

Fomentando la inclusión financiera global mediante mejoras integradas en la alfabetización financiera y tecnológica. Un análisis de datos de panel

Promoting global financial inclusion through integrated financial and technological literacy improvements. A panel data analysis

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RESUMEN

La inclusión financiera es esencial para el desarrollo económico, al proporcionar servicios fundamentales como cuentas de ahorro, crédito y seguros. A pesar de su relevancia, de acuerdo a datos del Banco Mundial, cerca de 1.5 mil millones de adultos en el mundo no tienen acceso a una cuenta bancaria formal y casi 2 mil millones no son sujetos de crédito, la mayoría en países en desarrollo. Ello limita sus oportunidades económicas y perpetúa la desigualdad. Promover la inclusión financiera es crucial para impulsar un crecimiento económico sostenible, mejorar la igualdad de oportunidades y fortalecer la resiliencia financiera de un país frente a estos tiempos turbulentos. La alfabetización financiera y tecnológica desempeña un papel fundamental en impulsarla. Dotar a los individuos de estas habilidades les permite tomar decisiones informadas y utilizar eficazmente los servicios financieros digitales. Esta investigación proporciona evidencia cuantitativa, a través de estimaciones con datos panel, sobre la importancia de la alfabetización tecnológica y financiera en la determinación de la inclusión financiera, junto con la educación. También revela que, por el lado de la oferta, una infraestructura sólida para los servicios financieros digitales, especialmente a través de los teléfonos móviles, promueve el ahorro y el crédito. También es crucial mitigar el impacto de la información asimétrica, característica del sector financiero, a través de burós de crédito. Por el lado de la demanda, tanto las competencias digitales y financieras, como la resiliencia laboral, tienen una correlación positiva con la inclusión financiera. Los atributos institucionales de un país también son fundamentales.

PALABRAS CLAVE

Inclusión Financiera; Alfabetización Tecnológica y Financiera; Información Asimétrica; Datos de Panel.

ABSTRACT

Financial inclusion is essential for economic development, providing individuals and firms access to fundamental services such as savings accounts, credit, and insurance. Despite its relevance, according to the World Bank data, nearly 1.5 billion adults worldwide still lack access to a formal bank account and almost 2 billion do not have access to credit, with the majority in developing countries. This lack of access limits their economic opportunities and perpetuates inequality. Promoting financial inclusion is crucial for driving sustainable economic growth, improving equal opportunities, and strengthening a country's financial resilience in these turbulent times. Financial and technological literacy play a fundamental role in advancing inclusion. Equipping individuals with these skills enables them to make well-informed financial decisions and effectively utilize digital financial services. This research provides quantitative evidence, through panel data analysis, of the importance of technological and financial literacy in determining financial inclusion, alongside education. It also reveals that, on the supply side, a robust infrastructure for digital financial services—particularly through mobile phones—is a prerequisite for formal savings and credit. Additionally, mitigating the impact of asymmetric information, a characteristic of the financial sector, through credit bureaus is crucial. On the demand side, both digital and financial competencies and employment resilience positively correlate with financial inclusion. The institutional attributes of a country are also fundamental.

KEYWORDS

Financial Inclusion; Technological and Financial Literacies; Asymmetric Information; Panel Data.

Clasificación JEL: G21, G53, E2.

MSC2010: 62P25; 62P20

1. INTRODUCTION

Financial services play a crucial role in development, offering individuals and firms access to payments, savings accounts, and credit. These services, whether provided by banks, credit unions, microfinance institutions, or mobile money providers, offer a secure and affordable means for daily transactions, emergency planning, and future health, education, and business investments.

Savings accounts among adults globally have increased steadily, with over 70 % having a financial account, though significant inequalities persist. Financial inclusion is almost universal in regions such as Europe and Central Asia. At the same time, Sub-Saharan Africa lags, with less than 25 % of adults owning a bank account and even fewer (around 5 %) having access to credit. The most notable increases in financial account usage have been driven by digital financial services, particularly in emerging markets where mobile money is increasingly popular. Between 2019 and 2021, the share of depositors in middle-income countries rose from 44 % to 50 % (WB, 2023a).

Credit trends have been more uneven. While there was some increase in middle-income countries, borrowing remained largely stable in low- and high-income countries. The reliance on informal financial sources remains significant, particularly in regions with high-income instability and difficult access to formal credit, like Sub-Saharan Africa. Roughly 47 % of adults globally reported taking out a formal or informal loan in the last 12 months, rising to 64 % in high-income countries and dropping to 44 % in emerging economies (World Bank, 2023a). These trends are influenced by broader institutional frameworks, gender gaps, and technological adoption, which remain critical areas for development (Pavón, 2024).

Research shows that households and businesses with access to financial services are better equipped to withstand financial shocks. Thus, financial inclusion has become a global priority,

particularly in emerging economies, as it aims to boost economic growth and reduce poverty. While progress has been made in expanding infrastructure and diversifying financial services, research suggests that these efforts may fall short without a simultaneous focus on improving financial and technological literacies.

In this work, a literature review of savings, credit, financial, and technological literacies is incorporated, to go forward to a more rigorous foundation from the empirical analysis of financial inclusion commonly developed. An analysis of the determinants of access to savings and credit is included as well as two models that allow them to be validated statistically. Such guidance is vital for creating an enabling environment that fosters the entry of new participants, encourages responsible financial behaviors, and ensures consumer protection. The fundamental goal is to cultivate a supportive ecosystem that facilitates the extension of financial services to populations that have been historically overlooked or underserved.

How are access and financial inclusion measured and why do they differ from financial deepness? What determines access to financial services and what is required to advance on financial inclusion? Is saving and credit related to education, digital skills, and financial knowledge? Are the factors of both decisions common or are there distinctive factors in each decision? This paper addresses these issues by analyzing if digital and financial skills are fundamental to financial inclusion, controlled by other drivers such as access infrastructure, palliatives to asymmetric information, institutional quality, employment and general educational level. By exploring the current state of financial inclusion and its drivers, this paper highlights the advancements, discusses the challenges that remain, and outlines potential solutions for achieving greater financial inclusion. The hypotheses to be tested are:

Hoa: the ownership of savings accounts within a country is contingent upon the accessibility of financial service infrastructure, such as ATMs, bank branches, cellular phones, or information technologies (ICT). Additionally, it is a decision that requires education, financial and technological literacy, to judiciously weigh the cost-benefit of saving. In this assessment, individual motivations for consumption and investment, limitations in accessing information, and the overall institutional framework are critical.

To get into the use of these products (hiring a credit or insurance), they must be affordable, accessible, and adequate. Therefore, the second hypothesis test is:

Hob: Country access to credit relies on the available infrastructure to contact financial services, such as ATMs, bank branches, cellular phones, or ICT technologies. Additionally, it is a decision that requires education, financial and technological literacy, to judiciously weigh the cost-benefit of pursuing credit. In this assessment, individual motivations for consumption and investment, limitations in accessing information, and the overall institutional framework are critical.

The work is divided into four sections. Once the general importance of financial inclusion, technological, and financial literacy in the framework of sustainable growth has been established, the second section provides a comprehensive literature review encompassing topics such as savings, credit, financial and technological literacy. This review facilitates the identification of factors that influence the processes of opening a savings account and obtaining a loan. Moving forward, the third section incorporates empirical data and the research methodology, notably focusing on the methods employed to estimate the macro-econometric models featured in this study and subsequently presents and inspects the attained results, placing a significant emphasis on key indicators. This presentation is accompanied by a comprehensive analysis and discussion of these outcomes. Finally, the concluding section highlights the main findings, recommendations, and crucial limitations of the study. Additionally, potential avenues for future research are highlighted, providing a well-rounded culmination to the work.

2. LITERATURE REVIEW

It is crucial to analyze economic growth models to understand the significance of financial inclusion and its factors in economics. This section briefly overviews the theoretical framework surrounding economic growth, savings, and credit decisions. It then delves into the determinants of financial depth and inclusion, emphasizing financial and technological literacy.

The modern theoretical framework for economic growth traces its roots back to classical economics, which sought to identify common traits contributing to wealth accumulation and improved living standards. However, the mid-19th-century marginalist revolution shifted focus to microeconomic analysis, resource allocation, and utility, leaving macroeconomics in the background until the Great Depression.

During the 1930s, formal growth theory emerged within the context of Keynesian analysis, investigating savings and capital accumulation, inspired by economists like Schumpeter. Solow and Swan in the 1950s (Schumpeter, 1934; Solow, 1956; Swan, 1956) introduced models predicting economies would reach a steady state where capital accumulation stops due to external technological progress diminishing returns. However, empirical evidence challenged this idea, leading to the nuance of the neoclassical hypothesis with beta convergence, considering demographic parameters, institutions, and natural resources among countries.

