

DNB Working Paper

No. 692 / August 2020

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EUROSYSTEEM

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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

Working Paper No. 692

August 2020

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The interplay of financial education, financial literacy, financial inclusion and financial stability:

Any lessons for the current Big Tech era?

by Nicole Jonker¹ and Anneke Kosse²

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Abstract:

The entry of Big Tech firms in the financial ecosystem might affect financial stability through the opportunities and challenges they create for financial inclusion. In this paper we survey the literature to determine the effectiveness of financial education in improving financial literacy and financial inclusion and to assess the impact of financial inclusion on financial stability. Based on our findings, we argue that new empirical research is needed to determine whether financial education can play a role in ensuring that everyone is able to reap the financial-inclusion benefits that Big Tech may bring. We also conclude that financial-inclusion opportunities created by Big Tech might potentially introduce risks for overall financial stability. Because of this, we underline the importance of proper supervision and regulation.

Keywords: Big Tech, Fintech, Financial Services, Financial Education, Financial Literacy, Financial Inclusion, Financial Stability

JEL codes: D14, D91, D92, G21, G23, O16

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The authors thank Lisa van Winden for her excellent assistance during the early stages of this study and Michiel Bijlsma, Ron Jongen, Maarten van Rooij, Wade McMahon, Chris Reid, two anonymous referees and participants of the Bank of Canada BBL seminar for their useful suggestions and comments. All remaining errors are our own. The views expressed are ours and do not necessarily reflect those of the Bank of Canada, the Nederlandsche Bank or the European System of Central Banks.

1. Introduction

New technologies and widespread internet and smart phone adoption have led to the increasing availability of digital financial services. Many of these services are offered by non-traditional financial-services providers. Even large technology firms—the so-called Big Techs that were originally active in platform economies such as social media or e-commerce—have started to offer financial services, including payment services, insurance and loans.³ This trend can be observed in both developing and developed countries.

The entry of Big Tech firms into the financial landscape not only has the potential to lead to new innovative financial services but may also enhance financial inclusion by making these services available to people who have traditionally been excluded from the financial services offered by banks. Due to their economies of scope and scale, Big Techs, like other (non-bank) financial-services providers, can broaden the range of financial services people have access to. Moreover, they may lead to efficiency gains in the provision of financial services, increase competition and, consequently, put downward pressure on the costs and fees associated with existing services.

In addition to providing these opportunities, the emergence of Big Tech firms may also introduce challenges for financial inclusion in both developing and developed countries. The digital nature of these firms' financial services might lead to certain population groups, such as the elderly, being excluded if they do not have the required knowledge and skills to appropriately use these services. Moreover, the rapidly changing financial-services environment might lead to certain groups becoming more susceptible to fraud if they do not know how to safely use the new innovative services.

³ Examples of Big Techs include Apple, Alibaba, Amazon, Facebook, eBay, Google and Tencent.

The financial-inclusion opportunities Big Techs bring might also potentially introduce risks for the overall financial stability in a country.⁴ Increased access to credit for households or small firms, for instance, might lead to over-indebtedness in cases of weak supervision, a lack of adequate risk models or repayment monitoring tools, or if previously unbanked people have insufficient financial knowledge and skills with which to make sensible borrowing decisions.

These challenges suggest a potential role for financial education to ensure that everyone is able to safely make use of and benefit from new financial products and services. As such, financial education might be used as a tool to ensure that the opportunities Big Techs offer for financial inclusion are fully reaped and that they do not lead to risks of fraud or problems of inclusion, among people who cannot or do not want to make use of their services, or even to financial-stability issues.

Given this background, the objective of this paper is twofold. First, we aim to find out whether financial education might be a suitable tool for promoting the opportunities Big Techs can provide for financial inclusion. Second, we try to learn how the potential financial inclusion that is stimulated by Big Techs might affect the overall stability of a country's financial system. We will do so by reviewing, summarizing, and drawing any lessons from the existing literature in the areas of financial education, financial literacy and financial inclusion. As such, our literature study aims to answer the two following questions: i) What is the effectiveness of financial education in improving financial literacy and financial inclusion? And ii) What is the impact of financial inclusion on a country's financial stability?

⁴ The entrance of Big Tech firms into the financial landscape might also lead to risks to financial stability in cases of major operational disturbances. Furthermore, their entrance may contribute to other risks, such as concerns over medium- and long-run competition and concentration risks and risks related to data privacy and cyber security. All of these other risks are outside the scope of this paper.

Financial education, literacy, inclusion and stability are broad concepts and there are multiple ways to define them. In this paper, we follow the OECD (2013) and define financial literacy as a people's level of knowledge and skills as well as their attitudes and preferences regarding financial concepts and the use of financial services.⁵ Our definition of financial inclusion is inspired by Čihák, Mare and Melecký (2016) and includes the degree of both access to and use of formal financial services by households and firms.⁶ When studying financial education, we also follow the OECD (2005) and consider all of the activities⁷ that aim to improve people's financial knowledge, skills and behaviours. Finally, we adopt the definition used by the European Central Bank (ECB 2018) for financial stability: a financial system in which the build up of systemic risk is prevented; i.e., a state in which shocks cannot spread through the entire financial system and lead to broad disruptions in the provision of financial services to a point where economic growth and welfare may be materially affected.

Figure 1 provides a schematic presentation of the linkages that we unravel in this paper.⁸ We start by discussing the impact of financial literacy on financial inclusion and then assess how financial education can affect this factor. The general aim of financial education is to

⁵ Our definition is, thus, broader than the one used in the often-cited work of Lusardi and Mitchell (2014) and other papers. Unlike these researchers, we not only consider people's knowledge and skills but also how they put these into practice. Hence, our definition of financial literacy also includes the actions people undertake that affect their individual financial well-being, such as thinking twice before making a purchase or paying bills on time. Our approach is in line with Warmath and Zimmerman (2019), who redefine financial literacy as the combination of explicit financial knowledge, financial skills and self-efficacy in making financial decisions.

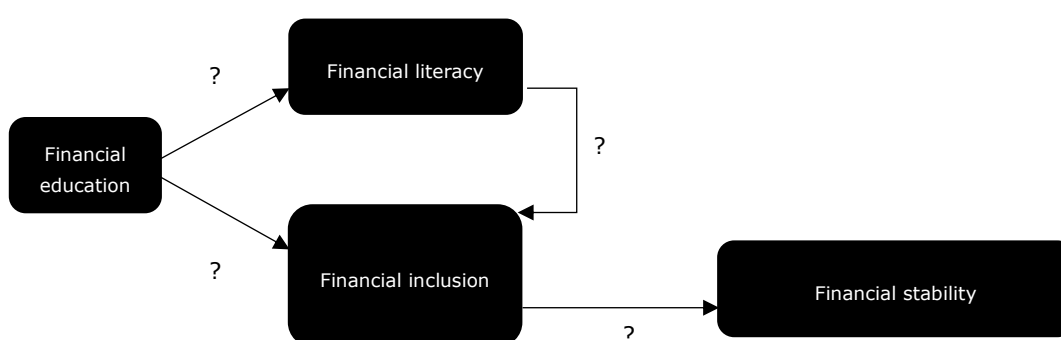
⁶ So unlike others, such as Hannig and Jansen (2010) or the Committee of Financial Inclusion, our definition not only includes access but also the actual usage of formal financial services. As such, our definition is based on the idea that access alone does not imply that people use these services and benefit from them.

⁷ These activities include (but are not limited to) financial education in schools, workshops on financial subjects and financial counselling.

⁸ Ahunov and Van Hove (*forthcoming*) provide evidence of a link between financial exclusion and trust in banks. It might be valuable to further explore the theoretical foundation of this link while putting it in the context of financial education and financial behaviour. The aspect of trust is however outside the scope of our paper, so we rather leave that for others to take up.

improve people’s financial knowledge, skills, preferences and attitudes. But are financial-education activities indeed effective in achieving this objective? Does financial education, either directly or indirectly, through the mechanism of increased financial literacy, indeed increase people’s access to and use of financial services? Finally, we assess the link between financial inclusion and financial stability. A large part of the low-income adult population and many small firms, worldwide, do not have bank accounts, savings accounts or access to formal lines of credit.⁹ This makes them vulnerable, as they have limited possibilities to save during good times and to rely on savings or credit during bad times, such as during illnesses or periods of unemployment or after crop failures. On the other hand, supplying financial services to new groups of customers might change the risk profile of financial institutions and the financial system. This may both enhance financial stability; e.g., when leading to more stable deposit funding or increased portfolio diversity, or worsen it; e.g. when lowering credit standards, increasing indebtedness, or leading to the inadequate governance of financial-services providers.

Figure 1: Scope and linkages studied in this paper



Source: Author’s own diagram.

⁹ For instance, more than 80 percent of adults in low-income countries did not have an account at a formal financial institution in 2014. Sources: World Bank’s Global Financial Development indicators downloaded at <https://databank.worldbank.org/data/reports.aspx?source=global-financial-development> and the World Bank’s Findex database.

Financial literacy and financial inclusion are two issues that have increasingly received attention, over the past few years, from regulators, policy makers, non-profit organizations and central banks. Hence, many relevant studies have been done to unravel the impact of financial education, financial literacy and financial inclusion. The majority of these studies focus on either one or some of these elements.¹⁰ Our objective is to bring them together and provide a holistic picture. A closely related paper is that of Hastings, Madrian and Skimpyhorn (2013), which reviews the literature on financial education, financial literacy and consumers' financial outcomes. However, since its publication, there has been a lot of new work that provides new insights; hence, an update is warranted. Also, we take it a step further by linking financial inclusion to financial stability. Understanding the interlinkages between financial education, literacy, inclusion and stability is important for institutions that aim to achieve one or more of these objectives. Moreover, by assessing the current state of the literature, we aim to signal potential areas that require additional empirical research, especially given the current era in which Big Techs play an increasing role in providing financial services and improving financial inclusion.

When selecting the papers for our literature review, we focused on those that present studies that explicitly investigated the impact of or association between financial education, literacy, inclusion and/or stability. Papers that merely present studies on one of these topics are out of our scope. Also, we did not apply a specific geographical focus and we only included high-quality empirical papers that are based on well-founded approaches and were published in

¹⁰ To the best of our knowledge, Carpena and Zia (2018) are the only ones to empirically study the causal interlinkages between financial education and both financial literacy and financial behaviour. They run a field experiment in India and use causal mediation analysis to see how financial education influences various aspects of financial literacy (e.g., numeracy skills, financial awareness, perceptions of financial products), and how these, in turn, mediate the treatment effects by influencing financial outcomes. All other empirical papers either focus on the impact of financial education on financial literacy or they study the impact of financial education on financial outcomes or of financial literacy on financial outcomes.

peer-reviewed research outlets. In order not to duplicate existing literature reviews, we included only those that were often cited.

Our first conclusion is that financial-education programs can improve people's knowledge and skills related to financial issues. The education effects, however, are highly heterogeneous and there is a lack of studies that truly focus on this topic as it relates to the financial services of Big Techs. Therefore, we argue that there is a need for future empirical research that looks into whether the conclusions from the "traditional" financial-education and literacy literature can be extended to Big Techs. Second, we argue that the financial-inclusion opportunities brought by Big Techs might potentially introduce risks to financial stability. Increased access to credit by households or small firms might lead to over-indebtedness in cases where credit providers are subject to weak supervision; e.g., if risk-management or loan-repayment monitoring programs are either inappropriate or lacking. Therefore, we conclude with various questions that require further research.

This paper is structured as follows: section 2 discusses the presence of Big Tech firms in the financial-services market and the opportunities and challenges they can bring with respect to financial inclusion and financial stability. Section 3 provides some background on current global initiatives to enhance financial inclusion and financial education, including some relevant key indicators. Section 4 discusses the results of our literature review on the relationship between financial education, literacy, and inclusion, and section 5 summarizes the literature on the impact of financial inclusion on financial stability. Section 6 concludes and relates the findings to the recent activity of Big Techs that operate in the financial-services market.

