



UNIVERSIDADE D
COIMBRA

Daniel Alberto Jardim de Freitas

ANALYSIS OF FACTORS THAT INFLUENCE
FINANCIAL INCLUSION
THE CASE OF OECD COUNTRIES

Project Work under the scope of the Master's Degree in Economics, with specialization in Financial Economics, with the supervision of Professor José Alberto Fuinhas and presented to the Faculty of Economics of the University of Coimbra.

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À família.

Aos amigos.

Aos professores.

A special thanks to FEUC for the attribution of the
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Abstract

This research studies the relationships between financial literacy and inclusion, and in particular the imbalance between them, by studying the short-run impacts and long-run computed elasticities that macroeconomic and institutional factors and the key financial literacy determinants have on the three main financial inclusion dimensions and on financial illiteracy consequences, specifically on over-indebtedness. ARDL models were used to estimate the short-run impacts and to calculate the long-run computed elasticities, using panel data from 2004 to 2019, with a sample composed of 24 OECD countries. Due to the presence of first-order autocorrelation, group heteroscedasticity, and contemporaneous correlation in the models, Driscoll and Kraay estimations were carried out, as they were expected to be robust enough to deal with such conditions. Subsequently, the variables that did not present statistical significance were excluded from the equations to obtain the parsimonious sets of each model. Regarding macroeconomic and institutional factors, it was observed that emigration, banking concentration, and housing prices positively, and bureaucracy negatively, influence financial inclusion, with more noticeable effects in the long run. Furthermore, positive impacts on inclusion were also detected concerning income, education, and age, the key determinants of financial literacy. However, when analyzing the effects of these same factors and determinants on over-indebtedness, the signs become the opposite of those previously described. That is, the effects that the explanatory and control variables have on financial inclusion are the opposite on the consequences of financial illiteracy, making it possible to conclude that the factors considered, capturing the effects of financial literacy, can explain some discrepancies found in certain countries between the levels of financial literacy and inclusion, and the consequences that arise from these imbalances, such as over-indebtedness.

Keywords: ARDL; banking; financial inclusion; financial literacy; over-indebtedness

JEL classifications: C01; D14; G21; G51; G53

Resumo

Esta investigação analisa as relações entre a literacia e a inclusão financeira, e, em especial, dos desequilíbrios que existem entre ambas, através do estudo dos impactos de curto-prazo e das elasticidades calculadas de longo-prazo que fatores macroeconómicos e institucionais e os principais determinantes da literacia financeira têm nas três principais dimensões da inclusão financeira e nas consequências da iliteracia financeira, em concreto no sobre-endividamento. Modelos ARDL foram usados com vista a estimar os impactos de curto prazo e a calcular as elasticidades de longo prazo, através do uso de dados em painel desde 2004 a 2019, com uma amostra composta por 24 países da OCDE. Devido à presença de autocorrelação de primeira-ordem, heterocedasticidade em grupo e correlação contemporânea nos modelos, foram efetuadas estimações Driscoll e Kraay, por ser esperado que sejam robustas o suficiente para lidar com tais condições. Posteriormente, foram excluídas das equações as variáveis que não apresentavam significância estatística com vista a serem obtidos os conjuntos parcimoniosos de cada modelo. Relativamente aos fatores macroeconómicos e institucionais, foi observado que a emigração, a concentração bancária e os preços das habitações influenciam positivamente, e a burocracia negativamente, a inclusão financeira, com efeitos mais notórios no longo-prazo. No que toca ao rendimento, à educação e à idade, que constituem determinantes da literacia financeira, também foram detetados impactos positivos na inclusão. No entanto, quando analisados os efeitos destes mesmos fatores e determinantes no sobre-endividamento, os sinais tornam-se os opostos aos descritos anteriormente. Ou seja, os efeitos que as variáveis explicativas e de controlo têm na inclusão financeira, são os opostos nas consequências da iliteracia financeira, sendo possível concluir que os fatores tidos em consideração, captando os efeitos da literacia financeira, permitem explicar algumas discrepâncias verificadas em certos países entre os níveis de literacia e de inclusão financeira, e das consequências que advêm desses desequilíbrios, tal como o endividamento excessivo.

Palavras-chave: ARDL; banca; inclusão financeira; literacia financeira; sobre-endividamento

Classificações JEL: C01; D14; G21; G51; G53

List of Acronyms

AIC	Akaike information criteria
ARDL	Autoregressive distributed lag
ATM	Automated teller machine
BIC	Bayesian (or Schwarz) information criterion
CIPS	Cross-sectional augmented Im Persaran and Shin
ECM	Error correction models
EU	European Union
GDP	Gross domestic product
PWT	Penn World Table
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing power parity
RESET	Regression specification error tests
UN	United Nations
VIF	Variance inflation factors

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Chapter 1 Introduction

Financial inclusion, which corresponds to the usage of financial services that are available to the public, is recognized as one of the main tools in the fight against poverty and the socioeconomic progress of societies, according to Sha'ban et al. (2020). Population groups with low financial inclusion rates incur being socially excluded, which makes reducing financial exclusion a primary concern for the authorities in each country.