In response, endogenous growth theory emerged, aiming to create a macroeconomic model that surpassed the boundaries of microeconomic foundations. It emphasized the production of new technologies and investment in human capital (Romer, 1986; Lucas, 1988; Rebelo, 1991). Instead of solely focusing on technological change, these models integrated growth with human capital investment, leading to spillover effects on the economy that could offset diminishing returns from capital accumulation.

Consequently, frameworks for growth and development began converging into a unified understanding, recognizing the interconnectedness of various forms of capital and their role in fostering lasting prosperity and improved living standards. Sustainable growth relies on the efficient and equitable accumulation of quality physical, human, social, and natural capital through savings and appropriate allocation to investment. This broader perspective on capital arises from global inequality and environmental degradation concerns, highlighting that economic growth alone is insufficient for overall well-being (Pavón, 2018).

The emphasis on achieving sustainable economic development through financial inclusion solidified the relevance of understanding financial development in policymaking and development strategies. Even though the exploration of the link between savings, loans, investment, and economic growth has a rich historical background, with studies dating back to Bagehot (1873), Schumpeter (1934), and later researchers like McKinnon (1973), it wasn't until endogenous growth theories (Levine, 1991), that arose a more rigorous analysis of the importance of financial development, revealing its endogenous and asymmetric nature through econometrics.

The Great Recession of 2007 prompted questions about the presumed benefits of financial deepening in the economy, suggesting a possible Gompertz curve relationship. Initially, financial development contributed significantly to growth by reducing liquidity constraints and boosting savings, investments, and formality. However, beyond a certain threshold, the impact of financial development on growth could slow due to diminishing returns and resource allocation issues. Moreover, excessive financialization could divert resources from other sectors, potentially leading to over-indebtedness and recurring financial crises (Minsky, 1982; Pavón, 2021).

As the idea of endogenous growth and conditional convergence gained prominence in specialized literature, the importance of environmental care and equity as essential factors for long-term economic sustainability was recognized. The Sustainable Development Goals (SDGs) underscored the role of financial inclusion in mobilizing resources to achieve these goals, facilitating productive engagement, expanding opportunities for family saving and consumption, and enhancing investment opportunities for businesses (United Nations, 2015).

This shift in perspective called for a move away from traditional indicators of financial development, such as financial deepness (credit or deposits as a percentage of GDP), towards indicators that assess access and usage of financial services – in other words, focusing on financial inclusion.

This framework emphasizes the importance of sociodemographic variables, such as age and gender, and the national social security network, as they influence savings and credit patterns. Additionally, higher current or expected income generally leads to increased savings, credit, consumption, and investment (Samuelson & Nordhaus, 2010). However, this relationship is not always consistent; during economic booms, companies that during economic booms companies tend to rely less in external financing, and households may reduce debt levels. The volatility and quality of income sources have also gained attention in recent years.

Additional macro-financial elements, beyond income, impact the disparity of savings and credit between countries. Human capital, including both formal and informal education, as training, financial, and technological literacy, is increasingly recognized for its effect on financial inclusion (Holzmann, 2010). Empirical research also examines firm characteristics, such as size and age. Additionally, national regulations quality influence attitudes toward savings and credit, while inertia makes that current-period savings and credit are influenced by previous trends.

The presence of financial service infrastructure significantly influences financial inclusion. Furthermore, variables like real interest rates, monetary and fiscal policy, financial system development, and market structure, all play a crucial role in aggregate savings and credit dynamics.

Financial inclusion refers to the seamless accessibility, extensive usage, and continuous engagement of diverse financial services by all strata of society. These services must be affordable, timely, and tailored to meet individual needs. This ecosystem thrives on healthy competition, transparency, and financial education, ultimately enhancing the well-being of users and ensuring overall stability within the system. By fostering sustainable economic development and economic and social inclusion, financial inclusion plays a pivotal role in creating a more equitable and prosperous society (Pavón, 2021). Financial inclusion encompasses banking services, financial advice, credit, insurance, savings products, and investment opportunities and it is a key enabler in eradicating poverty and enhancing prosperity, reasons why it has been recognized as an important policy tool to achieve Sustainable Development Goals (SDG) by different developmental bodies (United Nations, 2015; Atkinson & Messy, 2013).

To address economic growth challenges, improving access to financial services for the unbanked population, regardless of their personal net worth or company size in developing economies, is essential (Demirgüç-Kunt & Klapper, 2021; Kim et al., 2018). Education, technological, and financial literacy interventions can play a crucial role in enhancing access to financial services and fostering sustainable economic growth (Cole et al., 2011).

Financial literacy is the understanding and comprehension of financial concepts and practices that empower individuals to make informed and effective decisions concerning their finances and entrepreneurship (Lusardi and Mitchell, 2014). Financial literacy encompasses awareness, knowledge, skills, attitudes, and behaviors necessary to make rational decisions to achieve well-being (Klapper, Lusardi & Van Oudheusden, 2015). It comprises a range of attitudes and aptitudes related to budgeting, saving, investing, borrowing, and managing debt (Klapper & Lusardi, 2020), comprehending financial products, and planning (Atkinson & Messy, 2013; Cole et al. 2011). By acquiring financial literacy, people can make responsible choices about their finances, and avoid financial setbacks. It enables individuals to understand financial concepts, make informed decisions, and actively participate in formal financial systems, enhancing their overall financial well-being (Ashenafi & Kingstone, 2021).

The usage of the Internet has been found positively correlated with the level of financial literacy and financial inclusion (Königsheim, Lukas and Nöth, 2017; Lenka and Barik 2018). This correlation is believed to go through the usage of digital financial products such as Internet banking, peer-to-peer lending, and crowd-funding (Silgoner et. al., 2018). However, the use of the Internet and digital financial products are not growing at the same rate, partly reflecting a lag in the FinTech

literacy of their users which requires, not only a general technological readiness but a focused one (Milian, Spinola, & de Carvalho, 2019; Rillo, 2014). Yan, Hueng & Hua (2020) show that the impact of the usage of digital financial products on financial inclusion in China is been affected by the level of financial literacy of customers.

Technological literacy refers to the knowledge, skills, and understanding of technology and its practical applications. It involves being competent in using various digital tools, devices, and software effectively to solve problems, communicate, and access information (Parasuraman, 2000). From the demand side for financial services, when accompanied by financial education, technological literacy enables individuals to utilize digital financial services such as mobile banking, digital wallets, and online payment systems, contributing to financial inclusion. From the supply side, technological literacy plays a crucial role in financial inclusion by leveraging digital advancements to provide innovative digital financial services (DFS), reducing barriers, and creating equal opportunities (Goyal & Kumar, 2020; Kaiser & Menkhoff, 2017). This access is particularly beneficial for underserved populations in remote or rural areas with limited physical banking infrastructure because digital financial services offer lower transaction costs, making them more attractive and affordable to the unbanked or underbanked.

Thus, along with formal education, the integration of financial and technological literacy equips individuals to embrace opportunities, leading to greater financial security and resilience among economic challenges (Lusardi & Mitchell, 2014; Milian, Spinola & de Carvalho, 2019). Moreover, financial literacy bridges the gap between individuals and formal financial institutions (Jariwala and Sharma, 2011), allowing confident engagement and sound financial decision-making (Fungáčová & Weill, 2016). This increased financial inclusion contributes to overall economic stability and uplifts entire communities through financial Inclusion (Silgoner et al., 2018; Khan, Siddiqui & Salma, 2022).

3. EMPIRICAL DATA AND RESEARCH METHODOLOGY

3.1 Empirical data

Owning an account is commonly the first step in financial inclusion. However, realizing its full potential requires not only account ownership, but also the secure and convenient utilization facilitated by robust infrastructure, financial literacy, and technological readiness. The use of accounts is commonly for payments, savings, and borrowing. This section examines the contemporary dynamics among these services within the expansive financial ecosystem (Demirgüç-Kunt et al., 2021).