2. Big Techs and financial inclusion

Large technology firms, or Big Techs, such as Apple, Alibaba, Amazon, Facebook, eBay, Google and Tencent, have recently started to offer financial services to the users of their online market places and social-media platforms, such as payment services, insurance and loans. Their entry has the potential to lead to new innovative financial services and to enhance financial inclusion. Due to their global reachability, these firms may be able to provide a large number of unbanked people with financial services. That is, as billions of people already use the services that Big Techs traditionally provide on their platforms, it may be a relatively small step for them to also start using Big Techs' financial services. This would be a smaller step than switching to similar services offered by other financial-services providers with whom the unbanked have no relationship yet.

Currently, the types of financial services offered by Big Techs differ by region (BIS, 2019). Also, the ways in which they bring their services to the market vary. In developed Western economies, Big Techs have started to provide payment services and credit by using the existing retail payment infrastructure that was built by incumbent banks and credit card companies. In emerging market economies in Asia, Africa and South America, Big Techs offer payment and/or credit services directly to the users of their online platforms without the need for intermediation through incumbent banks and other financial-services providers. They have built stand-alone payment platforms that function independently of the existing payment systems. Examples include Alibaba, Baidu, Mercado Libre and Tencent. In these emerging countries, Big Techs have played an important role in facilitating access to

financial services, such as payments, credit, savings and even investment products, to previously unbanked people and small- and medium-sized enterprises (SMEs) (BIS, 2019).¹¹

Big Techs have the potential to boost innovation and efficiency in the financial system and to draw in large numbers of unbanked people. This may enhance households' welfare. Having access to savings accounts and credit lines allows households to smooth consumption over time by saving money in good times and spending it in bad times (e.g., during unemployment spells, after crop failures). Moreover, the entry of Big Techs into financial services can increase consumption. For instance, the introduction of online payment solutions, such as Alipay and PayPal, allows for guaranteed settlement at delivery and enables reclaims by buyers. These solutions have the potential to remove a trust barrier between buyers and sellers and to lead to higher sales (BIS, 2019). In addition, enlarging SMEs' access to credit lines might lead to these businesses expanding their product offerings, which also may boost sales (Frost et al., 2019).

When inappropriately managed, however, Big Techs may also introduce challenges for financial inclusion. As with the services incumbent banks offer, it is important that the (potential) users of the services offered by Big Techs have the necessary knowledge and skills to make responsible use of them. The speed with which financial services are digitizing might pose challenges for several groups, including the elderly and other vulnerable people.¹² The Global Partnership for Financial Inclusion (GPFI) and the OECD recently published the G20 Fukuoka Policy Priorities on Aging and Financial Inclusion to help countries address the financial-inclusion-related challenges aging populations face (GPFI, 2019). Financial

¹¹ Note that Van Hove and Dubus (2019) present a different view when studying M-PESA (a mobile money transfer service) and financial inclusion in Kenya. They find that those being in a position to save money by using their phones are less likely to do so.

¹² According to Pay-Able, there are 80 million disabled and close to 100 million elderly consumers in Europe (See <https://pay-able.eu/>)

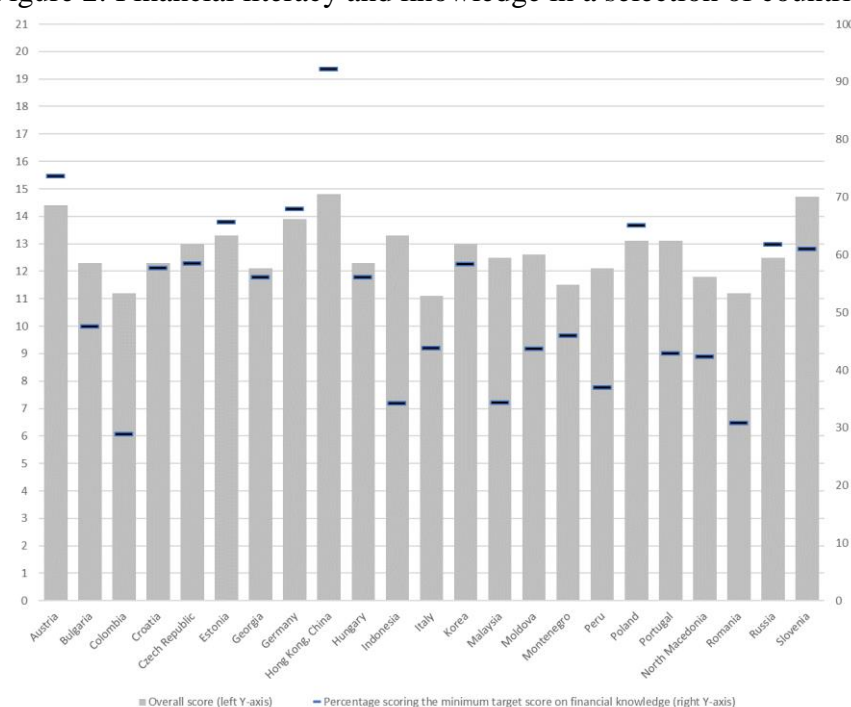
education is explicitly mentioned as one of the eight priorities “... to support the digital and financial-literacy skills of older people and those responsible for their financial decisions, to help them keep up with the pace of change and avoid risk factors that could influence their financial well-being.” Hence, financial education might be a tool that can be similarly used to ensure that everybody is able to reap the benefits of the digitalisation brought about by Big Techs and that nobody is excluded from the financial system due to a lack of the required knowledge and skills.

The improved financial inclusion that Big Techs may bring about may also lead to undesirable financial behaviours, by entities on the supply side (Big Techs) and the demand side (consumers and SMEs), and this might adversely affect individuals’ financial situations and the overall stability of the financial system. Frost et al. (2019), for example, show that Big Techs tend to lend relatively more in countries with less competitive banking sectors and less stringent regulations. Experiences from Bolivia (Marconi and Mosley, 2006) and India (Kahn, 2011) demonstrate that if new service providers with little lending experience enter the credit market, then low regulatory environments are subject to risks. These risks include the overprovision of credit and severe repayment problems during economic downturns. Hence, broadening financial inclusion may not necessarily have a positive impact on financial-stability outcomes, and this warrants further analyses.

3. Global financial education and financial-inclusion statistics and initiatives

Financial literacy or, better, financial illiteracy, is a global issue. Overall, levels of financial literacy are relatively low. Survey results suggest that only one in three adults worldwide were financially literate in 2014.¹³ Four years later, in 2018, just 53 percent of adults worldwide achieved the OECD's minimum target score for financial knowledge and the average financial-literacy score was 12.7 out of 21 (OECD/INFE, 2020).¹⁴ Figure 2 shows how these two indicators differ across countries.

Figure 2: Financial literacy and knowledge in a selection of countries



Notes: Indicators and data are taken from OECD/INFE (2020). The overall financial-literacy score presented on the left Y-axis ranges from 0 to the maximum score of 21. The minimum target score for financial knowledge was set at 5 (out of 7).

¹³ Source: Standard and Poor's Global FinLit Survey. In this survey, a person is defined as being financially literate when they correctly answer at least three out of the four questions that measure basic numeracy, interest compounding, inflation and risk diversification.

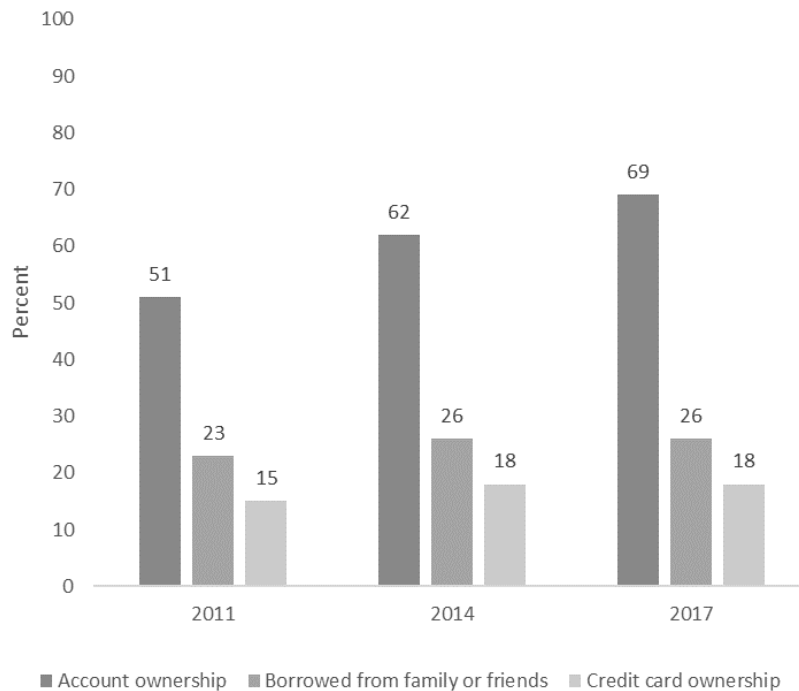
¹⁴ The OECD calculates the overall level of financial literacy as the sum of a country's scores on financial knowledge, behaviour and attitudes. The financial-knowledge scores are based on the responses to seven questions on financial knowledge, and the behaviour scores are calculated using a variety of questions about behaviours, such as budgeting, making considered purchases, paying bills on time, and avoiding borrowing to make ends meet. The attitude scores draw on three questions related to people's attitudes towards the long term. The minimum financial-knowledge score is assigned to those who correctly answered five or more of the questions on financial knowledge. OECD/INFE (2018) provides a guide to creating the financial-literacy scores.

In 2002, the governments of the OECD countries officially recognised the importance of financial literacy and this resulted in the creation of the International Network of Financial Education (OECD/INFE) in 2008. The OECD/INFE has a membership of over 240 public institutions from over 115 countries, including central banks, ministries of finance and ministries of education, and it aims to promote and facilitate international co-operation on financial-education issues worldwide. The OECD/INFE developed the High-Level Principles on National Strategies for Financial Education, which were endorsed by the G20 Leaders, in 2012, and published in a Policy Handbook, in 2015, to support governments in the implementation of these strategies.¹⁵

Turning to the issue of financial inclusion, in 2017, on average, 31 percent of all adults globally did not have an account at a financial institution or through a mobile money provider, 26 percent had turned to family or friends to borrow money and less than 18 percent owned a credit card (See Figure 3) (Demirgüç-Kunt et al., 2018).

¹⁵ See: <https://www.oecd.org/daf/fin/financial-education/nationalstrategiesforfinancialeducation.htm>. Last accessed on June 17th, 2020.

Figure 3: Global account ownership at a formal financial institution



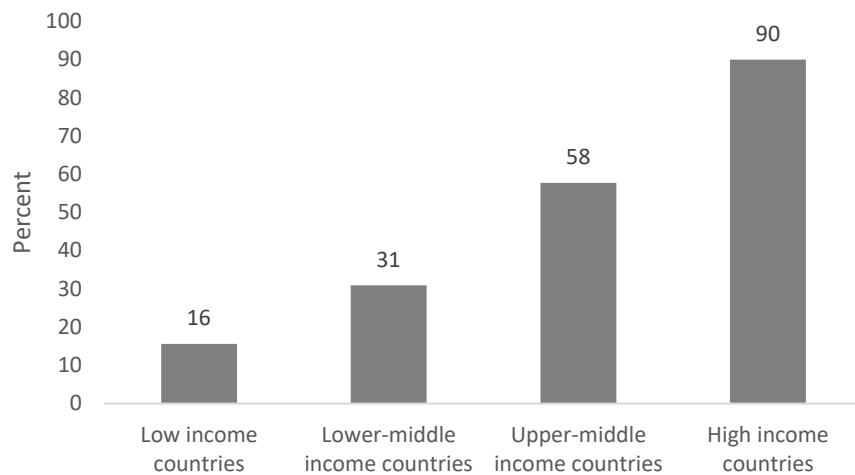
Notes: This graph presents the percentage shares of adults (age 15+) worldwide who had an account at a formal financial institution, borrowed money from family and friends and owned a credit card in 2011, 2014 and 2017. Source: World Bank Global Findex Database, as cited in Demirgüç-Kunt et al., 2018.