On the other hand, Klapper et al. (2015) argue that one major driver for financial inclusion is financial literacy, more specifically, the knowledge of the population of simple financial concepts. Understanding the latter enables people to make better decisions based on what they have at their disposal to consume, save and invest, eventually increasing their interaction with existing financial services, consequently making them increasingly financially included.

However, although there is a significant relationship between financial literacy and inclusion, as mentioned by Klapper et al. (2015), in several countries, it is possible to find contrasting situations, as in the cases of Portugal and Sweden. For example, one variable most used to quantify financial inclusion is the density of ATMs per 100,000 adults, according to Ozili (2021). Using data from 2014 obtained from the World Bank, Portugal had a density of around 177 ATMs, one of the highest among OECD member countries, as opposed to Sweden, which had some of the lowest densities by showing a density of 41 machines. However, in surveys by Klapper et al. (2015), which concluded that only one-third of the world population knew basic financial concepts, Portugal showed one of the lowest levels of financial literacy in 2014. Specifically, only 28% of adults were financially literate, a low figure compared to their peers, including Sweden, which presents some of the highest numbers of financial literacy, with a rate of 71%.

This way is possible to notice that there seem to be some discrepancies between variables, which *a priori* were expected to be more balanced among themselves. Consequently, Klapper and Lusardi (2020) show that situations where optimal levels of financial literacy do not support financial inclusion, may give rise to adverse situations. Those can be the payment of high-interest rates and transaction fees, as exemplified by Lusardi and Tufano (2015), or over-indebtedness and lower savings, as referred by Stango and Zinman (2009). Regarding non-performing loans to gross loans among the OECD countries used in the research, in 2014, Portugal appeared in one of the highest positions, with a percentage of

11.91%. However, Sweden demonstrated excellent indicators of financial compliance compared with other countries, with a percentage of 1.24%.

This way, financial inclusion does not appear to have a strictly linear relationship with financial literacy across countries, suggesting that other factors also influence financial inclusion. At the same time, in the literature is possible to find several analyses about macroeconomic and institutional factors that seem to affect financial inclusion that may help to explain the contrasts found, such as emigration (Anzoategui et al., 2014), bureaucracy (Karpowicz & Cerra, 2014), banking concentration (Owen & Pereira, 2018) and housing prices (Milana & Ashta, 2020). The main concepts of the research and the factors previously mentioned are developed in more depth in Chapter 2 regarding the literature review.

In Chapter 3, about the conceptual framework, the main objective of this analysis is looked at in more detail. More precisely, whether the previously mentioned factors help explain the discrepancies between financial literacy and inclusion by studying the impact of these factors, controlling the effects of financial literacy through its key determinants, on the main financial inclusion dimensions. A further objective is to examine whether these same macroeconomic and institutional factors, together with the key financial literacy determinants, can influence financial illiteracy consequences.

The research focused on countries that were members of the OECD in 2021 and had observations for every time series used in this investigation. For the analysis, the period from 2004 to 2019 was considered. The study consisted of panel ARDL model regressions, taking into account fixed effects that may exist for each country, with the aim of capturing the short- and long-run relationships between variables (Pesaran & Shin, 1995). In addition, the time series more suitable to quantify each financial inclusion dimension and one financial illiteracy consequence were considered as dependent variables, the macroeconomic and institutional factors that seem to influence financial inclusion were treated as explanatory variables, and the financial literacy determinants were designated as control variables. All these aspects are elaborated on in Chapter 4, about the methodology employed in the research.

In Chapter 5, concerning the research results and discussion, the statistically significant coefficients from the parsimonious models were analyzed to understand the contribution that the macroeconomic and institutional factors had on the financial inclusion dimensions and on the financial illiteracy consequences over the years.

Finally, after the respective observations and discussions of the short-run impacts and long-run computed elasticities, the main conclusions of the project work are presented in Chapter 6, along with policy implications, study limitations and suggested further research.

Chapter 2 Literature Review

This chapter discusses the main concepts of this research, more precisely, what they mean and how to quantify them. Overall, the chapter is divided into four parts, in particular, (i) the definition of financial inclusion, what affects it, and the importance it has in societies; (ii) the contextualization of financial literacy, how it has been studied over time, and the determinants used to measure it; (iii) the factors that seem to affect financial inclusion, which was searched in the literature having in mind the realities of the countries in the study, with particular attention to Portugal; and (iv) the consequences that may arise from the lack of financial literacy, along with some ways that they can be estimated, reiterating the importance of inclusion and financial literacy in each country.

2.1 Financial inclusion

Sha'ban et al. (2020) define financial inclusion as the usage of financial systems available to the population. Given its role in the fight against poverty and developing societies, advancing the financial system has become a concern for those who rule. However, Allen et al. (2016) point out that financial inclusion not only depends on macroeconomic and institutional factors, such as the proximity to banks or the stability of the legal system but is also influenced by the conditions of each individual, such as monetary unavailability. Thus, the authorities of each region must design specific measures considering each area's particularities to increase inclusion across the nations (Grohmann et al., 2018).

