	-0.132 (0.099)	-0.007 (0.334)
Secondary degree	0.258** (0.103)	0.206 (0.330)
Tertiary degree	0.464*** (0.145)	0.702* (0.368)
Young (age 18-26)	-0.131 (0.143)	
Constant	1.396*** (0.210)	1.968*** (0.707)
Observations	2036	203
R-squared	0.126	0.155

Source: Authors' elaborations on the Survey on the financial literacy and competence of Italian adults (IACOFI) conducted in 2020. OLS regressions; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the score in financial knowledge (a variable ranging between 1 and 7). All regressions include regional dummies. The variable digitalization includes qf2_5, qprod1b_6 q, prod1b_13, qprod1b_14, qprod1b_15, qprod1c_6, qprod1c_13, qprod1c_14, qprod1c_15. For a description of the variables see https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/alfabetizzazione/Data-description-2020.pdf?language_id=1.

²⁹ See D'Alessio et. al (2020). The OECD/INFE toolkit for measuring financial literacy among adults has been launched in a pilot survey in 2010 (Atkinson and Messy (2012)).

4. Financial literacy and its measurement

Previous sections highlighted that financial knowledge and financial education policies are positively correlated with financial inclusion. Focusing on financial knowledge, we also found a strong correlation between this competence and proxies that capture the active participation of people to the economic life, such as the female participation rate to the labor market or the percentage of NEET. Moreover, we found a significant correlation between financial literacy/knowledge and digital skills, as well as more in general higher financial knowledge among financially included people.

What does this imply for the definition and measurement of financial literacy? And what implications can we draw for financial education policies?

As regards the definition of financial literacy³⁰, the view that being financially literate - or financial capable or financial competent - encompasses more than financial knowledge is a long-lasting issue in the literature³¹. Being financially literate requires the use of accumulated knowledge through practical skills and other capabilities, such as attitudes, motivation and values. Financial literacy is not a state of art, but is a competence to be built throughout life and is affected by experience.

For youth, since 2012 the financial literacy assessment has been encompassed in PISA, the largest international comparative study of education worldwide. PISA is intended to provide a measure of 15 years old students' overall preparedness for the future, not just their schooling achievements.³² By design, PISA emphasizes functional skills that students have acquired as they approach the end of compulsory schooling: having financial literacy in PISA points out to this competence as foundational to a student's ongoing education to active citizenship and participation to economic life. Furthermore, having financial literacy as an additional domain of PISA made it possible to take advantage from measurement of other domains, such as mathematics and reading. A certain level of numeracy and a basic level of reading are regarded as necessary conditions of financial literacy and the assessment allows this to be taken into account. Furthermore, the financial literacy test encompasses more than 40 questions, covering the whole framework of financial literacy core competencies for young people (OECD, 2015); items are not limited to risk and rewards, but consider wide range of financial issues, including payment and insurance.

Since PISA tests students' ability to apply skills and knowledge to solve real-life problems, the assessment evolves over time and accounts for changes in financial issues and general ones, such as digitalization.

In addition to being a multifaceted concept, being financially literate requires possessing some basic levels of numeracy and reading, and nowadays, digital skills. Understanding how different competences interact and complement each other represents a challenge for measuring financial literacy and implement effective financial education strategies. More generally, digital skills are now a founding element of active citizenship and the OECD is already accounting for it in PISA. In particular, PISA collects information on ICT familiarity and digital financial habits of students and from next survey it will adopt a complete framework to assess the integration of information and communication technologies in teaching and learning.

³⁰ See Lamboglia and Travaglino (2022) for a review of the sources and methods to assess financial literacy.

³¹ In 1992, Noctor et al. defined financial literacy as "the ability to make informed judgments and to make effective decisions regarding the use and management of money".

³² See OECD (2018c) for methodological information on the PISA project.

Thus, PISA data are extremely valuable for policy purposes on financial education; three waves are already available and financial literacy assessment have already planned in 2022. Italian students took part in all the PISA financial literacy assessment and they will be part of the next ones.