Financial access is made basically through commercial bank branches, ATMs, internet and mobile phones, supported by reliable physical and financial infrastructure, such as dependable electricity and mobile networks, an interoperable payments system that allows seamless transactions between financial institutions and mobile money providers. Additionally, mechanisms to verify users' identification and regulations are needed to protect consumers and encourage high-quality services (Demirgüç-Kunt et al., 2021)

The COVID-19 pandemic has disrupted the traditional way people access financial services, prompting greater use of digital finance. According to Financial Access Survey data (IMF, 2023), the number of traditional financial access points such as bank branches has decreased, while non-traditional digital modes of financial access, particularly mobile money in developing economies, have grown significantly. The number of mobile money agents per 100,000 adults has almost doubled worldwide between 2019 and 2021 (from around 450 to 880), mostly driven by increases in Africa and Asia. In contrast, the number of commercial bank branches and ATMs per certain number of adults, the two indicators of the United Nations Sustainable Development Goals (SDGs) (United Nations, 2015), have been declining in recent years, in part due to cost-cutting efforts by banks, a trend magnified since the COVID-19 pandemic. The high-income country group of European economies experienced the largest reduction in the number of ATMs, while

in some emerging countries, branchless agent banking, an innovation in the banking sector to expand the provision of financial services, has grown significantly (Demirgüç-Kunt et al., 2021).

The digital divide continues to present a significant global challenge. Despite internet usage surging to over 4.9 billion users, as reported by the International Telecommunication Union (ITU, 2022), sizable segments of the global population, especially in developing nations, still lack access to the internet. For instance, only 28.2% of Sub-Saharan Africa's population has internet access. Nevertheless, mobile technology has emerged as a potent instrument for enhancing technological literacy and promoting financial inclusion. The universality of mobile phones has not only enabled access to digital financial services but has been especially transformative for individuals devoid of traditional banking infrastructure. GSMA, the worldwide association of mobile operators, reported 1.21 billion mobile money accounts in 2019, demonstrating the potential of mobile technology to bridge the digital divide (Demirgüç-Kunt et al., 2021).

Pronounced trends underscored by various studies and empirical research in this domain encompass the rapid digital transformation accelerated by the COVID-19 pandemic. The landscape is further shaped by the expansion of 5G technology, the integration of Artificial Intelligence (AI), the proliferation of the Internet of Things (IoT), the adoption of Cloud Computing, remote work, and digital collaboration, and the growth of e-commerce. The Internet of things (IoT) ecosystem has undergone an exponential expansion, witnessed by the proliferation of interconnected devices. These tools have found applications in diverse sectors, from smart homes and cities to agriculture and industries, optimizing operations and amplifying data collection capabilities (Alahi et al., 2023).

Recognizing the importance of digital inclusion, efforts are being made to bridge the digital gap and ensure that everyone has access to technology and the necessary skills to use it effectively. These endeavors aim to provide equal opportunities for all. However, it is essential to note that technological readiness trends can vary by region and are influenced by factors such as economic development, government policies, and cultural attitudes toward technology. Examining the digital literacy of 15-year-old students worldwide, the Program for International Student Assessment (PISA), administered by the Organization for Economic Cooperation and Development (OECD), revealed that high-performing students from high-income countries exhibited more advanced digital skills. Similar results were found for the European Union, where the Digital Economy and Society Index (DESI) evaluated the digital abilities of member countries, encompassing factors like connectivity, digital skills, and the utilization of digital technologies (European Commission, 2022).

Technological literacy must be accompanied by adequate education and financial readiness to promote more comprehensive financial inclusion, but the Organization for Economic Cooperation and Development (OECD, 2022) surveyed financial literacy across 30 countries, revealing that only 51% of adults possess basic financial literacy skills. Previously, Standard & Poor's Global Financial Literacy Survey (2016) found that only about 33% of adults worldwide were considered financially literate. This suggests that a significant portion of the global population lacks the knowledge and skills to make sound financial decisions. The disparity in financial literacy rates is evident between major advanced and emerging economies. In major advanced economies, 55% of adults are financially literate, whereas this figure drops to 28% in major emerging economies (Klapper, Lusardi & Van Oudheusden, 2015). Within major advanced economies, the rates range widely from 37% in Italy to 68% in Canada. In major emerging economies, rates vary from 24% in India to 42% in South Africa. Financial literacy rates also differ based on gender, education level, income, and age. On a global scale, 35% of men are financially literate compared to 30% of women (Bottazzi and Lusardi 2021; Gudjonsson et al., 2022).

How has financial inclusion evolved in recent years? As already mentioned, owning an account commonly marks the initial stride toward achieving financial inclusion. Accounts serve various purposes, including facilitating payments, enabling savings, and facilitating borrowing. In emerging economies, approximately 24% use accounts for formal savings, while 22% use them for formal borrowing. Most adults (24%) use their accounts solely for payments, and only about 10% use them for all three financial services. Including those who use accounts to store money, the percentage of adults using accounts for saving increases to 43%. In high-income economies,

the pattern is different. Here, 95% of adults use accounts for payments, with 58% using them for formal savings and 56% for formal borrowing. The most prevalent combination of services in high-income economies is using all three (39%), while around 20% use accounts exclusively for payments (Demirgüç-Kunt et al., 2022).

Account ownership is defined as the possession of an individual or jointly-owned account at a regulated institution, such as a bank, credit union, microfinance institution, post office, or mobile money service provider (World Bank, 2021). This encompasses individuals who hold a debit card in their name, receive payments into a financial institution account, or have made utility payments from such an account within the past 12 months.

According to the World Bank (2021), account ownership has increased globally by 50% from 2011 to 2021, reaching 76% of the adult population. In developing economies, the ownership rate grew by 8 percentage points from 2017 to 2021, reaching 71%. The gender gap in account ownership has reduced to 6 percentage points. Mobile money drives growth in account ownership, particularly in Sub-Saharan Africa, where 33 percent of adults have a mobile money account. Recent growth in account ownership has been widespread across dozens of developing economies. This geographic spread is in stark contrast to that from 2011 to 2017 when most of the newly banked adults lived in China or India (Demirgüç-Kunt et al., 2022).

Account ownership rates have exhibited diverse growth patterns across economies. From 2017 to 2021, a total of 62 economies experienced an expansion in account ownership, with 34 of them witnessing a notable surge of over 10 percentage points. High-income economies, though already near-universal in account ownership, still saw an 8-percentage point increase from 2011 to 2021, from 88 percent in 2011 to 96 percent in 2021. Italy and Poland each saw overall account ownership increase by 26 percentage points since 2011, from 71 percent to 97 percent in Italy and from 70 percent to 96 percent in Poland. Developing countries, such as Peru, Uganda or South Africa, saw significant increases: account ownership increased 25 percentage points or more, while others experienced smaller growth, such as Pakistan, which grew by just 11 percentage points over the past decade, from 10 percent in 2011 to 21 percent in 2021 (World Bank, 2021). When delving into the different uses of an account, the following trends are observed (Demirgüç-Kunt et al., 2022):

Payments: In developing economies, the use of accounts for payments is the most common financial service, with 57% of adults using them for this purpose. When individuals in developing economies receive payments into their accounts, they are more likely to use digital payments (91%) and store money (70%). Among those who receive wage payments, 91% make digital payments, while about 70% use their accounts for saving and 50% for formal borrowing. The regularity and relative wealth associated with wage payments contribute to their higher usage of various financial services. On the other hand, adults who receive government transfers or pension payments into their accounts are less likely to use digital payments (70%) and are less involved in saving or borrowing.

Saving: by relevance, the second main use of an account is for saving. According to the Global Findex Database 2021 (WB, 2021), 49% of adults worldwide saved money in the past 12 months. In high-income economies, 76% of adults reported saving, while 42% saved in developing economies. Globally, about two-thirds of people who saved any money (31% of adults) reported saving formally at a financial institution or using a mobile money account. In high-income economies, 58% saved officially, while in developing economies, the figure was 25%. However, among those who saved in any form, three out of four in high-income economies and more than half in developing economies saved formally. Some people prefer saving in ways other than formal or semiformal methods. Globally, about 14% of adults reported having saved only in some other way, including keeping cash at home or investing in assets like livestock, jewelry, or real estate. In 26 developing economies, more than half of savers used only some other way to save. The share of adults saving formally has increased globally over the past decade, growing by 14 percentage points in high-income economies

and 7 percentage points in developing economies. In some developing economies, particularly in Sub-Saharan Africa, mobile money accounts have facilitated formal saving. About 15% of adults in the region, or 39% of mobile money account owners, reported saving using their mobile money accounts. Furthermore, 26% of adults globally reported saving money for old age, with 53% in high-income economies and 19% in developing economies saving for this purpose. Among those saving for old age, a majority in developing economies (about two-thirds) and an even larger majority in high-income economies (over three-quarters) saved formally.