On the other hand, despite the importance of financial inclusion, Sarma (2008) elaborates that there is no single variable to measure financial inclusion equally for all countries. Alternatively, financial inclusion needs to be quantified through its main dimensions, namely, (i) the penetration of financial services because an inclusive system requires as many people as possible to be covered, which can be quantified with the share of the population with a bank account; (ii) the availability of financial services since for citizens to be part of the financial system, they must have ways of accessing the services themselves, a dimension that can be measured with the densities of ATMs; and (iii) the usage of financial services, because it does not matter if populations incorporate and access the financial systems if they do not use them, a concept that can be assessed through the bank deposits to GDP.

2.2 Financial literacy

According to Klapper et al. (2015), greater financial literacy increases various financial inclusion indicators. The authors define financial literacy as the knowledge of simple financial notions, which provides the skills necessary to make better consumption, saving, and investment choices. These activities, naturally, culminate in more significant interaction between financial systems and users, thus increasing financial inclusion.

However, as addressed by Aren and Dinç Aydemir (2014), there does not exist a commonly used way to measure financial literacy. One primary method used by researchers to quantify financial literacy has been the conduction of surveys with accessible questions and, based on the results, the calculation of financial literacy in each country. However, neither are they regular in time nor conducted using the same questions or other assessment methods. Alternatively, another approach to quantify financial literacy has been through its key socioeconomic determinants, such as income, education, or age of the population, something used, for example, in the analysis of Grohmann et al. (2018).

Although higher income is not a direct indicator of greater financial literacy, Elmerick et al. (2002) explain that, indirectly, the higher the income and wealth, the greater the financial possibilities for households to afford the fees of financial experts, ranging from accountants to lawyers, to help them take much better economic decisions. However, not all households seek the same level of advice, as some seek only guidance related to savings and investment. In contrast, others try to find guidance for a broader scope, a differentiation that is mainly due to different incomes, highlighting the positive relationship expected between wealth and literacy.

Arthur (2012) exposes that another factor that defines financial literacy is education. The basic idea is that, through education, individuals can perform basic mathematical calculations and learn simple financial concepts, which makes them aware of topics such as saving, investment, and indebtedness. Consequently, the population gains the knowledge to reject low-quality financial products, which can reduce the personal impact of financial crises and poor government economic policies. This situation happens because, behind education, individuals understand how the various economic risks can affect them and the financial world, something that could be first seen as complex but ends up becoming more accessible. In any case, the concept that gains more emphasis with education is the

importance of saving. Thus, the greater education is, the higher financial literacy is expected to be.

Finally, Xiao et al. (2015) demonstrate how age plays a vital role in financial literacy. The central premise is that, over the years, individuals tend to experience situations through formal or informal education or financial interactions with those around them, increasing their ability to interpret financial concepts. Thus, the older they are, the greater their financial literacy tends to be compared to younger people. However, although consumers in the short run show more significant signs of impatience when compared to the long run, on a psychological level, as time goes by, topics such as consumption, indebtedness, and saving start to become more complex to deal with. In short, it is expected that the higher the share of the active population in a society, the higher its indices of financial literacy.

2.3 Factors related to financial inclusion

Grohmann et al. (2018) argue that although financial literacy significantly affects financial inclusion, the way literacy impacts inclusion depends largely on macroeconomic, institutional or financial variables. Thus, there seems to be an indication that literacy and financial inclusion are not always balanced. On the other hand, as stated by Stango and Zinman (2009), these unbalances can damage individual wealth. This way, to determine possible reasons for the disparities, a search was conducted in the literature for macroeconomic or institutional factors that, besides appearing to influence financial inclusion, fit the reality of the countries under analysis.

According to Anzoategui et al. (2014), one factor that seem to influence financial inclusion is emigration. This phenomenon is due to the fact that migration tends to be associated with the constant population demand for higher income in a struggle for better living conditions (Arango, 2000). However, Anzoategui et al. (2014) also explain that migration seems to influence financial inclusion in their countries of origin due to the need for families to have bank accounts to receive remittances sent by their relatives.

Ambrosius and Cuecuecha (2016) also point out that the impact of remittances sent by emigrants on the financial system is not limited to the people who are helped financially and seek saving and investment solutions but also encompasses the financial institutions themselves. Banks are interested in the reception of remittances and tend to develop campaigns to attract customers to increase their liquidity needs. In addition, the combination of financial services with the remittances received allow households to obtain additional

resources for managing their risk. Thus, emigration may help explain the contrast observed in the case of Portugal, given that, as elaborated by Vieira and Trindade (2008), the country has had a solid connection to emigration since the fifteenth century. It is estimated that about four million Portuguese citizens or descendants reside outside Portuguese territory. Thus, emigration was considered in the analysis as a factor expected to influence financial inclusion positively.