Measuring financial literacy of adult population is more difficult, and methodologies are less developed. The OECD toolkit for measuring financial literacy among adults is not structured as PISA, limiting its information power, such as to grasp interlinkages with other essential competences and to disentangle causal effects with economic outcomes. Proposing a PISA-like survey to adults would be very complicated, but integrating actual financial literacy measurements, particularly to better capture the role of active participation to the economic life, the familiarity with economic and financial decision and digital skills, becomes urgent in order to plan effective financial education, also to improve economic and financial inclusion and reduce financial vulnerability.

As said, the *OECD/INFE toolkit for measuring financial literacy among adults* has been launched in a pilot survey in 2010. Two surveys have been conducted in 2016/17 and 2020 and a third wave will be collected in 2023³³. Using the toolkit, in 2017 the Bank of Italy started a new periodical survey, also as a contribution to OECD data collection. These are the statistics we used in Section 3.2. In this toolkit, the financial literacy index is the sum of three element: the knowledge component assesses the understanding of key financial concepts; the behaviors component explores how people act with respect to financial issues; the attitudes component accounts for personal traits such as preferences and non-cognitive skills.

This broader index is certainly an important result, as its various sub-components can be put in relations with demographic characteristics, economic status, financial inclusion, financial sophistication and the use of digital devices. Moreover, it takes into account insights from behavioral finance. This is a good starting point, but improvements can be seen in several dimension.

A first dimension is the sample size. Efforts are needed to increase the number of countries surveyed, to include also low-income countries.

A second dimension is to add variables that better capture the attitude of people to participating actively into the economic life. For instance, for those who are not in the labor force nor in training, adding some questions to uncover whether the status is a true individual choice or whether other factors may play a role (such as tax distortions, discouragement, cultural or religious factors), can be very informative for better tailor financial education programs to these targets.

A third dimension concerns digital skills and digital adoption. Digital skills should be evaluated independently from the use in finance, in order to capture whether they represent an element of self-confidence that stimulates financial awareness and positive financial attitudes. Digital skills may favor also a greater participation to the economic life and hence be important for economic resiliency. Moreover, measuring digital adoption at micro-level, may help to disentangle supply and demand constraints.

In line with this aim, the OECD has conducted in 2021 a survey to measure financial literacy of micro, small and medium enterprises, with a focus on digital skills and the impact of COVID-19 on firm resilience.³⁴ This survey represents a milestone in filling a knowledge gap on an essential segment of

³³ See Atkinson and Messy (2012) and OECD (2018b). The third wave will be based on an updated version of the toolkit (see OECD, 2022).

³⁴ See OECD (2021) and D'Ignazio et al (2022). The Bank of Italy promoted the project among the priorities established under the G20 Italy Presidency 2021.

the economy in many countries. The data brought to light how entrepreneurs' financial skills were key to mitigate the consequences of the pandemic on the soundness of their businesses.

A fourth dimension relates to the opportunity to integrate financial and digital literacy, financial and digital inclusion and consumer protection survey data.

5. Challenges and new directions for financial education policies

The economic and financial system is subject to fast changes, shaped by economic and technological shocks. Financial literacy and digital skills have become essential pillars to withstand these changes and build successfully on them, also in light of the growing relevance of digital financial services and its implications for financial inclusion and for financial education policies.

If low financial literacy were already an issue before the crisis, the Covid-19 pandemic - and more generally the increasing digitalization of finance – augments the problem, urging immediate and effective policy actions to close the gaps.

Policy actions need to be informed by granular high quality data. Integrating actual financial literacy measurements, particularly to better capture the role of active participation to the economic life, familiarity with economic and financial decision and digital skills, become urgent in order to plan effective financial education, also to improve economic and financial inclusion and reduce financial vulnerability.

Moreover, a proper management of digitalization offers the opportunity to enhance digital financial literacy, but it comes with many challenges. Digital financial education allows to reach a wider audience at lower costs. It permits programs tailored to the different targets delivered in the most favourable teachable moments. Delivering financial information in a timely and appropriate manner increases the likelihood of retention. At the same time, digital financial education gives the possibility to enhance the monitoring and the evaluation of financial education programs, by facilitating data collection for monitoring and evaluation analysis.

The shift to an increased use of technology, however, comes - not surprisingly - with specific challenges that need to be addressed to make the most of progress in digitization. The effective delivery of digital financial education programs could be compromised by the lack of digital skills or the lack of the necessary digital infrastructure. Under these circumstances, digital educational programs become a source of exclusion especially for the most vulnerable, those who mostly need financial literacy and advice.