Contrary to what many people may think, financial inclusion is not only an issue in developing countries but it is also a factor in developed ones. Figure 4 shows that in high-income countries, on average, 10 percent of adults do not have an account.¹⁶ In fact, Ampudia and Ehrmann (2017) provide evidence of the importance of financial inclusion in the euro area and the United States, where 3.6 percent and 7.5 percent of households, respectively, hold neither a checking nor a savings account with a formal financial institution.

Given this background, various global initiatives have been set up around financial inclusion. The World Bank Group, through the Universal Financial Access 2020 (UFA2020) initiative,

¹⁶ High-income countries with the lowest level of unbanked people include Uruguay (55%), Chile (37%), Saudi Arabia (31%), Hungary (28%), Kuwait (27%), Slovak Republic (23%), Poland (22%) and Lithuania (22%). Source: World Bank Findex database, 2014.

Figure 4: Account ownership at a formal financial institution by country class (2014)



Notes: This graph presents the percentage share of adults (age 15+) who had an account at a formal financial institution in 2014. The 2014 breakdown by country class is taken from the World Bank's Findex database. Data is taken from the World Bank's Global Financial Development indicators:
<https://databank.worldbank.org/data/reports.aspx?source=global-financial-development>.

has committed to help promote financial inclusion by enabling one billion people to gain access to a transaction account,¹⁷ and in its 2030 Sustainable Development Goals the United Nations has included financial inclusion as a means to achieve other developmental goals.¹⁸ Similarly, at the 2010 Seoul Summit, the leaders of the G20 recognised financial inclusion as one of the main pillars of the global development agenda and officially launched the Global Partnership for Financial Inclusion (GPFI).¹⁹ Further, in 2016, the G20 published the High-Level Principles for Digital Financial Inclusion in order to promote digital financial services as a way to close the remaining gaps in financial inclusion.²⁰

¹⁷ See: <https://www.worldbank.org/en/topic/financialinclusion/brief/achieving-universal-financial-access-by-2020>. Last accessed on June 17th, 2020.

¹⁸ See: <https://www.uncdf.org/financial-inclusion-and-the-sdgs>. Last accessed on June 17th, 2020.

¹⁹ See: <https://www.gpfi.org/about-gpfi>. Last accessed on June 17th, 2020.

²⁰ See: https://www.gpfi.org/sites/gpfi/files/documents/G20-HLP-Summary_0.pdf. Last accessed on June 17th, 2020.

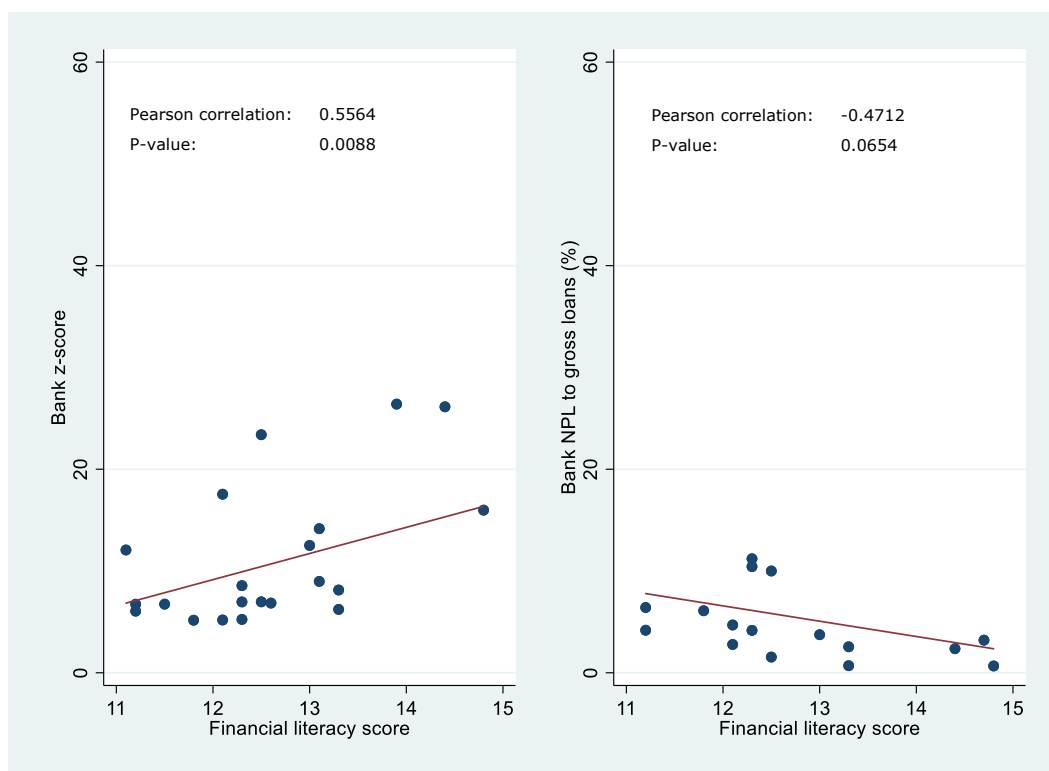
In recent years, financial education and inclusion have also received increasing attention from the central banking community. In 2016, the Bank for International Settlements (BIS) and the World Bank Group published a report that provides guiding principles and key actions to help countries advance their financial inclusion (CPMI, 2016). Central banks have also acknowledged the crucial role of effective financial education in properly managing the risks that increased inclusion can bring to financial stability (Buch, 2018; IFC, 2017). In fact, many central banks actively provide different types of financial-education products and/or have launched financial-literacy campaigns (Fluch, 2007; DNB, 2018; BOC, 2020).

Clearly, the worldwide ambition to improve financial literacy and financial inclusion is not a goal in itself. According to the OECD, financial education and financial inclusion are recognised at the highest policy level as two of the three essential ingredients for individuals' financial empowerment and the financial system's overall stability (OECD, 2020). From a central-bank perspective, improving financial literacy would enable citizens to make better-informed decisions that would better suit their risk profiles and financial needs which, in turn, would improve the efficiency and stability of the financial system (IFC, 2017). However, it is not clear-cut whether and, if so, how financial literacy and inclusion can actually contribute to a country's financial stability.

To get an idea of the potential association between financial literacy and financial stability, Figure 5 plots the financial-literacy scores of various countries, together with two often-used measures of financial stability: the bank Z-score and the ratio of banks' non-performing loans to their gross loans. The bank Z-score is an insolvency-risk indicator which relates banks' buffers with the potential for risk. The higher this score, the lower the probability of default of a country's banking system. The ratio of banks' non-performing loans (NPLs) to their

gross loans is an indicator of a banking sector's health. A high ratio may signal deterioration of the asset quality of a banking sector's loan portfolio. The scatterplots and Pearson correlation coefficients demonstrate that there is a significant positive (negative) association between a country's level of financial literacy, on one hand, and their bank-score (bank NPL ratio), on the other. This suggests a positive association between financial literacy and financial stability. However, it remains unclear whether there is a true causality. This positive association might also be driven by common causality, where both financial literacy and financial stability are driven by common factors, for instance by a country's general level of economic development.

Figure 5: Financial literacy and financial stability in a selection of countries

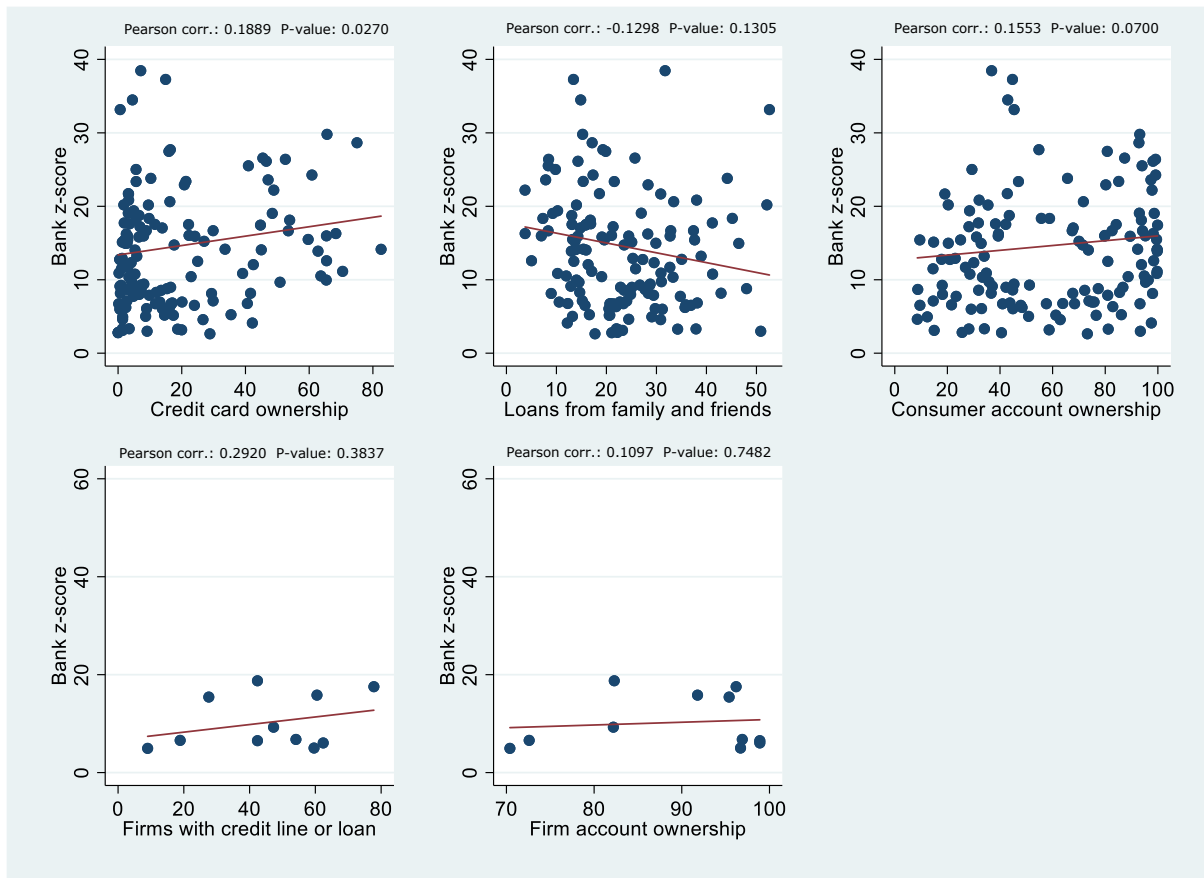


Notes: The bank Z-score and bank non-performing loans (NPL) to gross loans (%) both refer to 2017 and are taken from the World Bank's Global Financial Development indicators: <https://databank.worldbank.org/data/reports.aspx?source=global-financial-development>. The financial-literacy scores refer to 2018 and are taken from OECD/INFE (2020). The names of the displayed countries are available upon request. The left and right panels are exclusive of the outliers (Slovenia and Moldova, respectively).

Similarly, again without claiming any causality, Figures 6 and 7 show the correlations between the two financial-stability indicators and various measures of financial inclusion: the share of adults having a credit card, the share of adults that had taken out a loan from family or friends in the past year, the share of adults having an account at a formal institution, the share of firms with a bank loan or a line of credit and the share of firms with a checking or savings account. Figure 6 shows that there is a moderately significant (at the 5% level) positive association between the bank Z-score and credit card ownership and a weakly significant association (at the 10% level) with consumer account ownership. This suggests that countries with a relatively high penetration of credit cards and accounts are more likely to have a stable and healthy banking sector. The same conclusion can be drawn from Figure 7, which plots three consumer-related financial-inclusion indicators against selected countries' non-performing loan ratios.²¹ Figure 7 also shows how this ratio is significantly positively correlated with the share of people borrowing money from family and friends. Even though we should not interpret these associations as being causal, they do demonstrate that it is worthwhile to further dive into the potential impact of financial inclusion on financial stability.