Karpowicz and Cerra (2014) illustrate that countries' bureaucracy is another variable affecting financial inclusion. This idea arises from the fact that the more complex the process of opening, maintaining, and closing accounts in financial institutions is, in terms of documents and requirements, the less active is the participation in the financial world by the population. However, this limitation corresponds to involuntary exclusion, i.e., due to elements external to the individual. In this case, high costs, inadequate solutions, or excessive documentation determine exclusion from the financial world, as shown by Bester et al. (2008). This situation is the contrast to voluntary self-exclusions, in which case the non-participation in the financial system is due to personal reasons, such as religious or cultural reasons, distrust in institutions, or the unnecessary need for a bank account, as addressed by Beck et al. (2009).

Bester et al. (2008) also add that one main reason for excessive documentation is related to anti-money laundering and anti-terrorist financing regulations. However, although such rules have the expected effects, many times, those who also end up being affected are the immigrants who, for not having all the necessary documents to comply with the requirements, find themselves unable to get payment accounts in their name. One solution that several governments have adopted has been the reduction of requirements to be fulfilled by clients who conduct few transactions. Based on data from a survey conducted in 2017, Demircuc-Kunt et al. (2019) noted that one leading cause that 20% of the world population did not have an account was due to the required documentation and trust in the financial system. Thus, bureaucracy was used as an institutional factor that is expected to influence countries' financial inclusion negatively.

Banking concentration is another indicator that can help explain financial inclusion, as mentioned by Owen and Pereira (2018), because the higher the concentration, the greater the economies of scale tend to be, which, due to the better efficiency achieved by the financial system, it is possible to reduce both the costs for the institutions and the costs to be supported by the end users of the services. This logic contradicts the traditional theory, which suggests

that greater banking competition is what would indeed reduce costs. Since one main obstacle to financial inclusion is the costs to be borne by users, it is assumed that a greater banking concentration may increase financial inclusion.

As analyzed by Fungáčová et al. (2017), it is possible to find a positive association between bank competition and financing costs in Europe. That is, the higher the bank concentration, given the lower competition, the lower the costs charged to end users tend to be. On the other hand, Owen and Pereira (2018) refer that the phenomenon of bank consolidation has been accentuated since the 2008 financial crisis. Therefore, although there is hesitation by the governments with the existence of large banking concentrations, as the predominance of smaller banks tends to mitigate the risk of financial instability, it is possible to verify a positive relationship between the range of financial areas in which banks operate and the financial inclusion of societies. Thus, banking concentration is expected to impact financial inclusion positively over time.

Finally, a factor that can also impact financial inclusion is the case of housing, as addressed by Milana and Ashta (2020), who describe, using data from 2017, that one reason why adults tend to take loans is for the acquisition of a home of their own. Given that housing loans have figured a considerable percentage compared to GDP in several countries, as Porteous (2011) alluded, housing prices may affect financial inclusion since, most of the time it is necessary to resort to financial institutions for contracting loans.

In some European countries, such as Portugal, there has been a continuous increase in housing prices and an inadequate supply of social housing for the population's needs, as mentioned by Branco and Alves (2020). It may be then theorized that the increase in housing prices leads to more significant interaction with financial systems, both in terms of loans size and the number of customers, so that it is possible to allocate the necessary resources for the acquisition of houses, and, consecutively, positively affecting financial inclusion.

2.4 Financial illiteracy consequences

Over time, markets have experienced an increase in complex financial products and credit solutions associated with high costs, as stated by Klapper and Lusardi (2020). At the same time, governments have been trying to ensure that citizens can easily access bank accounts or other financial products. However, if the users of these systems do not possess the required financial literacy, these products can result in huge losses. In other words, something that could be seen as beneficial may turn out problematic. On the other hand, Lusardi and Tufano

(2015) conclude that the decisions made by each person reflect their financial literacy, with the most unaffordable choices being made by those who are more illiterate, choices that can result, for example, in paying exorbitant interest and transaction fees. Stango and Zinman (2009) also find that these poor-quality decisions can culminate in higher debts and lower savings.

Gathergood (2012) reinforces that one financial illiteracy consequence is over-indebtedness. However, from this author's perspective, this is mainly associated with self-control problems, which prevent those with little financial knowledge from using products for which they are not prepared, ending up taking loans with excessive costs caused by their higher degree of impatience. Therefore, one way for governments to avoid these situations, given the time needed to increase the population's education and subsequent financial literacy, is to limit their choices, given their lack of self-control.

On the other hand, Gutiérrez-Nieto et al. (2017) highlight the negative impact that over-indebtedness can have on customers, institutions, and society as a whole, which can range from an increase in poverty rates to a decrease in the quality of life of the population. The solution concluded by the authors is to increase legislation related to how banks operate, and the penalties associated with defaulting on loans.

Concluding the literature review, with the concepts, the relevance, and the measurements of financial inclusion and literacy having been developed, including how the two interact with each other, it is now essential to discuss the methodology adopted, the established hypotheses, the data used, and the results obtained in this research.