Borrowing: The third main use of an account is for borrowing. In 2021, according to the Global Findex Database 2021, approximately 53 percent of adults worldwide disclosed that they had taken out loans or borrowed money in the previous 12 months, including using credit cards. The prevalence of new credit, formal or informal, was higher in high-income economies (65 percent), compared to developing economies (50 percent). Formal borrowing, particularly through credit cards, was the primary method of accessing short-term credit in high-income economies. In contrast, developing economies exhibited a lower percentage of formal borrowing, with many individuals relying solely on family and friends for credit. Nevertheless, there has been an increase in the number of adults engaging in formal borrowing in developing economies over the past decade. Credit card usage was more widespread in high-income economies, with 51 percent of adults utilizing them, while in developing economies, only 14 percent of adults reported using credit cards. Some exceptions existed in certain countries in Europe, Central Asia, and Latin America, where credit card usage was more prevalent. The percentage of adults borrowing money through mobile money accounts remained relatively small, even in regions with high mobile money account ownership, such as Sub-Saharan Africa. Family and friends played a significant role as a source of credit for many borrowers in developing economies, particularly in Afghanistan. Some economies also demonstrated higher rates of semi-formal borrowing, particularly through savings clubs. In developing economies, 17 percent of adults reported borrowing money for health or medical purposes, which was likely influenced by the pandemic. Overall, the data underscores the disparities in borrowing patterns between high-income and developing economies, as well as the differences in the sources of credit used by borrowers.

3.2. Methodology

Once the fundamental determinants of financial inclusion have been discerned through an in-depth review of the existing literature and the latest data, the subsequent phase involves their statistical validation. This undertaking needs a comprehensive exploration and harmonization of diverse databases, followed by the selection of variables to serve as either dependent or explanatory factors, a selection process that entails a factorial-style statistical analysis, facilitating the categorization of indicators and, through correlation analysis, the elimination of redundant information.

A single data source was used for each indicator to ensure the timeliness and representativeness of the sample in its cross-sectional and longitudinal components while maintaining the comparability of the figures. The initial dataset was drawn from the World Bank database (WB, 2021), covering the period from 2010 to 2021, with economic regions excluded to focus solely on countries, resulting in 217 nations. These were then filtered based on the availability of consistent data series for the dependent variables in this research—savings, and credit—retaining only those with homogeneous data across the entire analysis period. This process led to the exclusion of several countries, either because some databases consolidate entities that the World Bank does not—such as Taiwan with China—or because they lacked consistent longitudinal data or did not report to the World Bank. Notably, the remaining countries in the sample were more representative of the developing and emerging world, where indicators related to savings and credit are particularly relevant to the literature on financial inclusion, given the limited penetration of these services. 115 countries were excluded from the savings sample, while 105 were removed from the credit sample.

Subsequently, multiple explanatory models were tested for both dimensions of financial inclusion using various methodologies, with preference given to those that demonstrated the greatest explanatory power, significant independent variables, and met necessary validation criteria. This process further refined the datasets in both their cross-sectional and longitudinal dimensions, as some explanatory variables—sourced from various origins—made it unfeasible to estimate isolated data points through linear extrapolation. Consequently, three additional countries were removed from the savings models, while 24 were excluded from the credit models. Including different indicators across the three models for savings and credit sometimes resulted in the loss of further data.

Table 1 presents the indicators used for the selected dependent and explanatory variables. Notably, the technological literacy indicators used in these estimations were only published as a consistent data series beginning in 2014. As a result, one of the savings models and one of the credit models were applied to the 2014–2020 period, rather than the full 2010–2021 timeframe, to account for the introduction of this emerging indicator. This adjustment allowed for the inclusion of the technological literacy data while preserving the original period in models where this variable was not used, where alternative methodologies sometimes produced superior outcomes. Moreover, presenting all three models for both savings and credit confirmed the stability of their coefficients and signs, ensuring the robustness of the estimates.

The original country sample for savings models before considering missing values was: Afghanistan; Albania; Argentina; Azerbaijan; Bangladesh; Belize; Benin; Botswana; Brazil; Brunei Darussalam; Bulgaria; Burkina Faso; Burundi; Cabo Verde; Cameroon; Central African Republic; Chad; People's Republic of China; Colombia; Comoros; Congo, Democratic Republic; Congo, Republic; Costa Rica; Cote d'Ivoire; Croatia; Cyprus; Djibouti; Dominican Republic; Ecuador; Egypt, Arab Republic; El Salvador; Equatorial Guinea; Estonia; Eswatini; Gabon; Georgia; Ghana; Guinea Republic; Guinea-Bissau; Haiti; Hungary; Israel; Italy; Kiribati; Kuwait; Kyrgyz Republic; Lao PDR; Latvia; Lebanon; Lesotho; Madagascar; Malawi; Malaysia; Maldives; Mali; Malta; Mauritania; Mauritius; Moldova; Myanmar; Namibia; Nicaragua; Niger; Nigeria; North Macedonia; Pakistan; Paraguay; Peru; Philippines; Poland; Qatar; Rwanda; Samoa; San Marino; Sao Tome and Principe; Saudi Arabia; Senegal; Seychelles; Singapore; Solomon Islands; South Sudan; Suriname; Tajikistan; Thailand; Timor-Leste; Togo; Tonga; Tunisia; Turkey; Uganda; Ukraine; United Arab Emirates; Uruguay Oriental Republic; Uzbekistan; Vanuatu Republic; Yemen, Republic; Zambia and Zimbabwe.

The original country sample for credit models before considering missing values was: Afghanistan; Albania; Algeria; Argentina; Azerbaijan; Bangladesh; Belgium; Belize; Bolivia; Bosnia and Herzegovina; Botswana; Brazil; Brunei Darussalam; Bulgaria; Burundi; Cabo Verde; Cameroon; Chile; People's Republic of China; Colombia; Comoros; Congo, Democratic Republic; Costa Rica; Croatia; Cyprus; Djibouti; Dominican Republic; Ecuador; Egypt, Arab Republic; Estonia; Georgia; Ghana; Guatemala; Honduras; Hungary; Indonesia; Italy; Kenya; Kuwait; Kyrgyz Republic; Lao People's Democratic Republic; Latvia; Liberia; Madagascar; Malawi; Malaysia; Maldives; Malta; Mauritania; Mauritius; Moldova; Montenegro; Myanmar; Namibia; Nigeria; North Macedonia; Pakistan; Paraguay; Peru; Poland; Portugal; Qatar; Romania; Rwanda; Samoa; Saudi Arabia; Serbia; Seychelles; Singapore; Spain; Suriname; Tajikistan; Tanzania; Thailand; Timor-Leste; Tunisia; Turkey; Uganda; United Arab Emirates; Uruguay Oriental Republic; Uzbekistan; Vanuatu Republic; West Bank & Gaza; Yemen, Republic; Zambia and Zimbabwe.

Database integration forces multiple years and countries to be removed and to estimate some isolated missing data through a linear extrapolation (Armstrong & Collopy, 1993). The final sample includes the 2010–2021 period and the 2014–2021 period for the model including technological literacy.

The available indicators for assessing technological literacy are still limited, only encompassing a restricted and discontinuous period of data, and they do not cover all countries worldwide. Therefore, it was deemed relevant to, in addition to the linear extrapolation, obtain a technological literacy indicator constructed based on the average of various indicators provided by the World Bank (WB, 2023b), which enabled the creation of a more continuous and uniform series with a broader cross-sectional and temporal scope.

Table 1. Variables

Variable alias	Variable	Definition	Source
Savings	Depositors with commercial banks (per 100 adults)	Deposit account holders at commercial banks and other resident banks (public and private). Includes checking accounts, savings accounts, and time deposits, among others.	International Monetary Fund, Financial Access Survey IFS (IMF, 2023)
Credit	Borrowers from commercial banks (per 100 adults)	Number of resident customers who obtained loans from commercial banks and other banks functioning as commercial banks.	International Monetary Fund, Financial Access Survey IFS (IMF, 2023)
Mobile cell	Mobile cellular subscriptions (per 10 people)	Subscriptions to a public mobile telephone service that provides access to the PSTN using cellular technology.	World Telecommunication/ ICT Indicators Database (ITU, 2023)
Bureau	Public credit registry coverage (% of adults)	Reports the number of individuals and firms listed in a public credit registry with current information on repayment history, unpaid debts, or credit outstanding.	World Bank (WB, 2023a)
Vulnerable work	Vulnerable employment (% total employment)	Vulnerable employment is contributing family workers and own-account workers as a percentage of total employment (ILO estimate).	ILOSTAT database ILO (2023).
Regulations	Regulatory Quality	Perceptions of government's ability to formulate and implement sound policies and regulations to promote private sector development. The country's score is in units of standard normal distribution, i.e. ranging from (-2.5 to 2.5) *100.	World Bank (WB, 2023a) Kaufmann, D., Kraay, A. & Mastruzzi, (2010).
Education	Labor force with intermediate education (% of working-age population)	Intermediate education comprises upper secondary or post-secondary, nontertiary education.	ILOSTAT database ILO (2023).
Tec. Literacy	Technological Readiness	Proportion (%) of youth and adults who have: connected and installed new devices; copied or moved a file or folder; created electronic presentations; installed and configured software skills; sent e-mails with attached files; transferred files between a computer and other devices; used basic arithmetic formulae in a spreadsheet; used copy and paste tools to duplicate or move information within a document and/ or wrote a computer program using a specialized programming language.	World Bank SDG Indicators Metadata repository Goal 4: Quality education (WB, 2023b).