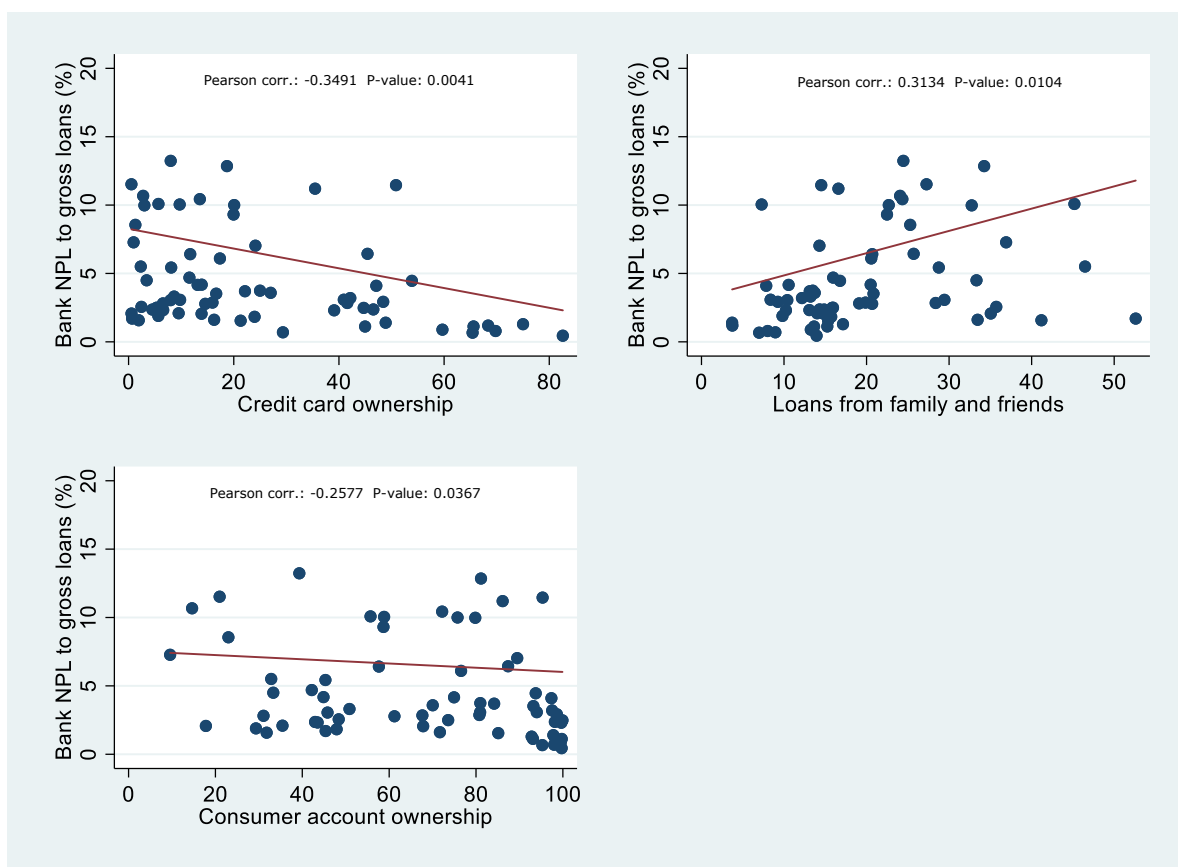
²¹ Due to missing data, scatterplots that show the share of firms with a bank loan or a line of credit and the share of firms with a checking or savings account are excluded from this graph, since these would only include six observations.

Figure 6: Financial inclusion and bank Z-score (2017)



Notes: Indicators all refer to 2017 and are taken from the World Bank's Global Financial Development indicators: <https://databank.worldbank.org/data/reports.aspx?source=global-financial-development>. Credit card ownership = % share of adults aged 15+ that had a credit card in 2017; Loans from family and friends = % share of adults aged 15+ that had taken out a loan from family and friends in the past year; Consumer account ownership = % share of adults aged 15+ that had an account at a formal financial institution in 2017; Firms with a credit line or loan = % share of firms with a bank loan or a line of credit; Firm account ownership = % share of firms with a checking or savings account. The names of the displayed countries are available upon request. The three panels on the top are exclusive of the four extreme outliers (Jordan, Luxembourg, Morocco and Panama).

Figure 7: Financial inclusion and banks' non-performing loans to gross loans (%) (2017)



Notes: Indicators all refer to 2017 and are taken from the World Bank's Global Financial Development indicators: <https://databank.worldbank.org/data/reports.aspx?source=global-financial-development>. Credit card ownership = % share of adults aged 15+ who had a credit card in 2017; Loans from family and friends = % share of adults aged 15+ that had taken out a loan from family and friends in the past year; Consumer account ownership = % share of adults aged 15+ who had an account at a formal financial institution in 2017. The names of the displayed countries are available upon request. The three panels on the top are exclusive of the four extreme outliers (Cyprus, Greece, Moldova and Ukraine).

4. Literature review: Financial literacy and financial inclusion

In this and the following section, we provide a summary of the literature on financial education, literacy, inclusion and stability. In particular, we focus on high-quality papers that present studies that are explicitly on the impact of or association between these different factors.

4.1 The effect of financial literacy on financial inclusion

The impact of financial literacy on financial decision making has received a lot of attention from researchers. Lusardi and Mitchell (2014) assess a large variety of empirical papers that examine the impact of financial literacy on economic decision making in the United States and elsewhere. They conclude that there is evidence of a link between different measures of financial literacy and various economic behaviours, such as financial planning, wealth accumulation, the likelihood of participating in financial markets, making stock investments, undertaking precautionary savings and taking out loans. Similarly, in a more recent study, Van Ooijen and Van Rooij (2016) show proof of a relationship between financial literacy and mortgage-loan decisions. They analyse survey data collected amongst a panel that is representative of the Dutch population and they measure financial literacy using the three commonly used questions developed by Lusardi and Mitchell (2011) (i.e., the “Big Three” financial-literacy questions) concerning interest rates, inflation and risk diversification, as well as some more specific questions about debt contracts. The results show that individuals with a lower level of financial literacy are more likely to take out traditional mortgages that pay off the principal at maturity. Riskier mortgages are found to be more prevalent among homeowners with a better understanding of loan contracts or among financially less sophisticated homeowners who consult intermediaries for professional financial advice.

Various papers present studies that focus more on the impact of financial literacy on financial inclusion as they investigate its impact on the use of formal financial products and services. The majority of these studies are based on consumer surveys or post-treatment tests (Carpena and Zia, 2018; Cole, Sampson and Zia, 2011; Huynh, Nicholls and Zhu, forthcoming; Lusardi et al., 2011; Lusardi and Tufano, 2015; OECD, 2013). Other papers provide a summary through either literature reviews or meta-analyses (Hastings, Madrian and Skimmyhorn, 2013; Fernandes, Lunch and Netemeyer, 2014., Kaiser and Menkhoff, 2017). Overall, in both developing and developed countries, it has been concluded that financial literacy is associated with a higher usage of various financial services, such as savings accounts and credit cards. However, causal links are often not clear. The causality may run both ways: higher levels of financial literacy may affect people's attitudes and uses of financial products, but by using financial products people might also increase their knowledge of related financial concepts.

A study by the OECD explicitly focuses on the relationship between financial literacy and financial inclusion (OECD 2013). This investigation included collecting survey data across a selection of both developing and developed countries. In the survey, financial literacy is defined as a combination of financial behaviours, attitudes, preferences and knowledge, whereas financial inclusion is measured through questions about product awareness, product holding and recent financial choices. Comparative analyses suggest a positive association between financial literacy and an awareness of financial products. Moreover, in most of the countries studied, lower levels of financial literacy are associated with lower probabilities of holding insurance policies and higher likelihoods of turning to friends to borrow money. Also, holding credit products and having savings accounts are associated with higher levels of financial literacy.

Likewise, Cole, Sampson and Zia (2011) suggest a positive association between financial literacy and the use of financial services in India and Indonesia. They conduct a national representative household survey in Indonesia and another one in India to measure people's uses of and attitudes towards financial services, their levels of financial literacy and other characteristics, such as cognitive ability, risk aversion and demographics, which may also predict financial behaviour. Their regression results show that a higher level of financial literacy is significantly associated with the greater use of bank accounts in Indonesia and of insurance in India. However, this association is not found for all financial products. In particular, no significant relation is found for borrowing.

When examining US respondents' self-reported abilities and methods to cope with financial shocks, Lusardi, Schneider and Tufano (2011) include in their probit models a proxy for risk literacy that indicates whether the respondent correctly answered three questions on risk. Although they do not find a relation between respondents' level of risk literacy and their overall ability to deal with shocks, they do find that it has a correlation with how people intend to cope. A higher level of risk literacy is found to be correlated with a higher likelihood of using savings in times of distress and a lower likelihood of using more crude methods, such as selling personal possessions.

Lusardi and Tufano (2015) use survey data that is representative of the US population to find a relationship between debt literacy and self-reported experiences with traditional borrowing, alternative borrowing and investing activities. Debt literacy is measured through questions on interest compounding and self-assessed financial knowledge. The results show a strong relationship between literacy and debt behaviour, even after controlling for demographics.

Those with lower levels of debt literacy tend to incur higher fees and use high-cost borrowing methods.

Huynh, Nicholls and Zhu (forthcoming) examine the relation between financial literacy and the use of different payment methods among a representative sample of Canadians. The results of probit models show that individuals with low levels of financial literacy are less likely to own a credit card and if they have a card, they are more likely to revolve credit card balances.

The above results are in line with the conclusions presented in earlier summary papers. Hastings, Madrian and Skimmyhorn (2013) review the literature on financial literacy, financial education and consumer financial outcomes and also conclude that a sizeable and growing literature has established a correlation between financial literacy and several financial behaviours and outcomes. Similarly, the meta-analyses conducted by Fernandes, Lunch and Netemeyer (2014) and Kaiser and Menkhoff (2017) show that there is a relationship between financial literacy and financial behaviour, although small, especially after correcting for omitted-variable bias. These papers also underline that the causality remains unclear.

This makes the paper from Carpena and Zia (2018) quite unique. These authors not only find proof of a positive association between financial literacy and financial inclusion but they also claim that the association is causal, with the causality running from literacy to inclusion. They conduct a causal mediation analysis, using the data collected from a randomized field experiment of Carpena et al. (2019), to examine the extent to which a five-week video-based financial-education program influenced people's behaviour through the mediation of

increased financial literacy. The results show that increases in people's financial awareness have a significant impact on relatively simple financial actions, such as attempting to write a household budget. However, for more complex activities, such as opening a savings account, financial attitudes are concluded to play a more meaningful role and their financial numeracy and awareness not so much.²² No relationship is found between the financial-literacy variables and borrowing and taking out insurance.

4.2 The effect of financial education on financial literacy

The previous section demonstrates that financial literacy is associated with a higher usage of various financial services. So, although there is still room for further research into the causal relationship between both factors, financial literacy can be said to be a predictor of financial inclusion. Knowing this, our next question is how financial education can play a role here. Many studies have examined the factors that influence financial literacy²³ and a subset of these dive into the effectiveness of education initiatives. Overall, the latest works show proof of a significant causality, in both developing and developed countries, with financial education improving financial literacy. However, the strength of the effect varies with the type of indicator used for financial literacy (i.e., knowledge, awareness, attitudes, numeracy skills) and with the characteristics of the educational program, such as whether people are trained alone or not and the income level of the targeted groups.

²² Carpena and Zia (2018) consider budgeting and record keeping as simple activities, because they do not require institutional change or the creation of new financial products. This would be the case for some other financial behaviours, such as opening a savings account, which they therefore define as a complex activity.

²³ Overall, both socio-demographic and country-specific characteristics are found to contribute to the financial-knowledge levels of individual persons. Lusardi and Mitchell (2005), Lusardi (2008), DNB (2006), Lusardi and Mitchell (2014) and Cupak et al. (2018), for instance, show that individual characteristics considerably matter. Overall, higher levels of education and income as well as self-employment are associated with higher levels of financial knowledge. Moreover, women and the elderly are shown to be at risk of displaying lower levels of financial knowledge. The OECD/INFE (OECD, 2013), in particular, shows that gender differences in financial literacy are strongly correlated with differences in the socio-economic conditions between men and women in terms of access to education, employment and formal financial markets. Cupak et al. (2018) also point at the importance of institutional factors, with a country's level of financial knowledge being associated with its level of life expectancy, social contribution rate, math scores and internet usage. Ahunov and Van Hove (2019) show that cultural aspects, such as power distance and individualism, explain a substantial portion of cross-country variations in financial literacy.