Chapter 3 Conceptual Framework

3.1 Theories

Although financial literacy positively influences financial inclusion, it does not appear to have a strictly linear relationship with financial literacy across some OECD member countries. This issue suggests that other factors, perhaps macroeconomic or institutional, influence financial inclusion, apart from financial literacy (Klapper et al., 2015).

In the literature is possible to find some factors that seem to affect financial inclusion, in addition to the key financial literacy determinants, precisely, income, education and age (Grohmann et al., 2018), that may help explain the contrasts found, more specifically, (i) emigration, which seems to positively influence financial inclusion as it is necessary to have accounts in financial institutions in the countries of origin for the receipt of remittances sent by emigrated relatives (Anzoategui et al., 2014); (ii) bureaucracy, as due to their nature they can prevent access and maintenance of financial services through, for example, excessive documentation requirements, thus producing a negative relationship with financial inclusion (Karpowicz & Cerra, 2014); (iii) banking concentration, which due to the economies of scale, allows more participation in the financial system, since it becomes more accessible and cheapest for the population (Owen & Pereira, 2018); and (iv) housing prices, which dictate the use of financial institutions to contract loans, which leads to financial participation and, subsequently, a higher level of financial inclusion (Milana & Ashta, 2020).

The conceptual framework diagram of the research is displayed in Figure 1.

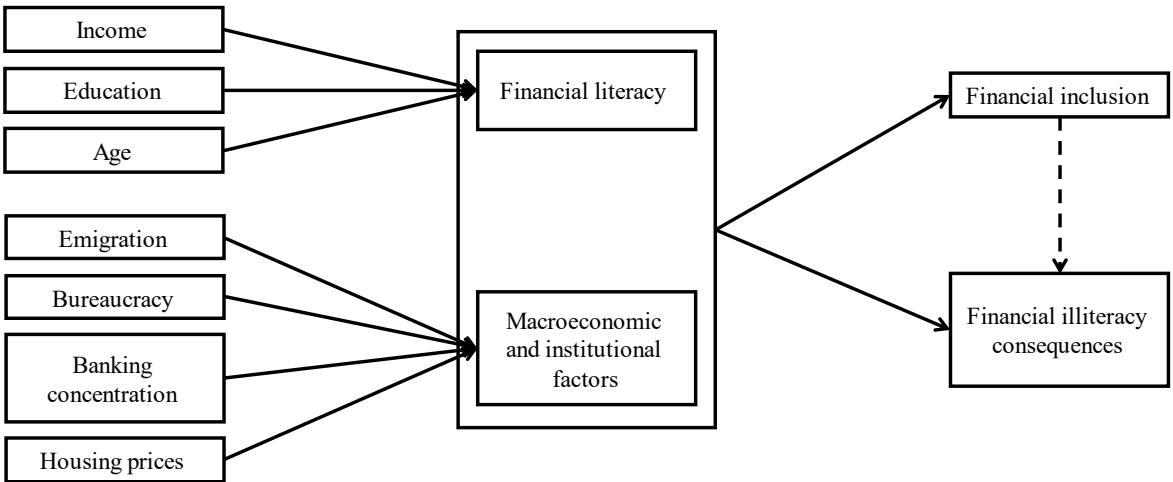


Figure 1. Conceptual framework diagram

3.2 Hypotheses

Having the theoretical framework been developed, the first hypothesis of this analysis can be formulated:

Hypothesis 1: *Emigration, bureaucracy, banking concentration, and housing prices, along with the key financial literacy determinants, influence the main three financial inclusion dimensions.*

Thus, the detection of positive impacts of emigration, banking concentration, housing prices, and the key financial literacy determinants, that is, income, education, and age, and negative influences of bureaucracy, on financial inclusion, enables the validation of the first hypothesis formulated.

On the other hand, further research was also conducted in which a consequence of financial illiteracy, more specifically, non-performing loans, replaced the financial inclusion dimensions in the previous statement, being possible to hypothesize the following:

Hypothesis 2: *Emigration, bureaucracy, banking concentration, and housing prices, along with the key financial literacy determinants, influence some consequences that arise from financial illiteracy.*

That is, in the opposite sense of Hypothesis 1, the finding of negative effects of emigration, banking concentration, housing prices, and the key financial literacy determinants, more precisely, income, education, and age, and positive impacts of bureaucracy, on financial illiteracy consequences, which can be partly caused by the imbalance between financial literacy and inclusion, support Hypothesis 2.

Chapter 4 Methodology

4.1 Data

In this research, only OECD member countries in 2021 were considered to focus the analysis on regions with high and medium income levels, setting aside the vast majority of developing countries where key macroeconomic indicators tend to have high volatilities (Adeniyi et al., 2019), which could lead to biased conclusions.

Due to the absence of observations in specific time series for some OECD countries, only 24 countries were considered, which are detailed in Table 1.