Variable alias	Variable	Definition	Source
Fin. Literacy	Financial Literacy	The financial literacy questions in the S&P Global Fin Lit Survey focus on four fundamental concepts for financial decision-making: risk diversification, inflation, basic numeracy, and interest compounding. Interview includes more than 150,000 nationally representative and randomly selected adults (age 15+) in more than 140 countries.	Klapper, L., Lusardi, A. & Van Oudheusden P. (2015). Standard & Poor's Ratings Services Global FinLit Survey (2016)

Source: Author with sources included.

Regarding financial literacy, this paper evaluates its significance but also that of workforce education, where intermediate-level education was particularly relevant. This was imperative to test model robustness, due to the limited availability of indicators for financial literacy, which led to resorting to a fixed-time proxy national rating based on the Standard and Poor's Survey (2016).

The constraint was driven by the currently accessible indicators for assessing financial capabilities, such as those provided by Pisa or the World Bank (2023a), which presented challenges in comprehensively evaluating its role in financial inclusion, primarily due to missing values and inconsistent data continuity. Given that the analysis was confined to less than a decade, this simplifying assumption remained valid, because improvements in education take time to manifest (Kling et al., 2007). The indicators finally included in the estimations are described in Table 1.

After testing with different models and methodologies, six panels were selected to verify robustness. They have five equations: three for savings and two for credit using two different methodologies. Estimation results are in Tables 2 and 3.

(1)

$$Savings_{it} = \alpha_0 + \alpha_1 Bureau_{it} + \alpha_2 Regulations_{it} + \alpha_3 Tec.Literacy_{it} + \alpha_4 Mobile\ cell_{it} + \alpha_5 Education_{it} + \alpha_6 Vulnerable\ work_{it} + \epsilon_{it}$$

(2)

$$Savings_{it} = \beta_0 + \beta_1 Bureau_{it} + \beta_2 Regulations_{it} + \beta_3 Mobile\ cell_{it} + \beta_4 Fin.Literacy_{it} + \beta_5 Vulnerable\ work_{it} + \beta_6 Regulations_{it} + \epsilon_{it}$$

(3)

$$Savings_{it} = \gamma_0 + \gamma_1 Bureau_{it} + \gamma_2 Regulations_{it} + \gamma_3 Mobile\ cell_{it} + \gamma_4 Education_{it} + \gamma_5 Vulnerable\ work_{it} + \gamma_6 Regulations_{it} + \epsilon_{it}$$

(4)

$$Credit_{it} = \delta_0 + \delta_1 Bureau_{it} + \delta_2 Regulations_{it} + \delta_3 Tec.Literacy_{it} + \delta_4 Mobile\ cell_{it} + \delta_5 Education_{it} + \delta_6 Vulnerable\ work_{it} + \epsilon_{it}$$

(5)

$$Credit_{it} = \eta_0 + \eta_1 Bureau_{it} + \eta_2 Regulations_{it} + \eta_3 Mobile\ cell_{it} + \eta_4 Vulnerable\ work_{it} + \eta_5 Regulations_{it} + \epsilon_{it}$$

Where the α 's; β 's; γ 's; δ 's and η 's are parameters, and ϵ_{it} are error terms.

The presence of heteroscedasticity and autocorrelation was diagnosed through the modified Wald and Wooldridge tests, respectively.

For savings, as can be seen in Table 2. the model was run using alternative variables to capture the influence of education on financial inclusion (general secondary education versus more finance-focused education) and with and without technological literacy to verify that the correlation of this last variable with the regulation indicator was solved through the panel estimation, avoiding potential multicollinearity problems.

The three models were run using the feasible generalized least squares methodology, which allows estimation in the presence of AR (1) autocorrelation within panels and cross-sectional correlation and heteroskedasticity across panels.

Table 2. Depositors with commercial banks. Panel Results

Variables	Model 1: Feasible Generalized Least Squares		Model 2: Feasible Generalized Least Squares		Model 3: Feasible Generalized Least Squares	
	Coefficients	Standard Errors	Coefficients	Standard Errors	Coefficients	Standard Errors
Dependent:: Savingsit						
Explanatory						
Bureauit	0.1677***	0.0458	0.2742***	0.0483	0.2257***	0.0390
Regulationsit	1.4110***	0.2435	0.9223***	0.1462	1.2087***	0.1367
Tec. Literacyit	0.4707***	0.0847				
Mobile cellit	3.7951***	0.3235	6.2671***	0.1716	3.2970***	0.1709
Fin. Literacyit			0.0973***	0.0139		
Educationit	0.5324***	0.0579			0.7692***	0.0028
Vulnerable workit	−0.2593***	0.0305	−0.1160***	0.0260	−0.4481***	0.0317
Wald Test						
Chi2	4862.21		3247.30		3558.17	
Prob>Chibar2	0.0000		0.0000		0.0000	
Breusch and Pagan LaGrange Multiplier Test						
Chi2	2698.38		1383.33		2698.38	
Prob>Chibar2	0.0000		0.0000		0.0000	

Variables	Model 1: Feasible Generalized Least Squares	Model 2: Feasible Generalized Least Squares	Model 3: Feasible Generalized Least Squares
Hausman test			
Chi2	23.56	24.22	17.36
Prob>Chibar2	0.0006	0.0002	0.0000
Kleibergen– Paap k LM statistic			
Chi2 (2) P-value	110.394	120.871	138.325
value	0.0000	0.0000	0.0000
IV redundancy test (LM test of redundancy of specified			
instruments)	48.120	38.667	47.870
Chi2 (1) P-value	0.0000	0.0000	0.0000
Hansen J statistic (Overidentification test			
of all instruments)	21.560	11.792	8.991
Chi2 (1) P-value	0.0000	0.0000	0.0000
Observations	251	734	892
Groups (Countries)	49	99	80

Notes: Statistically significant at *10%, **5%, ***1% levels. Source: Author with data from OECD (2023), WB (2023a), ILO (2023) and IMF (2023).

In the case of credit, Table 3 shows the chosen model estimated with and without technological readiness for the same reasons mentioned above, using two different methodologies in the first one: the feasible generalized least squares methodology, which enables estimation even when there is AR(1) autocorrelation within panels and cross-sectional correlation and heteroskedasticity across panels, and the Panel Corrected Standard Errors (PCSE) estimators with a Prais–Winsten equation (with first-order autocorrelation). This is because disturbances cannot be considered independent and identically distributed (iid) since they are heteroscedastic and correlated contemporaneously between countries. All estimates from Prais–Winsten are conditional on those estimated with autocorrelation, or in other words, the estimator of the variance-covariance matrix of the parameters is asymptotically efficient under the assumed covariance structure of the disturbances and uses the Minimum Feasible Generalized Squares estimated from the disturbance covariance matrix (Kmenta, 1997; Stata, 2019).

Table 3 Borrowers from commercial banks. Panel Results

Variables	Model 1 Feasible Generalized Least Squares		Model 2 Feasible Generalized Least Squares		Model 3 Prais-Winsten Regression	
	Coefficients	Standard Errors	Coefficients	Standard Errors	Coefficients	Standard Errors
Dependent: Creditit						
Explanatory						
Bureauit	0.0902***	0.0199	0.0879***	0.0125	0.0819***	0.0296
Regulationsit	0.6851***	0.0733	0.8649***	0.0496	1.0099***	0.1025
Tec. Literacyit	0.1674***	0.0342				
Mobile cellit	0.9398***	0.1005	1.0538***	0.0594	1.1808***	0.1072
Fin. Literacyi						
Educationit	0.1913***	0.0211	0.2037***	0.0108	0.1834***	0.0198
Vulnerable workit	−0.0893***	0.0171	−0.1277***	0.0114	−0.0666***	0.0205
Coefficient of determination R ²						0.6205
Wald Test						
Chi ²	4193.37		3776.74			
Prob>Chibar ²	0.0001		0.000			
Breusch and Pagan LaGrange Multiplier Test						
Chi2	2694.70				3694.70	
Prob>Chibar ²	0.0000				0.0000	
Hausman test						
Chi2	20.91				36.09	
Prob>Chibar ²	0.0130				0.0000	
Kleibergen 'Paap k LM statistic						
k LM statistic)	110.294				127.244	
Chi ² (2) P-value	0.0000				0.0000	
IV redundancy test (LM test of redundancy of specified						
instruments)	48.120				128.291	

Variables	Model 1 Feasible Generalized Least Squares	Model 2 Feasible Generalized Least Squares	Model 3 Prais-Winsten Regression
Chi ² (1) P-value	0.0000		0.0000
Hansen J statistic (Overidentification test of all instruments)			
	21.560		5.465
Chi ² (1) P-value	0.0000		0.0000
Observations	357	935	936
Groups (countries)	46	86	86

Notes: Statistically significant at *10%, **5%, ***1% levels. Source: Author with data from OECD (2023), WB (2023a, ILO (2023) and IMF (2023).