Broadly speaking, the most recent work in this research area can be divided into randomized field experiments (e.g., Batty, Collins and Odders-White, 2015; Berg and Zia, 2017; Carpena et al., 2019; Doi, McKenzie and Zia, 2014; Kalwij et al, 2019) and meta-analyses (Fernandes, Lunch and Netemeyer, 2014; Kaiser and Menkhoff, 2017). In randomized field experiments, the authors study the impact of specific educational interventions. These interventions widely vary in terms of format and duration, from financial-education lessons to high schoolers to financial messages broadcast in a TV soap or a multi-week video-based program combined with personal counselling (See Table 1 in the Appendix). The impact of these interventions is generally tested through a large variety of pre- and post-intervention questions that try to capture people's knowledge, numeracy, and awareness and/or attitudes, while controlling for baseline characteristics and using a control group. The meta-analyses conducted in this area comprise the often-mentioned study of Fernandes, Lunch and Netemeyer (2014) and the one of Kaiser and Menkhoff (2017). These two studies analyse the educational-intervention effects reported in empirical papers by regressing these factors on various explanatory variables, such as the characteristics of the studies' research design, the sample sizes, and how the education was delivered.

Batty, Collins and Odders-White (2015) conduct a field experiment in which a series of five standardized financial-education lessons was delivered to a randomly selected group of primary school children. The experiment was run in two states in the United States and used a control group of students who did not obtain the lessons. The authors measure the impact of these lessons on the students' financial knowledge and attitudes, both shortly after the intervention as well as one year later. The results show that the lessons resulted in significant and reasonably large gains in financial knowledge and that these even persisted one year later.

Similarly, Kalwij et al. (2019) examine the results of controlled field experiments conducted among primary school children in the Netherlands by Schonewille, Van der Werf and Van der Schors (2016). They find that a 45-minute education program led to a post-test improvement in financial knowledge, compared to that of the control group. However, the program only turned out to be effective for those questions that were explicitly addressed in the program. No improvement was found for other financial issues or when issues were addressed in a different context.

Berg and Zia (2017) also find a causal effect of financial education on financial knowledge. In their study, educational messages on debt management and gambling were woven into the storyline of a daily South African TV soap for over two months. The effectiveness of the messages was evaluated through a self-reported follow-up survey among a randomly selected treatment group four months later and by using a control group. The analysis shows significant improvements in financial knowledge among the treated. However, the knowledge improvements were only visible for those concepts that were specifically mentioned in the storyline and not for other financial concepts.

The conclusion that financial education can be effective in improving people's financial knowledge and attitudes does not seem to apply to all facets of financial literacy. Carpena et al. (2019) study the impact of financial education on financial numeracy, financial awareness, and financial attitudes. They run a field experiment in India in which a randomly selected group of people were offered a five-week video-based financial-education program. In addition, some participants also received free financial counselling or were encouraged to set short-term financial goals or both. Based on pre- and post-treatment surveys, the analyses show that all treatment combinations significantly improved people's awareness of and

attitudes towards using financial products. However, no significant impact on numeracy skills was found, no matter whether the educational program was provided on its own or combined with counselling and/or goal setting.

Doi, McKenzie and Zia (2014) too find that financial education is relatively ineffective in improving financial numeracy, as opposed to making people more financially aware. Also, they show that the effectiveness of financial education varies according to whom is trained. The authors arrived at these conclusions after conducting a randomized field experiment in Indonesia. In this experiment, female migrants and one of their family members were offered a training program that ran over several days and covered various topics, such as financial planning, savings and debt management. The participants were divided into four groups: a migrant-only training group, a family-member-only training group, a group in which migrants were trained together with a family member, and a control group. Three follow-up surveys were used to measure the impacts on financial awareness, applied financial knowledge and financial-numeracy skills. The results show that the training significantly increased the participants' awareness of basic financial concepts, with the impact being greater when both the migrant and their family member were trained. Also, the training had a significant impact on applied financial knowledge but only when taken together with a family member. The impacts on financial-numeracy skills were insignificant for all three treatment groups.

The above studies and conclusions do not seem to be isolated cases. Kaiser and Menkhoff (2017) perform a meta-analysis of 126 studies to analyse the financial-education impacts found in the literature. They go beyond the meta-analysis of Fernandes, Lunn and Netemeyer (2014) by covering more papers that look at financial-literacy impacts and by also

including more recent studies that are mostly based on randomized experiments.²⁴ It is noteworthy that these randomized experiments provide evidence of effective interventions, which explains why Kaiser and Menkhoff (2017) are more positive about the effectiveness of financial education than are Fernandes, Lunch and Netemeyer (2014). In particular, the former conclude that financial education has a strong positive impact on financial literacy but that it is less effective for low-income people as well as for those in low- and lower-middle-income economies.

4.3 The effect of financial education on financial inclusion

After combining the conclusions drawn in sections 4.1 and 4.2, it can be argued that financial education can significantly improve financial literacy and, therefore, have a positive association with financial inclusion. But what about the causal impact of financial education on inclusion?

There are a lot of papers, including the ones already mentioned, that examine the effects of financial-education programs on consumers' financial behaviours. The most recent ones especially focus on determining whether there is a causal impact. This body of literature can be categorised into three streams. First, there are randomized field experiments (Agarwal et al., 2010; Batty, Collins and Odders-White, 2015; Berg and Zia, 2017; Carpena et al., 2019; Cole, Sampson and Zia, 2011; Drexler, Fischer and Schear, 2014; Doi, McKenzie and Zia, 2014; Field et al., 2016; Kalwij et al., 2019) that assess the impact of financial education on people's self-reported use of financial services, such as bank accounts, savings products, borrowing, insurance and budgeting. Secondly, some papers present studies that use household surveys and difference-in-difference methods to examine how individuals changed

²⁴ Randomized evaluations were rare in earlier years. Since these evaluations allow for distinguishing between selection and treatment effects, they provide for better results than non-randomized evaluations.

their behaviour in response to educational interventions (Bernheim et al., 2001; Lusardi et al., 2011; Cole, Paulson and Shastry, 2016). Third, the literature contains a few studies that provide summaries or analyses of the existing empirical work, either through literature reviews (Hathaway and Khatiwada, 2008) or meta-analyses (Fernandes, Lunch and Netemeyer, 2014; Miller et al., 2014; Kaiser and Menkhoff, 2017).

The conclusions on the effectiveness of financial education on financial behaviours vary widely. In general, there seems to be a pattern that points to financial education as being beneficial in changing people's uses of financial products, in both developed and developing countries. However, this educational impact is not as stark as it is on financial literacy. Also, the effectiveness strongly depends on various factors, such as the types of interventions and their timing, and the people and types of behaviours targeted.

Overall, there are various lessons to take away from this stream of literature. First, there is evidence that financial education among primary and secondary school children might be effective. The 45-minute education program studied by Kalwij et al. (2019) turned out to have increased primary school children's willingness to save by four percentage points, compared to the control group. Batty, Collins and Odders-White (2015) also show that fourth and fifth graders who are exposed to financial education have more positive attitudes about personal finance and are more likely to save. A second post-intervention test taken one year after the education program showed that these effects had been sustained. While significant, the effects were fairly small relative to the effects on financial literacy.

It remains unclear whether financial education among school children influences their financial decisions much later in life. Bernheim, Garrett and Maki (2001) use a cross-

sectional household survey to collect data from 2,000 American consumers, to study the long-term effects of state mandates that required secondary schools to provide financial education. While controlling for socio-demographic variables, these authors compare the level of self-reported savings of people who had gone to school in states that had implemented these mandates with the level of savings of those who attained their high school education elsewhere. They find that the savings rates of individuals who had been exposed to financial education during their student years were significantly higher than the savings rates of those who had not. Therefore, Bernheim, Garrett and Maki (2001) argue that financial education during a person's childhood positively affects savings once that person becomes an adult. However, Cole, Paulson and Shastry (2016) re-examine this impact by using a larger sample and accounting for unobserved state and year heterogeneity. They find that the mandatory financial programs had little effect on long-term savings and argue that the positive effect found in Bernheim, Garrett and Maki (2001) was caused by systemic differences between the states that had imposed these mandates and those that had not.²⁵

When studying the predictors of people's abilities to cope with unexpected expenses, Lusardi et al. (2011) also consider the long-term impact of high school financial education. They find that, while controlling for other economic and demographic characteristics, respondents who had not received financial education at school are less likely to be able to cope with a financial shock. However, it remains unclear whether this relationship is causal.

Second, there is proof of financial education having a causal impact on behaviour when it is not delivered in the traditional way. One example is found in the previously mentioned study by Berg and Zia (2017), who examined the financial messages that were woven into a TV soap storyline. The results show that those who had watched the soap were significantly and

²⁵ Cole, Paulson and Shastry (2016) provide suggestive evidence that the imposition of the mandates was related to different long-term trends in asset accumulation across states.

substantially more likely to borrow from formal sources and for productive purposes and they were less likely to enter into retail credit or to gamble, even four months later. Also, Berg and Zia (2017) find a stark increase in the number of calls made to a counselling centre on the days following the episodes that featured a financial counsellor. Another example of non-traditional financial education is tested by Drexler et al. (2014). They examine the impact of two financial training programs for small business owners in the Dominican Republic: a traditional principles-based accounting program and a program that teaches simple rules of thumb. The results document significant differences across the two approaches. Relative to the control group, participants of the rule-of-thumb training showed significant improvement in the way they managed their finances. No such changes were found for those who had attended the standard training. In line with this, Carpena et al. (2019) find that their five-week video-based financial-education program, when combined with goal setting or counselling, had a stronger effect on participants' likelihood of opening savings accounts or writing budgets.

Third, the literature shows proof of heterogenous treatment effects; i.e., that financial education might have an impact on the behaviour of some but not of everyone. Agarwal et al. (2010), for example, study the impact on mortgage defaults in the US of a voluntary two-year program for prospective homebuyers. The program included monthly classes and counselling on credit, savings and financial literacy. Accounting for various controls and potential selection bias, these researchers find that participation in the program could be related to lower default rates afterwards, even in the long-run. The effects were strongest among households that appeared least creditworthy in terms of their income and official credit scores. Likewise, the rule-of-thumb training assessed in Drexler, Fischer and Schear (2014)

only had a significant positive impact for people with lower levels of business skills at the start of the program and those who had a limited ex ante interest in financial training.

Similarly, Field et al. (2016) study the effects of two days of business counselling among business women in India. The sample was randomly divided into three groups: women who attended the training on their own, women who were invited to bring a friend, and a control group. Analyses of the post-training survey data shows that, four months later, those who had been invited to bring a friend reported significantly higher business sales relative to the control group. Field et al. (2016) also find a significant positive effect on taking out business loans. No differences were found for those who had trained alone. Also, the effects were strongest among women who faced greater restrictions on their mobility; for example, due to their religion or caste. Doi, McKenzie and Zia (2014) also conclude that it is all about whom is trained. Their randomized field experiment among Indonesian immigrants shows that financial-literacy training had a strong and statistically significant impact on their reported level of savings but only when both the migrants and their family members were trained. Also Cole, Sampson and Zia (2011) find causal evidence of financial education being more effective among certain population groups. They conducted a randomized evaluation of a two-hour financial-education program among the non-banked in Indonesia. This training was designed with the specific goal of teaching households about bank accounts. Cole, Sampson and Zia (2011) find that for the full population the training had no effect on the probability of opening a bank account, although it did have a modest impact among those with low initial levels of education and financial literacy.

Fourth, the impact of financial education seems to vary with the type of behaviour targeted. Carpena et al. (2019), for instance, show that their financial-education program had some

effect on people's insurance behaviour but that this effect was only weakly significant and much smaller in absolute terms relative to the impact on savings, budgeting or borrowing.