Table 1. Countries

Australia	Belgium	Chile	Czech Republic	Denmark	Estonia
France	Germany	Greece	Hungary	Ireland	Israel
Italy	Korea	Latvia	Lithuania	Netherlands	Poland
Portugal	Slovak Republic	Slovenia	Spain	Sweden	Türkiye

The choice of OECD in favor of other sets of countries or economic regions, such as the EU or the Eurozone, comes from the fact that it aggregates a considerably broader set of countries with stable economic and political levels, which can reduce possible ambiguities in the results obtained (Fernández-Portillo et al., 2020), not least because, for example, not all the member states of EU are part of OECD.

Regarding the period under analysis, the interval from 2004 to 2019 was considered, corresponding to 16 annual periods. The choice of 2004 has to do with it being a year in which many financial time series necessary for the research began to be produced (Sarma, 2008).

In the reverse situation, 2019 was the last annual period before the economic effects of the COVID-19 pandemic began to be felt since the way the world population interacted and has since interacted with financial systems has changed substantially, as stated by Naeem and Ozuem (2021). The authors further explain that during the pandemic, there was a trend towards less interaction with ATMs, as they were considered a potential focus of contagion. On the other hand, Zhang et al. (2020) highlight that during the worse period of the pandemic, financial markets experienced high volatility, caused by uncertainties about the economy's future.

As stated above, financial inclusion was the primary dependent variable of the analysis. However, since it does not have a commonly used measure, according to Sarma (2008),

inclusion was quantified through its three main dimensions: penetration, availability, and usage of financial services.

Regarding the first dimension Sarma (2008) defined, the penetration of financial services corresponds to the number of people integrated into the banking system. It can be quantified through the share of the population with a bank account, with data obtained from occasional surveys.

Sarma (2008) also establishes the dimension of the availability of financial services, that is, the access that people have to existing financial products. The availability was measured using the density of ATMs per 100,000 adults, as it corresponds to one of the best time series to quantify this aspect of inclusion, as stated by Ozili (2021).

Finally, the last dimension determined by Sarma (2008) refers to the usage of financial services, that is, the degree to which the population takes advantage of existing systems, where the bank deposits to GDP for each year and country were used. The data of these time series were obtained from the World Bank database.

In addition to financial inclusion, financial illiteracy consequences are another aspect studied and consequently considered as a dependent variable. Specifically, one consequence is indebtedness, as pointed by Stango and Zinman (2009). Bank non-performing loans to gross loans for each year and country were used as a proxy to quantify this effect, also gathered from the World Bank database.

Regarding the macroeconomic and institutional factors found in the literature that seem to influence financial inclusion, used in this analysis to understand the discrepancies between financial literacy and inclusion, (i) for the quantification of emigration, the international migrant stock to total population of the country of origin, obtained from UN, was used to determine the countries where emigration is more prominent; (ii) regarding bureaucracy, due the complexity to quantify the difficulty to open, maintain and close bank accounts, the score of starting a business in each country provided by the World Bank was used as a proxy, a variable that is measured with the quantity of procedures, time, costs and initial investments required for a company to begin operations; (iii) for the banking concentration, the assets of the three largest commercial banks to total commercial assets in each country over time was used, available from the World Bank; and, finally, (iv) regarding housing prices, the real house price indices was used, a time series that was obtained from OECD.

In the matter of financial literacy, Aren and Dinç Aydemir (2014) explain that there is no measure with regular frequency or accepted consensually in the literature. Thus, its key determinants were used to control for the effects of financial literacy. Income, education, and age were quantified through the variables used by Grohmann et al. (2018) in their analysis.

Specifically, to quantify income, the expenditure-side real GDP at chained PPPs *per capita* was used, with the data about the GDP obtained from the PWT, which deals with possible exchange rate biases by calculating each country's GDPs based on the prices of each product group so that it is possible to obtain GDPs in a comparable mode (Feenstra et al., 2015). To get the value per head, the GDP was divided by the total population estimated by the UN.

Regarding education, the share of the population aged between 25 and 64 years with at least upper secondary education attained was considered, with data obtained from the OECD. Secondary education tends to be the compulsory level in several OECD countries, despite the maximum age being 16 on average, as opposed to 18 in Portugal, according to OCDE (2021).

To quantify age, specifically those in the workforce, that tend to be the target audience of financial institutions, as noted by Grohmann et al. (2018), the share of the population between 15 and 64 years was employed, using data gathered by the UN.

In Table 2, is possible to find a summary of the variables used, long their units and sources resorted to obtain them.