In this model, as already mentioned, the technological readiness variable exhibited a significant correlation with another explanatory variable, regulatory quality, which could potentially lead to multicollinearity, given that this correlation was greater than that found for each of these variables with the dependent variable in both models (savings and credit). Because multicollinearity is typically addressed within a panel framework, the models were estimated with and without this variable. Subsequently, a thorough examination was conducted to ensure that the remaining variables retained their directional consistency and statistical significance, resulting in a satisfactory outcome.

The last step in this section was to determine, using the Akaike (AIC), Schwarz (SBIC), and Hannan-Quinn (HQIC) information criteria, which of the estimates was more accurate in savings and credit (Table 4).

The analysis shows that the Feasible Generalized Least Squares regression is more suitable for savings using cellular phones, financial literacy, vulnerable employment, depth of credit information, and regulation quality as independent variables, explaining financial inclusion through depositors with commercial banks (per 100 adults).

Table 4. Selection of the Optimal Model Using Information Criteria

Models	Information Criteria		
	Akaike (AIC)	Schwarz (SBIC)	Hannan – Quinn (HQIC)
Savings			
Model 1 Feasible Generalized Least Squares	7.634428	7.702741	7.661662
Model 2 Feasible Generalized Least Squares	7.485149	7.516407	7.484383
Model 3 Feasible Generalized Least Squares	7.499952	7.526821	7.510221

Models	Information Criteria		
Credit			
Model 1 Feasible Generalized Least Squares	5.708883	5.77392	5.734748
Model 2 Feasible Generalized Least Squares	5.378028	5.403892	5.387889
Model 2 Prais–Winsten regression	5.376661	5.402524	5.386523

Source: Author.

In the case of credit, the Prais–Winsten regression is more suitable using cellular phones, intermediate education, vulnerable employment, depth of credit information, and regulation quality as independent variables to explain financial inclusion through borrowers from commercial banks (per 100 adults). This is because these estimates minimize the information criteria, and therefore, its goodness of fit is higher. In any case, both methods are useful because the sign and significance stability of the explanatory variables in them is an unequivocal sign of the robustness and validity of models.

3.3. Analysis and discussion of results

In this section, the results obtained and their interpretation are discussed, relating them to those previously found in the literature, and then closing in the next section with the conclusions, recommendations, and future lines of research that appear promising to a better understanding of financial inclusion.

3.3.1 Savings

In these models, the representative variable of banking access and savings, from a financial inclusion perspective, is the number of depositors with commercial banks (per 100 adults), as seen in Table 1.

When the effect of access infrastructure on credit coverage among the population is analyzed, the variable of interest is cell phones and no longer bank branches, not even ATMs. Expanding physical bank branches or ATMs in every area has not been cost-effective for reaching the unbanked population. As mentioned, recent empirical evidence shows that digital financial services are already in use in nearly a hundred countries, rapidly increasing in popularity due to their inclusion virtues. In China, Kenya, India, and Thailand, more than 80 % of the population is banked, thanks to reforms, innovations, and the opening of low-cost accounts, including mobile and digital payments (WB, 2023a). The model confirms its positive and significant effect on savings.

The chosen independent variables, selected for their high explanatory power both individually and collectively, in addition to the previously mentioned access indicator, are described below.

Regarding financial sector variables, the concentration and information problems seem to be captured by the World Bank's Public Credit Registry Coverage (% of adults). Its relationship with the dependent variable is positive and significant, as a reduction in information asymmetries correlates with greater financial inclusion. This reduction, in turn, lowers the cost of financial products and mitigates the risk of insolvency or illiquidity for both the user and the provider. This outcome aligns with findings in the literature (Greenwald et al., 1984; Hoffman, 2001).

Turning to non-financial explanatory variables, three were selected: the quality of employment sources, the institutional framework, and a variable representing educational level, with financial literacy being the most relevant for the savings model. The high significance of the job insecurity variable indicates that it constitutes a more significant barrier to savings than income or em-

ployment itself. The chosen indicator to reflect this is vulnerable employment as a percentage of total employment, published by the International Labour Organization (ILO, 2023), representing self-employed or unpaid family workers. These groups are more prone to falling into poverty due to a lack of formal employment arrangements, social protection, or safety nets to shield them from contingencies. This situation hinders their ability to generate savings or become eligible for credit. These results align with those obtained by Girma & Shortland (2008), Demirgüç-Kunt et al. (2018) and Hyman (2016).

Additionally, the model underscores the importance of financial literacy as a promoter of savings and the financial well-being of individuals. As highlighted by Lusardi & Mitchell (2014), providing individuals with the knowledge and skills to understand and manage their finances effectively transforms education into a powerful tool for nurturing a savings culture. A financially literate population is more likely to grasp the significance of saving, make informed budgeting decisions, and navigate the complexities of various savings instruments. As individuals grasp the concepts of compounding, interest rates, and the long-term benefits of saving, they are better positioned to establish a financial safety net, plan for future goals, and navigate unforeseen economic challenges.

Finally, institutional framing structures determine how households and firms interpret, evaluate, comprehend, and make monetary decisions and choices while defining the level of trust in the financial system. These decisions are enhanced by knowledge and skills acquired through financial literacy and put into practice through technological skills. This variable is relevant for both savings and access to credit.

As mentioned by Purba et al. (2019), financial literacy appears to encompass technological readiness, like the variable associated with access infrastructure represented by mobile phone coverage. This model is deemed more explanatory for our financial inclusion variable related to savings, based on information criterion tests, than the model that includes technological literacy as an additional explanatory variable: a noteworthy finding given its statistical significance.

3.3.2 Borrowing

In the credit model, borrowers from commercial banks (per 100 adults) are employed as a variable representative of financial inclusion to capture not only the depth but also the breadth of the usage of these financial products.

Similarly, to the savings model, when analyzing the impact of access infrastructure on credit coverage within the population, the variable of interest is cell phones. These results coincide with the findings of authors such as Lenka & Barik (2018) and U.S. Department of the Treasury (2018).

In addition to the indicator of channels for accessing financial services, the variables chosen for their high explanatory power, both individually and collectively, are described below.

In terms of barriers attributed to the financial sector, the variable that proved to be highly significant in inducing credit, as in the previous model, is the one representing remedies for asymmetric information: the depth of Credit Information Systems (CIS) or public credit bureaus, aligning with findings in the literature (Beck et al., 2007). The credit model also incorporates non-financial barriers, and like the savings model, the variable of employment vulnerability is significant. Once again, the quality of employment is more pertinent to financial inclusion than employment itself.

As Girma & Shortland (2008) point out, robust and well-functioning institutions create an environment that fosters trust, transparency, and stability in financial markets. When institutions are of high quality, with clear and enforceable regulations, it instills confidence in lenders and borrowers alike. This, in turn, facilitates easier access to credit for individuals and businesses. A strong institutional framework ensures that credit transactions are conducted fairly, reducing the risk of default and fostering a healthy credit environment.

Ultimately, initiatives aimed at achieving greater financial inclusion require the education of potential users for successful implementation. The model indicates that in countries where the

labor force with intermediate education is higher, the utilization of financial products beyond a simple bank account is more feasible, upper secondary or post-secondary equips individuals with the necessary analytical and critical thinking skills to understand the complexities of financial instruments. This cognitive foundation enables them to make informed decisions regarding credit options, assessing terms, interest rates, and potential risks effectively. Additionally, a quality secondary education fosters financial literacy, providing individuals with a comprehensive understanding of financial concepts. Moreover, a solid secondary education contributes to a stable and reliable income, as it enhances employability and opens opportunities for higher-paying jobs. A consistent income stream is fundamental for individuals to qualify for and manage credit effectively. Furthermore, individuals with a quality secondary education are more likely to understand long-term financial planning, budgeting, and goal setting. This financial foresight is crucial when considering and managing credit, ensuring that borrowed funds are utilized strategically and repaid sustainably.