As with any randomized experiment or household survey, the above results provide the impacts of the programs that were studied in one particular context. However, the results are in line with the literature review provided in Hathaway and Khatiwada (2008). This review also concludes that, unlike general programs, programs that are targeted toward a specific audience and financial topic tend to be effective in changing people's financial behaviours. Also, they suggest that education programs should be provided just before the corresponding financial event, such as buying a house or requesting a credit card. In the same vein, the meta-analyses of Miller et al. (2014) and Kaiser and Menkhoff (2017) show that financial education can have an impact on financial behaviour but that the effects depend on the target group and type of financial behaviour targeted as well as on the intensity and timing of the educational program. In particular, Miller et al. (2014) conclude that financial education performs less well in preventing negative outcomes, such as loan defaults. The authors attribute this difference to the degree to which consumers can exert immediate control over these issues. They argue that the effectiveness is larger in relation to savings and record keeping, since these are decisions that consumers can immediately act upon after attaining education on these issues, whereas loan defaults are merely outcomes of longer-term behaviours.

4.4 Conclusion

Overall, the literature suggests that financial-education programs can be effective in improving financial literacy and in increasing people's use of formal financial products and services. However, the program design strongly matters, such as its timing and format and

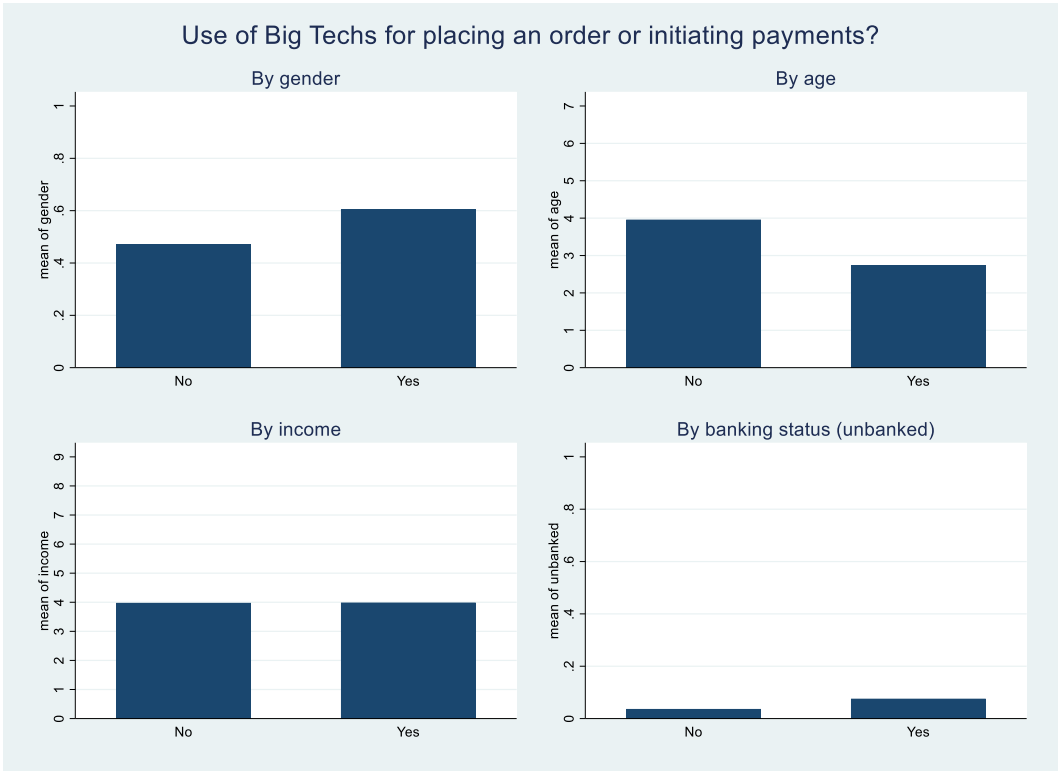
the type of financial behaviour(s) aimed for. Also, the impact heavily depends on whom is targeted. It is clear that one size does not fit all.

Now let us put this conclusion into the context of Big Techs and the potential challenges they bring if people lack the required knowledge and skills to appropriately use their financial services. Unfortunately, the existing literature, as summarized above, is solely focused on the products and services offered by traditional financial institutions, such as banks, insurance firms and credit companies. It remains unclear whether the conclusions can be applied to Big Techs. In fact, the conclusion that financial education might have impacts on the behaviours of some but not everyone makes us believe that we should not groundlessly assume that financial-education programs can be effective in increasing the general public's skills and knowledge about the financial services Big Techs offer. The types of services these firms offer considerably differ from traditional financial services. Also, the way these services are offered, and their users, may differ. Evidence from Canada suggests that people who recently conducted a financial transaction with a Big Tech were significantly younger, more often unbanked and more often male, compared to those who had not used these Big Tech services (See Figure 8). To this day, it is unknown whether financial-education programs would work for this population group; this calls for future research. Survey results from OECD/INFE (2020), for instance, suggest that users of digital services or devices already have significantly higher financial knowledge and more prudent financial-behaviour patterns than those who have not used digital services or devices.

Another lesson to take away from the existing literature is that when financial education is not delivered in a traditional way it can have a causal impact on financial behaviours. Hence, the new Big Tech era might actually provide opportunities for financial education. Big Techs use the latest technologies to reach and serve their clients—technologies that could

potentially also be leveraged for financial-education purposes. Given the widespread use of the internet and smart phones, further research is required to understand whether the effectiveness of financial-education programs can be improved if supplemented or even replaced by digital communication means.²⁶

Figure 8: Characteristics of people who recently transacted through a Big Tech in Canada



This graph provides a breakdown of the respondents that used (Yes) or did not use (No) Alexa, Google home, Instagram, Facebook or Apple Siri to place an online order or initiate a payment in the last month prior to the survey. It is based on weighted data from the 2019 Canadian Consumer Payments & Transactions Survey of Payments Canada. Gender takes on a value of 0 (female) or 1 (male), age varies from 1 (aged between 18 and 24) to 7 (aged 75 or older), and income varies from 1 (\$19,999 or less) to 9 (\$350,000 or more). Banking status has a value of 1 (when not having either a debit or credit card) or zero otherwise. Differences in terms of gender, age and unbanked status are significantly different at the 0.01 significance level.

²⁶ In April 2020, the Committee on Payments and Market Infrastructures (CPMI) and the World Bank Group published their updated Payment Aspects of Financial Inclusion (PAFI) guidance (see BIS, 2020). In this work they call for educational and outreach efforts, delivered through the use of both traditional and digital communication means, that support awareness and financial literacy with respect to new technologies and financial services. However, sound empirical research is needed to substantiate this recommendation.

5. Literature review: Financial inclusion and financial stability

5.1 Indicators and methodologies used in the literature

Together with the increased attention placed on improving the access to and use of formal financial services by low-income households and small enterprises, there is increasing (academic) interest in the relationship between financial inclusion and financial stability. Various empirical studies have analysed the impact of enlarging financial inclusion on the financial soundness of financial institutions and on the financial stability of an economy's banking sector as a whole. Given the broad definition of financial stability, a wide range of financial-stability indicators can be found in the literature (See Tables 2 and 3 in the Appendix). According to Garçia (2016), this partly reflects “the multifaceted nature of financial stability” and the “relatively young age of the discipline of assessing financial stability.” Most studies use indicators that are based on banks' performance, such as their share of non-performing loans (NPLs) or the banking sector's Z-score—an indicator for the likelihood that a country's banking sector will default.

Broadly speaking, the literature on the impact of enlarging financial inclusion on financial stability can be divided into two streams. The first stream focuses on specific emerging or developing countries (See Table 2). These single-country studies examine the relation between changes in access to financial services for (low-income) households or (small) entrepreneurs in a particular country, on one hand, and changes in the stability of their financial system, on the other. The second line of research consists of cross-country studies (See Table 3). These studies analyse the relationship between differences in financial access and differences in financial stability across countries. Whereas most single-country studies focus on emerging and developing countries, most cross-country studies use information

from a large variety of countries, worldwide, including those with higher levels of financial inclusion and economic development.

In this section, we categorise the reviewed studies based on the type of financial inclusion they look at: access to and use of bank accounts, access to consumer loans and mortgages, and access to credit by micro, small- and medium-sized enterprises. Overall, the empirical literature shows that increasing financial inclusion contributes to the stability of financial institutions and to an economy's financial system as a whole. However, there are situations in which increased access to financial services may negatively affect financial stability, especially if adequate supervisory controls are absent.

5.2 The effect of increased access to and use of bank accounts

Regarding access to bank deposits, the economic literature shows that financial inclusion may foster the financial resilience of a country's banking system. According to Cull, Demirgüç-Kunt and Lyman (2012), among others, a more inclusive financial system will lead to a more diversified and, thus, more stable funding base for banks. This is supported by empirical studies by Han and Melecky (2013), Sahay et al. (2015) and Canlas, Ravalo and Remolona (2018), who examine the relationship between households' access to bank deposits and banks' financial stability.

Canlas, Ravalo and Remolona (2018) conclude that it is unlikely that increasing financial inclusion leads to higher financial-stability risks to the banking system. Using difference-in-difference regressions, they analyse the withdrawal behaviour of small and large depositors who live near one of the three largest banks that have gone bankrupt in the Philippines since 2007. The authors draw an association between financial inclusion and depositors that have small accounts. They find that although a bankruptcy can lead to the increased withdrawal

behaviour of those depositors who keep accounts in banks located nearby, there is no significant difference between the withdrawal behaviour of small and large depositors, suggesting that increased financial inclusion does not affect financial stability through the channel of the risk of contagion in bank runs.

Han and Melecky (2013) use information from 95 countries, for the period between 2006 and 2010, and several estimation methods and two different measures for access to deposits, and find that broadening households' access to bank deposits contributes to financial stability by reducing the volatility in bank funding during a crisis.^{27 28} They find that a 10-percent increase in the share of citizens that have access to or actively use bank deposits can reduce decreases in deposit growth by three to four percentage points. This effect is particularly strong for middle-income countries, which experienced a 50-percent decline in deposit growth around the financial crisis of 2008. Based on this, they conclude that public policies aimed at promoting financial inclusion can be complementary to macro prudential regulation that aims to enhance financial stability.

5.3 The effect of increased access to consumer loans and mortgages

Enlarging access to consumer loans and mortgages without adequate risk-control and monitoring systems may worsen the stability of an economy's financial system.

Kahn (2011) puts forward the US subprime mortgage crisis of 2008 as an example that shows that this adverse effect can also be found in developed countries. The US subprime mortgage crisis was the result of the overextension of mortgage lending to low-income households in America without adequately controlling the accompanying risks. Risks at the lower end of

²⁷ The authors use OLS regression, robust regressions and GMM regression estimation methods.

²⁸ The authors use two proxies for access to bank deposits. The first indicator is an index that was constructed by Honohan (2008) and measures the access to bank deposits before the 2008 crisis. The second indicator measures the share of the people that actually used bank deposits in 2011. This indicator was introduced by Demirgüç-Kunt and Klapper (2012).

the market spread throughout the entire US economy. Worldwide concerns about the reliability of US credit and financial markets led to a tightening of credit provision worldwide, resulting in fewer business investments, less household spending, and a slowing down of economic growth in the US and Europe. Kahn (2011) also refers to India's past experiences with local (non-bank) institutions' (e.g., MFIs) enlarging access to financial services for low-income and unbanked households and the adverse impact on financial stability. These institutions' focus on specific vulnerable consumer segments in specific regions resulted in concentration and funding risks, which made them vulnerable to natural disasters and local downturns.

Kahn (2011) pays special attention to the impact of a crisis in microfinance in the Indian state of Andhra Pradesh in 2010. This crisis was the result of a combination of enlarging access to credit to low-income households, the poor governance of MFIs' money-lending activities and the involvement of private equity investors in MFI lending. Between 2005 and 2010, access to credit was expanded to low-income households, leading to a high penetration rate of microfinance among households and households having multiple loans and over-indebtedness. Over time, an increasing number of households faced problems in repaying their debts which, in combination with the coercive methods of some MFIs, resulted in a large number of suicides among borrowers (Kaur and Dey, 2013). In order to help borrowers, the government of Andhra Pradesh implemented the Andhra Pradesh Microfinance Institutions Act 2010 to regulate MFIs' money-lending activities. However, this act had a negative impact on these MFIs' profitabilities. As an unforeseen consequence, households no longer felt the urge to repay their debts, resulting in a decrease in loan-recovery rates from 99% to 10%, which endangered the viability of these MFIs. Not only were the MFIs in Andhra Pradesh hit hard by this but the banks and financial institutions from which they had

borrowed were also affected. This indicates that, if not adequately regulated, enlarging financial inclusion may add systemic risks to the financial system.