Table 2. Variables, names, definitions, units, and sources

Variables	Names	Definitions	Units	Sources
<i>Dependent variables (financial inclusion dimensions and financial illiteracy consequences)</i>				
ACC	Penetration	Share of the population with a bank account	Percent	World Bank
A2A	Availability	Density of ATMs per 100,000 adults	Machines	World Bank
D2Y	Usage	Bank deposits to GDP	Percent	World Bank
NPL	Indebtedness	Bank non-performing loans to gross loans	Percent	World Bank
<i>Explanatory variables (macroeconomic and institutional factors)</i>				
M2P	Emigration	International migrant stock to the total population of the country of origin	Percent	United Nations
BNS	Bureaucracy	The score of starting a business	Index	World Bank
CCT	Concentration	Assets of the three largest commercial banks to total commercial banking assets	Percent	World Bank
HSE	Housing	Real house price indices	2015 = 100	OECD
<i>Control variables (financial literacy determinants)</i>				
YPC	Income	Expenditure-side real GDP at chained PPPs <i>per capita</i>	USD	Penn World Table and United Nations
EDU	Education	Share of the population with 25-64 years with at least upper secondary education attained	Percent	OECD
AGE	Age	Share of the population with 15-64 years	Percent	United Nations

Interpolations were performed to deal with the lack of annual observations in some variables, using the Stata command *mipolate*, resorting to annual observations outside the research period if they were helpful to interpolate data for periods missing in the sample time interval. The time series of the share of the population with a bank account only begins in 2011 due to the lack of data for the previous years.

For time series that had occasional gaps of some years in certain countries, the rule adopted was to perform linear interpolations to generate missing values to avoid creating shocks that would incorrectly affect the estimates (Bartram et al., 2007). However, in the cases of the share of the population with a bank account and the international migrant stock, where observations are only made available every 3 and 5 years, respectively, and since it was expected that the evolution over the years would be natural, without major oscillations, the time series were interpolated with the natural cubic spline interpolation method, developed by Herriot and Reinsch (1973).

Table 3 shows the summary descriptive statistics of the variables before applying logarithms, where it is possible to notice the use of a large set of observations for each time series. Since there are missing values for some countries in specific years, the number of observations is not the same in every time series.

Table 3. Descriptive statistics

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
ACC	216	0.8918816	0.1139754	0.4218	1
A2A	380	89.06379	51.32558	25.44	288.59
D2Y	384	0.6793602	0.2198198	0.2729027	1.405416
NPL	384	0.0512279	0.0639741	0.001	0.4557232
M2P	384	0.0718167	0.050131	0.020972	0.2217442
BNS	384	84.62031	9.658947	51.5	96.5
CCT	384	0.7120353	0.1514491	0.3234258	1
HSE	361	104.6513	20.62664	54.72464	169.2375
YPC	384	35.66122	11.832	12.77679	102.0709
EDU	377	0.7506268	0.1637165	0.2515656	0.9386059
A2P	384	0.6679705	0.0259216	0.6007496	0.732711

Notes: Stata command *sum* was used to compute the descriptive statistics

The summary statistics show that over the years, on average, regarding the dependent variables, 89.19% of the population had a bank account (ACC), there were 89.06 ATMs per 100,000 adults (A2A), bank deposits account for 67.94% of the GDP (D2Y) and the bank non-performing loans corresponded to 5.12% of gross loans (NPL).

Concerning the explanatory variables, on average, the international migrant stock corresponded to 7.18% of the total population of the countries of origin (M2P), the scores of starting a business had an average of 84.62 (BNS), the three largest commercial banks held 71.2% of the total commercial banking assets (CCT). In addition, the real house price indices stood at 104.65 (HSE).

About the control variables, on average, the expenditure-side real GDP at chained PPPs *per capita* (YPC) was \$35,661.22, 75.06% of the population with 25-64 years had at least upper secondary education attained (EDU), and 66.8% of the population had 15-64 years (A2P).

All variables were then transformed in natural logarithms, being represented with an "L", and the respective differentiations indicated with a "D".

4.2 Models

In this research, ARDL models were used to capture short- and long-run relationships between the variables, a method developed by Pesaran and Shin (1995). In addition, Narayan (2004) indicates that some advantages of using these models are related to their ability to simultaneously estimate short-run impacts and long-run computed elasticities, which helps to avoid endogeneity and autocorrelation problems that might occur with other cointegration methods.

Thus, to answer Hypothesis 1, related to the impacts of macroeconomic and institutional factors on financial inclusion, the following ARDL econometric models were used:

$$DLACC_{it} = \alpha_i + \beta_1 DLM2P_{it} + \beta_2 DLBNS_{it} + \beta_3 DLCCT_{it} + \beta_4 DLHSE_{it} + \beta_5 DLYPC_{it} + \beta_6 DLEDU_{it} \\ + \beta_7 DLA2P_{it} + \gamma_1 LACC_{it-1} + \delta_1 LM2P_{it-1} + \delta_2 LBNS_{it-1} + \delta_3 LCCT_{it-1} \\ + \delta_4 LHSE_{it-1} + \delta_5 LYPC_{it-1} + \delta_6 LEDU_{it-1} + \delta_7 LA2P_{it-1} + \epsilon_{it} \quad (1)$$

$$DLA2A_{it} = \alpha_i + \beta_1 DLM2P_{it} + \beta_2 DLBNS_{it} + \beta_3 DLCCT_{it} + \beta_4 DLHSE_{it} + \beta_5 DLYPC_{it} + \beta_6 DLEDU_{it} \\ + \beta_7 DLA2P_{it} + \gamma_1 LA2A_{it-1} + \delta_1 LM2P_{it-1} + \delta_2 LBNS_{it-1} + \delta_3 LCCT_{it-1} \\ + \delta_4 LHSE_{it-1} + \delta_5 LYPC_{it-1} + \delta_6 LEDU_{it-1} + \delta_7 LA2P_{it-1} + \epsilon_{it} \quad (2)$$