4. CONCLUSIONS

The study emphasizes the significance of financial inclusion and conducts a quantitative assessment of its potential drivers through a comprehensive review of specialized literature. The focus is on two key indicators: savings and financing.

The research establishes that formal access to savings requires, on the supply side, the utilization of mobile phones as a primary channel for accessing financial products, surpassing traditional options like ATMs or bank branches. Addressing asymmetric information problems through public credit bureaus and establishing a robust institutional framework is deemed crucial. On the demand side, the quality, stability, and formality of income sources for economic agents are identified as essential factors, encompassing financial literacy and technological readiness for contemporary inclusive channels such as online or mobile banking.

Transitioning to more comprehensive financial inclusion through credit, the study emphasizes the ongoing importance of relevant access channels and remedies for asymmetric information. The quality of regulations and income sources retains significance, with secondary education playing a crucial role in the credit model beyond the financial education of potential users.

Financial and technological literacy is considered a desirable complement to secondary education, facilitating the incorporation of individuals into a savings culture. However, it is not a substitute for making sound financial decisions regarding credit. Secondary education plays a multifaceted role in shaping financially literate and responsible individuals, providing technical skills and broader knowledge that contribute to sound financial decision-making, ethical behavior, and long-term financial stability.

The initial hypotheses of this paper are confirmed. Savings and more advanced dimensions of financial inclusion, such as credit use, are strongly influenced by the accessibility of financial service infrastructure. These decisions are also shaped by education, financial, and technological literacies, which are crucial for assessing the costs and benefits of saving and borrowing. Individual constraints on consumption, investment, or endowment, such as income instability or limited access to information, along with the broader institutional framework, also play a critical role.

The digital era, accelerated by the COVID-19 pandemic, presents a unique opportunity for low-cost financial inclusion. Governments can play a pivotal role in promoting financial services through digital platforms, offering products like credit, credit bureaus, electronic payments, factoring, and financial leasing. Interactive diagnostic tools, financial education, and specialized advice can be seamlessly integrated through intermediary entities such as business development centers, development banks, or local agencies, public or private.

Financial and technological literacies are critical skills that empower individuals to make informed financial decisions, contributing to overall well-being and economic stability. Disparities persist globally, and understanding and addressing barriers to financial services access, espe-

cially for vulnerable populations, can lead to more inclusive and equitable financial systems. To foster a financially literate society, a multi-faceted approach is necessary, including comprehensive financial education in schools, targeted initiatives for vulnerable populations, and the integration of digital financial literacy.

Financial inclusion, education, and quality jobs are interconnected pillars contributing collectively to economic development, poverty reduction, and global prosperity. Bridging gaps in these areas should be a shared priority for governments, financial institutions, and policymakers globally. Empowering economic agents with dignified employment and providing knowledge and tools for accessing financial services can pave the way for a more equitable and prosperous world.

The paper outlines strategic approaches to enhance financial inclusion, including strengthening financial literacy, expanding digital infrastructure, supporting responsible financial technology solutions, tailoring financial products to specific needs, and strengthening regulatory frameworks. This comprehensive roadmap provides actionable strategies for stakeholders aiming to drive financial inclusion in a rapidly changing financial landscape.

In terms of the paper's limitations, it is crucial to highlight certain aspects related to the use of panel data models. These models inherently assume a common function across all countries and the stability of this function over time, introducing a level of generality. Another significant limitation stems from data availability constraints. Specifically, the technological literacy variable could only be incorporated as an average of its key indicators due to data discontinuity. Similarly, the financial literacy variable had to be treated as constant over time in each country due to data limitations, allowing only for countries' rankings without capturing the relative progress they may have achieved during the analysis period. Additionally, the nature of this variable hindered the examination of potential endogeneity in certain explanatory variables like credit bureaus, as hinted by issues of heteroskedasticity and multicollinearity. Despite these constraints, the analysis offers valuable insights into the determinants and general trends of financial inclusion, considering both savings and borrowing perspectives.

For future research, the study recommends a more detailed identification of financial indicators, with a more detailed examination of individuals, companies, gender, age, size, and sectors. This should be coupled with a thorough evaluation of the impact of financial and technological literacy on financial inclusion among countries and, over time, leveraging databases once they enable such implementation. This comprehensive approach aims to provide a more nuanced understanding of this development priority.

Moreover, emerging financing channels beyond traditional bank credit need to be explored to gain a deeper understanding of financial inclusion. As innovative financing methods grow during this digital era, noteworthy channels encompass Fintech and Online Lending Platforms, Crowdfunding, Blockchain, and Cryptocurrencies. It is crucial to acknowledge that the widespread adoption of these financing channels is propelled by technological advancements and shifts in consumer preferences, playing a pivotal role in advancing financial inclusion globally.

REFERENCES

- Alahi, M. E. E., Sukkuea, A., Tina, F. W., Nag, A., Kurdthongmee, W., Suwannarat, K. & Mukhopadhyay, S. C. (2023). Integration of IoT-Enabled Technologies and Artificial Intelligence (AI) for Smart City Scenario: Recent Advancements and Future Trends. *Sensors*, 23(11), 5206. MDPI AG. <http://dx.doi.org/10.3390/s23115206>
- Armstrong, S. & Collopy, F. (1993). Causal Forces: Structuring Knowledge for Time-Series Extrapolation. *Journal of Forecasting* 12, 103-115. [https://doi.org/10.1016/0169-2070\(92\)90008-W](https://doi.org/10.1016/0169-2070(92)90008-W)
- Ashenafi, F. & Kingstone, M. (2021). Financial Literacy as a Driver of Financial Inclusion in Kenya and Tanzania. *Journal of Risk and Financial Management* 14, 561. <https://doi.org/10.3390/jrfm14110561>

- Atkinson, A. & Messy, F. (2013). Promoting Financial Inclusion through Financial Education: OECD/INFE Evidence, Policies and Practice. *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 34, OECD Publishing, <http://dx.doi.org/10.1787/5k3xz6m88smp-en>.
- Bagehot, W. (1873). *Lombard Street: A Description of the Money Market*. New York, NY: Scribner, Armstrong & Co.
- Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, Inequality, and the Poor. *Journal of Economic Growth* 12(1), 27–49. <https://www.jstor.org/stable/40216113>.
- Bottazzi, L. & Lusardi, A. (2021) Stereotypes in Financial Literacy: Evidence from PISA. *Journal of Corporate Finance* 71, 101831. <https://doi.org/10.1016/j.jcorpfin.2020.101831>
- Cole, S., Sampson, T. & Zia, B. (2011). Prices or Knowledge? What Drives Demand for Financial Services in Emerging Markets? *The Journal of Finance*, 66(6), 1933–1967. <https://doi.org/10.1111/j.1540-6261>.
- Demirgüç-Kunt, A.; Klapper, L.; Singer, D. and Ansar, S. (2021). The Global Findex Database 2021 Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19. *World Bank Group*. Retrieved from: <https://openknowledge.worldbank.org/bitstream/handle/10986/37578/9781464818974.pdf>
- European Commission (2022). The Digital Economy and Society Index (DESI). Retrieved from: <https://digital-strategy.ec.europa.eu/en/policies/desi>
- Fungáčová, R. & Weill, L. (2016). Reserve Requirements and the Bank Lending Channel in China. *Journal of Macroeconomics*, 50, 37–50. <https://doi.org/10.1016/j.jmacro.2016.08.007>
- Girma, S. & Shortland, A. (2008). The Political Economy of the Financial Development. *Oxford Economic Papers*, 60, 567–596. <https://www.jstor.org/stable/25167709>
- Goyal, K. & Kumar, S. (2020). Financial Literacy: A Systematic Review and Bibliometric Analysis. *International Journal of Consumer Studies*, 45(1), 80–105. <https://doi.org/10.1111/ijcs.12605>
- Greenwald, B., Stiglitz, J. & Weiss, A. (1984). Informational Imperfections in the Capital Market and Macroeconomic Fluctuations, *American Economic Review* Vol. 74, No. 2, 194–199.
- Gudjonsson, S., Minelgaite, I., Kristinsson, K., & Pálsdóttir, S. (2022). Financial Literacy and Gender Differences: Women Choose People While Men Choose Things? *Administrative Sciences*, 12(4), 179. <https://doi.org/10.3390/admsci12040179>
- Hyman, L. (2016) Temps, Consultants, and the Rise of the Precarious Economy, *The Hedgehog Review*, Vol. 18, No. 1, 17–32.
- Hoffmann, S. (2001) *Politics and Banking. Ideas, Public Policy, and the Creation of Financial Institutions*. Johns Hopkins University Press.
- Holzmann, R. (2010). Bringing Financial Literacy and Education to Low and Middle-Income. *Countries, Pension Research Council WP*, Vol. 38, <https://dx.doi.org/10.2139/ssrn.1707673>.
- ILO, International Labour Organization (2023). *ILOSTAT database*. Retrieved from: <https://ilostat.ilo.org/data/>
- IMF, International Monetary Fund (2023). *Financial Access Survey (FAS)*. <https://data.imf.org/?sk=e5dcab7e-a5ca-4892-a6ea-598b5463a34c>.
- ITU, International Telecommunication Union (2023), *World Telecommunication/ICT Indicators Database*. Retrieved from <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx>.
- ITU, International Telecommunication Union (2022). *Measuring digital development Facts and figures 2020*. Telecommunication Development Sector ITU Publications. <https://www.itu.int/itu-d/reports/statistics/facts-figures-2022/>
- Jariwala, H. & Sharma, S. (2011). Financial Literacy: A Call for an Attention. *International Journal of Academic Conference Proceedings*, 1(1), Proceedings of Conference on Inclusive and Sustainable Growth.
- Kaiser, T. & Menkhoff, L. (2017). Does Financial Education Impact Financial Literacy and Financial Behavior, and If So, When? *The World Bank Economic Review* 31(3), 611–630. <http://dx.doi.org/10.1093/wber/lhx018>
- Kaufmann, D., Kraay, A. & Mastruzzi, M. (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. *World Bank Policy Research Working Paper* No. 5430
- Khan, F., Siddiqui, M. & Salma, I. (2022). Role of Financial Literacy in Achieving Financial Inclusion: A Review, Synthesis and Research Agenda. *Cogent Business & Management*, 9, 2034236.