In a multi-country study that used data for 2004 to 2011 that covers the global financial crisis, Sahay et al. (2015) show that the impact of broadening access to credit on financial stability depends on the quality of the supervision. In countries with weak banking supervision, broadening access to credit to (low-income) households has a bell-shaped impact on banks' stability.²⁹ After an initial positive effect, a further broadening of the share of households with access to credit is associated with deteriorating payoff behaviour, which erodes banks' buffers and leads to less stable banks. Such a bell-shape effect, however, is not present in countries with strong banking supervision. The quality of banking supervision is proxied by the degree of compliance with the Basel Core Principles.³⁰ Based on this, the authors argue that to mitigate stability risks banks should properly screen and monitor their borrowers' payoff behaviour.

The findings of Sahay et al. (2015) are supported by Čihák, Mare and Melecký (2016), who study the trade-offs and synergies between financial inclusion and financial stability. They conclude that extending financial inclusion may result in both less and more financial stability, depending on the country characteristics. They find, among other things, that if a country's population is well educated, its tax rates are low and its credit-information depth is adequate, then there may be synergies between financial inclusion and financial stability. However, they also find that financial openness may go together with a negative association between financial inclusion and financial stability, particularly in cases of extensive

²⁹ The share of borrowers in the adult population is used as a measure for access to credit. The banks' Z-score is used as a proxy for the financial stability of a country's banking sector. This measure relates banks' buffers to their earnings.

³⁰ For more information about the Basel Core Principles, see: <https://www.bis.org/publ/bcbs230.htm>.

borrowing by households. The authors state that this holds especially for low- and middle-income economies, probably because in these economies there may be insufficient capacity and experience with adequately and systematically assessing the creditworthiness of potential borrowers. In particular, extending credit to households seems to affect the stability of a country's financial system. According to the authors,

[T]he depth of credit-information systems generates synergies by improving screening of credit worthy customers, ... and aids stability by, for example, improving the accuracy of estimations of expected losses." They conclude that if "financial policy focuses on advancing the financial inclusion of individuals, complementary policies to deepen credit-information systems could help mitigate the estimated trade-offs with financial stability.

5.4 The effect of access to credit for micro, small- and medium-sized enterprises

According to several papers, when financial institutions increase their lending to micro and small enterprises, this has a positive impact on financial stability as long as lenders are adequately assessed and monitored.

Patten, Rosengard and Johnston (2001), for instance, show that, in contrast to SMEs and large corporations, micro entrepreneurs in Indonesia repaid most of the loans they took out during the East Asian economic crisis of the late 1990s. The authors name several reasons for their good repayment behaviour. First, the loan instalments were adjusted to the cash flows of the borrowing entrepreneurs. Second, the micro entrepreneurs mainly sold domestically produced essential products. The demand for these products was less vulnerable to cyclical downturns and monetary crises than the products sold by other retailers, which were often products that were imported and less essential. Third, part of the produce of micro entrepreneurs in the rural sector benefitted from the monetary crisis as the devaluation of the rupiah led to increased export demand for rural products. Finally, micro entrepreneurs who

borrowed money seemed to highly appreciate their access to credit and savings accounts and, therefore, did their very best to repay their loans in a timely manner. Overall, the findings by Patten, Rosengard and Johnston (2001) illustrate what differs the newly included types of enterprises from the other entrepreneurs, why financial inclusion can lead to a more diversified portfolio of borrowers and, consequently, why financial inclusion may contribute to the financial stability of an economy.

Patten, Rosengard and Johnston's (2001) finding regarding the good repayment behaviour of small lenders is supported by Adasme, Majnoni and Uribe (2006). In a study on Chile for the period 1999 to 2005, they find that the payoff of small-loans portfolios was less sensitive to economic conditions than the payoff of larger loans. These small-loan portfolios are typically held by households and small enterprises. The authors conclude that increased access to credit for households and small firms may contribute to the financial stability of an emerging country as these borrowers contribute to a more diverse loan portfolio that is less sensitive to economic downturns.

In a study on the performance of two types of MFIs that provided microfinance in Bolivia between 1998 and 2004, Marconi and Mosley (2006) point to the importance of adequate institutional design in providing microfinance to small entrepreneurs. The Bolivian microfinance sector was hit disproportionately hard during the global economic crisis that first hit East Asia and Russia at the end of the 1990s. However, there were large performance differences across the two types of MFIs. The so-called private financial funds (PFFs), which had entered the market to achieve high growth and earn high profits, mainly offered relatively large loans to consumers who were living in urban areas and used these loans to buy durable goods. These MFI's loan-appraisal procedures were often not adequate and they

performed badly during the crisis. Some of them even defaulted. By contrast, MFIs that had been active in microfinance for a longer period and that offered a broad range of financial services to small entrepreneurs, like savings accounts, financial education, legal advice on taking out credit and quasi insurances, carefully assessed and monitored their (potential) borrowers' repayment capacities. By doing so, their customers were well equipped to cope with the economic crisis. Furthermore, these MFIs could identify, at an early stage, when borrowers were having repayment problems and help them solve their repayment problems. Unlike the PFFs, their default rates were not affected and the value of their portfolios increased during the crisis.

Using panel data for the period 2005 - 2011, Morgan and Pontines (2014) conclude that financial inclusion and financial stability are complementary and that policy measures to increase access to credit for SMEs enhance financial-sector stability as a side effect. They examine the relationship between the share of SME-lending in total bank lending on bank's performance and stability. They use two inclusion measures and two financial-stability measures. The financial-inclusion indicators are the value of the outstanding loans to SMEs relative to the total value of the outstanding loans of commercial banks and the number of SME borrowers as a proportion of the total number of borrowers from commercial banks. The financial-stability indicators are the banks' Z-scores and the share of banks' non-performing loans relative to their gross loans. Using dynamic panel system GMM estimations, which control for possible endogeneity issues, they find that an increasing share of SME lending in total bank lending reduces the share of non-performing loans and has a negative effect on financial institutions' probability of default.³¹

³¹ A dynamic system panel GMM has several advantages: it provides a remedy against endogeneity bias and it is more robust to measurement error than cross-sectional regressions.

Naceur, Candelon and Lajaunie (2019) assess the impact on the financial stability of various components of financial development, including access, which is referred to as people and firms' abilities to access financial services. They use a sample of 98 countries, covering the period 1980 to 2016, and proxy financial stability as the occurrence of a banking crisis within one to two years' time, using data on systemic financial-market failures from Laeven and Valencia (2013). Estimating dynamic panel logit regressions, the authors find that the influence of access on financial stability differs with a country's level of development. For the lowest-income countries within the group of developing countries and emerging markets, individuals and firms' access to financial institutions' services is concluded to have a stabilizing impact, as opposed to financial depth and financial efficiency having this affect.³² For developed countries, however, financial access is found to play a potential role in triggering a banking crisis. The authors conclude that the entry of new financial intermediaries, such as Big Techs, may be beneficial for the financial stability of developing and emerging countries but that regulators should impose strict access control in advanced countries.

5.5 Conclusion

Thus far, there is limited empirical evidence on the influence of financial inclusion on financial stability. The research indicates that the financial-stability impact of enlarging access to financial services depends on the types of services that households or firms are granted access to. Moreover, the financial institutions' competence to adequately assess whether a financial product is suitable for a client also plays an important role. Overall, a more inclusive financial system for deposit accounts leads to a more diversified and, thus, more stable funding base for banks and contributes to financial institutions' resilience against

³² Financial depth reflects the size and liquidity of the market and financial efficiency refers to the level of activity in capital markets and the ability of institutions to provide financial services at low cost and to earn sustainable revenues.

economic downturns. Enlarging people's and SMEs' access to credit also has a similar positive effect, provided that financial institutions have adequate loan-risk models and loan-repayment monitoring systems. Experiences in several countries, like Bolivia, the US and India, indicate that without adequate risk-management tools, there is a risk of the overprovision of credit, which can deteriorate a financial institution's resilience against economic shocks and, in the case of India (Kaur and Dey, 2013) and the US (Kahn, 2011), eventually affect the financial sector.

Recently, Big Techs have entered the financial-services market. In developing countries their focus has been on providing financial services, such as money transfers, payment services and/or credit lines to unbanked people and small entrepreneurs (BIS, 2019). Experiences from Canada suggest that, compared to their counterparts, the unbanked and younger people as well as males are more likely to use the payment services offered by Big Techs. Furthermore, Big Techs like Airbnb, Amazon, Alipay, Facebook, Google and Uber have acquired payment institution and/or e-money licenses in Europe, indicating that they intend to increase their activities in the European retail-payments market. Until now, usage of the Big Techs' financial services in Europe has been limited; but given their large customer base in most European countries, the adoption potential is huge and might materialize within a relatively short time frame.

These trends, especially considering the existing literature summarized above, highlight the importance of the appropriate regulation of Big Techs and other non-bank service providers that offer credit to the public. To date, there are no indications that Big Tech's entry into finance leads to the overprovision of loans. Frost et al. (2019) use the analysis of Big Data and machine learning and provide evidence that, in Argentina, credit assessment by Big

Techs outperforms that of traditional credit bureaus in predicting the loss rates of small firms. However, it remains uncertain whether their outperformance will also hold through a full economic cycle. It may therefore be good to monitor the performance of Big Techs during the current Covid-19 crisis. In general, a complicating factor with the performance monitoring of Big Techs is that they are huge and they operate in many countries. As a result, it may be challenging for supervision authorities and central banks to adequately monitor Big Techs' overall performance and their performance in individual countries, as these authorities' main mandates are restricted to specific jurisdictions. Hence, blind spots may arise if the risks that hit Big Techs in one country spread to other countries.

6. Conclusions and future research

The literature summarized in this paper shows that financial education can improve people's financial knowledge and skills and that this might lead to their making more responsible financial decisions, but only if the financial-education initiatives are well-designed. Careful attention should be paid to the exact design of such programs, such as their length (e.g., in hours, weeks or years) and timing (e.g., whether they should take place right before the purchase of a financial service), as well as the specific audience targeted (e.g., particular income or age groups). If these programs are not designed and implemented in such a way that they deliver the intended results, then there is a large risk that they will be ineffective.

Whether these conclusions can be extended to the current Big Tech era remains unclear.

Despite the sheer magnitude of papers, there is a large gap in the research on the effectiveness of financial education and the impact of financial literacy on the use of services offered by Big Techs. Given the speed at which Big Tech firms enter the financial market as well as the demonstrated heterogeneous treatment effects found in the literature on

“traditional” financial education and literacy, there is a need for a new stream of research. First, we need to gain more insight into which financial services Big Techs are providing in different countries, what kinds of business models they use (if at all) and how they monitor the customers that use their credit lines. Second, more insight into the existing and potential users of these firms’ services is warranted: who they are, what kind of services they prefer to use, their level of financial literacy, and whether users of Big Tech’s services show different behaviours and attitudes toward financial education, compared to users of the incumbent service providers. We also argue for further work to understand whether the effectiveness of financial-education programs can be improved if supplemented or even replaced by digital communication means, such as social-media platforms or through mobile applications.

Lessons learned from the (scarce) literature on financial inclusion and financial stability tell us that financial education, if at all effective, might not be enough to ensure that the potential financial-inclusion benefits of Big Techs are fully reaped and that these benefits do not have adverse effects on financial stability. The quality and scope of Big Tech supervision seems to also be a crucial factor. The literature suggests that if lenders are inappropriately supervised, then financial inclusion in the form of households and small firms’ increased access to credit might introduce risks to financial stability due to over-indebtedness, for instance if lenders lack adequate risk-management or loan-repayment monitoring programs. This risk might become systemic if it concerns a large number of people in many different countries, which in the case of Big Techs is not unlikely, given their large potential international client base.