We see an opportunity to improve our understanding of these complex phenomena, especially for adult population and for micro and small enterprises from integrating financial and digital literacy, financial and digital inclusion and consumer protection survey data. An ambitious global data project could be designed to better integrate demand and supply view of the phenomena able to inform global policymaking.

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Appendix

Table A1: data description and sources for regressions in Table 1

Variable	Description	Source	Definition
Financial Inclusion (low=1; high=0)	The percentage of respondents who report having an account (by themselves or together with someone else) at a bank or another type of financial institution or report personally using a mobile money service in the past 12 months, older adults (% age 25+).	Findev Database, World Bank	low=1 if country belongs to the lowest two quartiles of distribution; 0 otherwise
GDP per capita (high=1; low=0)	GDP per capita, PPP (constant 2017 international \$); year 2014	World Development Indicators database, World Bank	high=1 if country belongs to the highest two quartiles of the distribution; 0 otherwise
Credit to GDP (low=1; high=0)	Domestic credit provided by financial sector (% of GDP)	International Financial Statistics (IFS), International Monetary Fund (IMF)	high=1 if country belongs to the highest two quartiles of the distribution; 0 otherwise
Female labor market participation rate	Labor force participation rate, female (% of female population ages 15-64) (modeled ILO estimate)	International Labour Organization, ILOSTAT database. Data retrieved on January 29, 2021.	(% of female population ages 15-64)
People Digital Adoption (high=0; low=1)	Digital Adoption Index - People Subindex	DAI data, World Bank	low=1 if country belongs to the lowest 2 quartiles of the distribution; 0 otherwise
National Financial inclusion strategy (NFIS): if exists=1	National Financial Inclusion Strategy	Global Financial Inclusion and Consumer Protection (FICP) Survey, World Bank	NFIS=1 if strategy exists; 0 otherwise
Financial Sector Development Strategy +Financial Inclusion (FSDFI): if exists=1	Financial Sector Development Strategy with a Financial Inclusion component	Global Financial Inclusion and Consumer Protection (FICP) Survey, World Bank	FSDFI=1 if strategy exists; 0 otherwise
National Development Strategy +Financial Inclusion (NDSFI): if exist =1	National Development Strategy with a Financial Inclusion component	Global Financial Inclusion and Consumer Protection (FICP) Survey, World Bank	NDSFI=1 if strategy exists; 0 otherwise
ID+ Proof of Income (yes=1; no=0)	According to current law or regulation, which of the following information must be submitted to open a deposit account? Proof of income (commercial banks)	Global Financial Inclusion and Consumer Protection (FICP) Survey, World Bank	ID+ Proof of Income =1 if proof of income is required; 0 otherwise
NEET (% of young)	Share of youth not in education, employment or training (NEET) is the proportion of young people who are not in education, employment, or training to the population of the corresponding age group: youth (ages 15 to 24); persons ages 15 to 29; or both age groups.	International Labour Organization, ILOSTAT database. Data retrieved on January 29, 2021.	% of young population
Financial knowledge (high=0; low=1)	% of 15+ financially literate, taken from Standard&Poor's ratings services global financial literacy survey.	Klapper, L., Lusardi, A., van Oudheusden, P. (2015). Financial literacy around the world: Insights from the standards and poor's ratings service global financial literacy survey.	low=1 if country belongs to the lowest two quartile of distribution; 0 otherwise
Financial Capability/Literacy/Education Strategy (FEDS): if exists=1	Policies to promote financial capability: National Financial Capability/Literacy/Education Strategy	Global Financial Inclusion and Consumer Protection (FICP) Survey, World Bank	FEDS=1 if strategy exists; 0 otherwise
Tax incentive savings schemes: if exist=1	Policies to Promote Financial Inclusion: Tax incentive savings schemes	Global Financial Inclusion and Consumer Protection (FICP) Survey, World Bank	Tax incentive savings schemes=1 if incentives exist; 0 otherwise
Stand-alone financial consumer protection regulations: if exist=1	FCP - Regulation: Stand-alone financial consumer protection regulations	Global Financial Inclusion and Consumer Protection (FICP) Survey, World Bank	Stand-alone financial consumer protection regulations=1 if true; 0 otherwise