- Kim, D.-W., Yu, J.-S. & Hassan, M. K. (2018). Financial inclusion and economic growth in OIC countries. *Research in International Business and Finance*, 43, 1–14. <https://doi.org/doi:10.1016/j.ribaf.2017.07.178>
- Klapper, L, Lusardi, A. (2020). Financial Literacy and Financial Resilience (2020): Evidence from Around the World. *Financial Management*, 49, 589–614. <https://doi.org/10.1111/fima.12283>
- Klapper, L., Lusardi, A. & Van Oudheusden P. (2015). Financial Literacy Around the World: Insights from the Standard & Poor's Rating Services. Global Financial Literacy Survey. World Bank Development Research Group.
- Kling, J., Liebman, J. & Katz, L. (2007). Experimental Analysis of Neighborhood Effects, *Econometrica*, 75(1), 83–119.
- Kmenta, J. (1997). *Elements of Econometrics*. 2nd ed. Ann Arbor: University of Michigan Press, 127.
- Königsheim, Ch., Lukas, M. & Nöth, M. (2017). Financial Knowledge, Risk Preferences, and the Demand for Digital Financial Services. *Schmalenbach Business Review*, 18(4), 343–375.
- Lenka S. & Barik, R. (2018). Has the Expansion of Mobile Phone and Internet Use Spurred Financial Inclusion in the SAARC Countries? *Financial Innovation* 4(1), 1–19
- Levine, R. (1991). Stock Markets, Growth, and Tax Policy. *Journal of Finance*, 46(4), 1445–1465. doi. [org/10.1111/j.1540-6261.1991.tb04625.x](https://doi.org/10.1111/j.1540-6261.1991.tb04625.x)
- Lucas, R. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics* 22 (1). July, 3–42
- Lusardi, A. & Mitchell, O. S. (2014). The Economic Importance of Financial Literacy: Theory and evidence. *Journal of Economic Literature*, 52(1), 5–44.
- McKinnon, R. (1973). *Money and Capital in Economic Development*. The Brookings Institutions, Washington, D.C.
- Milian, E. Z., Spinola, M. D. M. & de Carvalho, M. M. (2019). Fintechs: A Literature Review and Research Agenda. *Electronic Commerce Research and Applications*, 34, 100833. <https://doi.org/doi:10.1016/j.elerap.2019.100833>
- Minsky, H. (1982). *Inflation, Recession and Economic Policy*, Brighton, Wheatsheaf.
- OECD, Organization for Economic Cooperation and Development (2022). INFE Toolkit for Measuring Financial Literacy and Financial Inclusion. <https://www.oecd.org/financial/education/2022-INFE-Toolkit-Measuring-Finlit-Financial-Inclusion.pdf>
- Parasuraman, A. (2000). Technology Readiness Index (Tri): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *Journal of Service Research*, 2(4), 307–320. <https://doi.org/10.1177/109467050024001>
- Pavón, L. (2018). International Financial Inclusion: Some Multidimensional Determinants. *Small Business International Review*, SBIR, 2 (2), 1–14, <https://doi.org/10.26784/sbir.v2i2.125>.
- Pavón, L. (2021). Financial Inclusion as a Pillar of Sustainable Growth: International Experience. *Economic Horizons*, 2021, 23(2), 105–118. <https://doi.org/10.5937/ekonhor.2102107P>.
- Pavón, L. (2024). The Importance of Social Capital in Promoting Financial Inclusion: An International Perspective. *Scientific Annals of Economics and Business*, 71(2), 221–240. <https://doi.org/10.47743/saeb-2024-0013>
- Purba, J., Hery, H. & Lestari, V. (2019). Financial Technology Readiness: Strategic Innovation Management in the Service Industry 4.0. Proceedings of the 1st Asian Conference on Humanities, Industry, and Technology for Society, ACHITS 2019, 30–31 July 2019, Surabaya, Indonesia. <https://doi.org/10.4108/eai.30-7-2019.2287760>
- Rebelo, S. (1991). Long-Run Policy Analysis and Long-Run Growth, *Journal of Political Economy*, 99(3), 500–521. <https://www.jstor.org/stable/2937740>
- Rillo A. (2014). Overview of Financial Inclusion in Asia. In Asian Development Bank Institute and Asia-Pacific Finance and Development Centre. *Country Surveys*; ADB: Tokyo, Japan.
- Romer, P. M. (1990). Human Capital and Growth: Theory and Evidence. *Carnegie-Rochester Conference Series on Public Policy*, 32, 251–286. doi.org/10.1016/0167-2231(90)90028-J
- Samuelson, P. & Nordhaus, W. (2010). *Economía, con Aplicaciones para Latinoamérica*, 19ª edición. Pavón, L., Blanco, C. Rev, Mc Graw Hill, Mexico City.

- Schumpeter J. (1934). *Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Harvard University Press, Cambridge, MA.
- Silgoner, Z, Shen, Y., Hu, W. & Hueng, J. (2018). The Effects of Financial Literacy, Digital Financial Product Usage, and Internet Usage on Financial Inclusion in China. *MATEC Web of Conferences* 228, 05012 <https://doi.org/10.1051/mateconf/201822805012>
- Solow, R. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70(1), 65–94, <https://doi.org/10.2307/1884513>.
- Standard & Poor's Ratings Services Global FinLit Survey (2016). Retrieved from: <https://gflec.org/initiatives/sp-global-finlit-survey/>
- Stata (2019). *Stata 16 Manuals: Longitudinal Data/ Panel Data Reference Manual*. Stata Press, College Station, Texas, 313–372.
- Swan, T. (1956). Economic Growth and Capital Accumulation. *Economic Record*, 32(2), 334–361. doi. [org/10.1111/j.1475-4932.1956.tb00434.x](https://doi.org/10.1111/j.1475-4932.1956.tb00434.x)
- United Nations (2015). Sustainable Development Goals. Retrieved from: <https://www.un.org/sustainabledevelopment/development-agenda/>
- U.S. Department of the Treasury (2018). A Financial System That Creates Economic Opportunities Nonbank Financials, Fintech, and Innovation, U.S. Department of the Treasury, <https://home.treasury.gov/sites/default/files/2018-08/>
- WB, World Bank (2023a). DataBank. Retrieved from: <https://databank.worldbank.org/>
- WB, World Bank (2023b). SDG Indicators Metadata repository Goal 4: Quality education. Retrieved from: <https://unstats.un.org/sdgs/metadata/>
- WB, World Bank (2021). The Global Findex Database. Retrieved from: <https://www.worldbank.org/en/publication/globalfindex/Data>
- Yan Sh., Hueng, J. & Hua, W. (2020). Using Digital Technology to Improve Financial Inclusion in China. *Applied Economic Letters*, 27(1), 30–34. <https://doi.org/10.1080/13504851.2019.1606401>