These and other risks have led to increased attention being paid, among central banks and supervisory authorities worldwide, to the activities of the Big Techs that provide financial services. These organizations are assessing what kind of regulatory framework would be

adequate to address these risks and whether current laws and regulations are sufficient. Given the global nature of Big Techs, the various activities they combine in their digital ecosystems and the large amounts and variety of personal data they possess, the appropriate regulatory framework might need to be designed at an international level. International coordination and harmonized legislation could be a way to prevent Big Techs from moving to the most flexible jurisdictions from which to operate. From a financial-stability perspective, one recommendation might be to introduce regulatory measures that mitigate the risks associated with broadened access to credit. So far, the experiences of (unbanked) people and small firms who have received credit from Big Techs' have been positive (Frost et al. 2019). However, it is unknown how well Big Techs perform in times of economic crisis. Will these large firms be able to appropriately monitor their clients' repayment behaviour? To what extent will they be able to adequately help those who experience payment arrears? And how will their loan portfolios perform during a crisis? Traditional financial institutions often have long-term relationships with their clients, with these clients having the possibility of discussing their financial issues with their banks. Such contact is not common between Big Techs and their clients. Will this influence their clients' repayment behaviour? Future research, for instance on the performance of Big Techs compared to incumbent financial-services providers during the current pandemic crisis, may provide answers to these questions.

Big Techs, as well as other new players in the financial-services market, may not only influence financial stability via the channel of financial inclusion but their entry may also lead to shifts in the provision of financial services from traditional financial institutions that are under supervision, toward these new players. However, are all of these new players and their activities fully covered by our current regulatory framework? If not, then risks to financial stability might arise if these institutions run into financial problems and even

default. Future research should address the question of whether all relevant new players in the financial sector are covered or whether some of them are out of scope. If the latter is the case, then central banks and supervisors should examine whether the criteria that are currently used to decide whether an organization should be under supervision are still adequate or whether these criteria should be revised to meet the challenges of the digital economy and its new players.

In addition, the Financial Stability Board (FSB) has done some work to identify other potential benefits and risks to financial stability arising from Big Techs (FSB, 2019). They mention various implications that differ from those of other institutions that offer technology-based financial services (fintech). First, due to their network effects, Big Techs have the potential to become large providers of financial services and to rapidly achieve scale. This could pose risks, especially when these firms grow at such speeds that regulators are unable to appropriately monitor and respond to them. Second, increased competition, for example for bank deposits, could affect incumbent banks' funding costs and profitability and eventually their stability. Third, partnerships between Big Techs and incumbent banks could potentially create new operational links and dependencies, for instance when financial institutions use the cloud services offered by Big Tech. Such links could increase the complexity of the financial system and provide new channels for risk propagation which, in turn, might accentuate contagion risk from operational failures or financial shocks. Fourth, Big Techs' widespread access to customer data might mean that they end up dominating the markets for certain services. This could potentially lead to barriers to entry or to increased end-user costs. Overall, the degree of the financial-stability risks that are associated with the above implications are still unclear and this points to an important area for further research.

A final area that requires further research relates to the direct implications that financial education and financial literacy can have for financial stability other than through their impact on financial inclusion. As underlined by Buch (2018), financial (il)literacy might be an important channel through which financial instabilities can arise. Un(der)informed individuals, businesses or intermediaries may take on excessive risks, either intentionally or unintentionally. Huynh, Nicholls and Zhu (forthcoming), for instance, find that people with lower financial literacy are more likely to revolve their credit card balances, and Agarwal et al. (2010) show how participants of a financial-education program were less likely to default on their mortgages. Micro outcomes like these might have systemic macro impacts if they build up in specific market segments or if a large share of the population faces these situations. Therefore, more research is needed into such links between micro decision making and macro outcomes and how financial education can play a role here. Financial education might potentially help people better manage their finances and make more sensible decisions. Or perhaps the opposite is true. Van Ooijen and Van Rooij (2016), for example, found that people with a better understanding of loans contracts are more likely to take out riskier mortgages which, in turn, might affect the stability of the financial system.

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APPENDIX - Table 1: Overview of a selection of studies on financial education, financial literacy and financial inclusion

Citation	Financial education indicator(s)	Financial-literacy indicator(s)	Financial inclusion / behaviour indicator(s)	Country considered	Developing country?	Developed country?	Impact or association found? *
Agarwal (2010)	Two-year program of classes and counselling on money-management practices		Mortgage default rate	United States		X	Y
Batty, Collins and Odders-White (2015)	A set of standardized financial-education lessons	Correct answers to various finance-related questions	Likelihood of saving	United States		X	Y
Berg and Zia (2017)	Targeted messages on debt management and gambling in a television soap	General and content-specific financial-literacy questions	Degree of formal borrowing, borrowing for productive purposes, gambling and hire-purchase deals, in combination with calls made into the National Debt Mediation Association helpline	South Africa	x		I
Bernheim, Garrett and Maki (2001)	Exposure to financial education in high school		Rates of saving and wealth accumulation	United States		X	Y
Carpena et al. (2019)	Financial education program on budgeting, savings, loans, insurance and financial management, combined with financial goal setting, individualized financial counselling or both	Financial numeracy (ability to add income and expenses and determine interest rates); financial awareness (about financial-planning tools and basic financial products and services); and financial attitudes (perspectives about the benefits of financial products)	Household budgeting, savings, borrowing, insurance outcomes	India and Indonesia	x		I
Carpena and Zia (2018)	Financial-education program on budgeting, savings, loans, insurance and financial management, combined with financial goal setting, individualized financial counselling or both	Financial numeracy (ability to add income and expenses and determine interest rates); financial awareness (about financial-planning tools and basic financial products and services) and financial attitudes (perspectives on the benefits of financial products)	Household budgeting, savings, borrowing, insurance outcomes	India and Indonesia	x		I
Cole, Sampson and Zia (2011)	Education program on bank accounts	Financial-literacy scores, based on a series of questions about compounding, interest rates and risk diversification	Stated interest in three financial products. Probability of opening a bank savings account; probability of using a bank account	Indonesia and India	x		I
Cole, Paulson and Shastry (2016)	Exposure to financial education in high schools		Level of investment income, credit scores, late payments, the probability of experiencing bankruptcy or foreclosure	United States		X	N
Doi, McKenzie and Zia (2014)?	Training on financial planning and management, savings, debt management, sending and receiving remittances, migrant insurance	Questions related financial awareness, applied financial knowledge and financial-numeracy skills	Savings	Indonesia	x		I
Drexler, Fischer and Schear (2014)?	Standard and rule-of-thumb training on financial practices		Implementation of business-management practices, quality of financial reporting, actual business revenues	Dominican Republic	x		I
Fernandes, Lunch, and Netemeyer (2014)?	Various financial education interventions	Financial literacy measured based on psychometric scales	Savings, planning for retirement, absence of debt, stock ownership, investment decisions, cash flow management, activity in retirement plans, financial inertia	Meta-analyses of 168 papers	x	X	Y
Field et al. (2016)	Two-day business counselling		Likelihood of taking out business loans, business activity, household income	India	x		I
Huynh, Nicholls and Zhu (forthcoming)?		Knowledge of financial concepts	Cash use, credit card possession and use	Canada		X	Y
Kalwij et al. (2019)	Forty-five-minute financial education program	Correct answers to various finance-related questions		The Netherlands		X	I
Kaiser and Menkhoff (2017)	Various financial education interventions	Financial knowledge	Borrowing & debt management, budgeting & planning behaviour, savings & retirement saving, insurance & risk mitigation, remittance behaviour, bank-account behaviour	Meta-analyses of 126 papers	x	X	Y
Lusardi and Tufano (2015)		Knowledge about debt and self-assessed financial knowledge	Reported experiences with traditional borrowing, alternative borrowing, and investing, and self-reported over-indebtedness	United States		X	Y
Lusardi et al., (2011)	Exposure to financial education in schools	Questions measuring knowledge of risk	Ability to cope with an unexpected expense; type of resources used in times of stress	United States		X	I
Miller et al. (2014)	Various interventions that aim to improve people's financial knowledge, skills, attitudes or behaviour		Savings, retirement savings, record keeping, credit performance, total assets, consumption, income, bankruptcy	Meta-analyses of 188 papers	x	X	I
OECD (2013)		Financial literacy score, based on scores of financial knowledge, financial behaviour and financial attitudes	Product awareness, product holding, recent product choices	12 countries worldwide	x	X	Y
Van Ooijen and Van Rooij (2016)		Knowledge of financial concepts, including debt-related concepts	Perceptions of mortgage risks, and actual riskiness of mortgages held	Netherlands		X	Y

Y = yes, N = no, I = it depends (e.g. people and behaviour targeted, on the indicators studied, etc.)

APPENDIX - Table 2: Overview of a selection of single-country studies on financial inclusion and financial stability

Citation	Financial inclusion indicator(s)	Financial stability indicator(s)	Countries considered	Developing country?	Developed country?	Impact or association found? *
Adasme,Majnoni and Uribe (2006)	Access to credit for firms	Loan loss distribution among banks	Chile, 1999-2005	x		Y
Canlas, Ravalo and. Remolona (2018)	Bank deposits	Closure of banks Contagion closing of nearby banks	The Philippines	x		N
Kaur and Dey (2013)	Microcredit for households and SMEs	Loan recovery of MFIs Profitability of MFIs	India, state Andhra Pradesh	x		Y
Marconi and Mosley (2006)	Microfinance by NGOs; Microfinance by commercial banks	Value of loan portfolio f.i.	Bolivia, 1998 - 2004	x		I
Patten, Rosengard,and Johnston (2001)	Savings deposits, consumer loans, microcredit, SME loans,	Non-performing bank loans	Indonesia, 1996 - 2000	x		Y

Y = yes, N = no, I = it depends (e.g., people and behaviour targeted, on the indicators studied, etc.)

APPENDIX - Table 3: Overview of a selection of multi-country studies on financial inclusion and financial stability

Citation	Financial inclusion indicator(s)	Financial stability indicator(s)	Countries considered	Developing country?	Developed country?	Impact or association found? *
Čihák, Mare and Melecký (2016)	Borrowed from a financial institution (% age 15+); Credit card (% age 15+); Saved at a financial institution (% age 15+); Account at a financial institution (% age 15+); Purchased agriculture insurance (% working in agriculture, age 15+); Debit card (% age 15+); Used either the Internet or electronic payments to make payments (% age 15+); Share of firms with a checking or savings account; Share of firms using banks to finance investments; Share of firms using banks to finance working capital; Saved to start, operate, or expand a farm or business (% age 15+); Used an account at a financial institution for business purposes (% age 15+)	Bank Z-score; Bank capital to total assets (%); Bank credit to bank deposits (%); Liquid assets to deposits & ST funding (%); Bank NPLs to gross loans (%); Provisions to NPLs (%); Standard deviation of the bank lending rate growth; Standard deviation of the outstanding loans; Stability Volatility measures; Credit volatility; Standard deviation of the bank-deposit-rate growth; Standard deviation of outstanding deposits; Cumulative loss in income relative to a pre-crisis trend; Direct fiscal outlays due to financial-sector rescue packages; Peak level of non-performing loans	158 countries, 2009 - 2014	X	X	I
Han and Melecký (2013)	Access to bank deposits by citizens Share of people who actually use bank deposits	Growth value of bank deposits	95 countries, 2006 - 2010	X	X	Y
Morgan and Pontines (2014)	Ratio of SMEs' outstanding loans to total amount of banks' outstanding loans; Ratio # SME borrowers to all borrowers	Banks' Z-score (indicator probability of default of a country's banking system); Ratio of non-performing loans	Several countries, panel data 2005 - 2011	X	X	Y
Naceur, Candelon and Lajaunie (2019)	Number of bank branches per 100,000 adults; Number of ATMs per 100,000 adults	Occurrence of a banking crisis in a country	98 countries, 1980 - 2016	X	X	I
Sahay, Čihák, N'Diaye, Barajas, Mita, Kyobe, Mooi, Reza Yousefi (2015)	Access to credit (number of bank borrowers/1000 adults)	Banks' Z-score	39 countries, 2004 - 2011	X	X	I

Y = yes, N = no, I = it depends (e.g., people and behaviour targeted, on the indicators studied, etc.)

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