$$DLD2Y_{it} = \alpha_i + \beta_1 DLM2P_{it} + \beta_2 DLBNS_{it} + \beta_3 DLCCT_{it} + \beta_4 DLHSE_{it} + \beta_5 DLYPC_{it} + \beta_6 DLEDU_{it} \\ + \beta_7 DLA2P_{it} + \gamma_1 LD2Y_{it-1} + \delta_1 LM2P_{it-1} + \delta_2 LBNS_{it-1} + \delta_3 LCCT_{it-1} \\ + \delta_4 LHSE_{it-1} + \delta_5 LYPC_{it-1} + \delta_6 LEDU_{it-1} + \delta_7 LA2P_{it-1} + \epsilon_{it} \quad (3)$$

In Eqs. (1), (2), and (3), each main financial inclusion dimension of country i in year t , as defined by Sarma (2008), specifically penetration, availability, and usage of financial services, corresponds to the dependent variables, respectively.

On the right side of the equations, each macroeconomic and institutional factor of country i in year t , that is, emigration, bureaucracy, banking concentration, and housing prices, are considered as explanatory variables. The control variables, specifically, the key financial literacy determinants of country i in year t , i.e., income, education and age, are also present. Lastly, the random errors of country i in year t are represented with ϵ_{it} . Concerning the coefficients, α_i denotes the intercept of country i , β_j with $j = 1, \dots, 7$ the short-run impacts, γ_1 the speeds of adjustment and δ_j with $j = 1, \dots, 7$ the long-run multipliers that were used to compute the long-run elasticities.

Regarding Hypothesis 2, about the impacts of the macroeconomic and institutional factors on financial illiteracy consequences, controlling for the effects of financial literacy, the ARDL econometric model used was the following:

$$DLNPL_{it} = \alpha_i + \beta_1 DLM2P_{it} + \beta_2 DLBNS_{it} + \beta_3 DLCCT_{it} + \beta_4 DLHSE_{it} + \beta_5 DLYPC_{it} + \beta_6 DLEDU_{it} \\ + \beta_7 DLA2P_{it} + \gamma_1 LNPL_{it-1} + \delta_1 LM2P_{it-1} + \delta_2 LBNS_{it-1} + \delta_3 LCCT_{it-1} \\ + \delta_4 LHSE_{it-1} + \delta_5 LYPC_{it-1} + \delta_6 LEDU_{it-1} + \delta_7 LA2P_{it-1} + \epsilon_{it} \quad (4)$$

In Eq. (4), NPL_{it} represents the dependent variable, in this case, the excessive indebtedness of country i in year t , which is the consequence of financial illiteracy considered in this research. Like Eqs. (1), (2), and (3), each macroeconomic and institutional factor of country i in year t , and the key financial literacy determinants of country i in year t , are shown on the right side of the equation. Furthermore, ϵ_{it} represents the random errors of country i in year

t , α_i the intercept of country i , β_j with $j = 1, \dots, 7$ the short-run impacts, γ_1 the speeds of adjustment and δ_j with $j = 1, \dots, 7$ the long-run multipliers.

4.3 Pre-test estimations

The Pearson correlation coefficients (Pearson, 1896) were calculated to detect possible presences of collinearity and multicollinearity in the variables, with the results shown in Table 4.

Table 4. Pearson correlation coefficients matrix

	<i>Dependent variables</i>				<i>Explanatory variables</i>				<i>Control variables</i>		
	LACC	LA2A	LD2Y	LNPL	LM2P	LBNS	LCCT	LHSE	LYPC	LEDU	LA2P
LACC	1.000										
LA2A	0.242 ***	1.000									
LD2Y	0.520 ***	0.581 ***	1.000								
LNPL	-0.192 ***	-0.123 **	-0.043	1.000							
LM2P	-0.038	-0.124 **	-0.265 ***	0.313 ***	1.000						
LBNS	0.515 ***	0.115 **	0.230 ***	-0.038	0.020	1.000					
LCCT	0.299 ***	-0.067	0.133 ***	-0.189 ***	0.067	0.100 *	1.000				
LHSE	0.171 **	0.095 *	0.119 **	0.101 *	0.260 ***	-0.217 ***	-0.173 ***	1.000			
LYPC	0.689 ***	0.328 ***	0.675 ***	-0.135 ***	-0.219 ***	0.447 ***	0.250 ***	0.122 **	1.000		
LEDU	0.405 ***	-0.237 ***	-0.155 ***	-0.140 ***	0.099 *	0.190 ***	0.155 ***	-0.160 ***	0.198 ***	1.000	
LA2P	-0.398 ***	0.049	-0.240 ***	-0.102 **	0.040	-0.487 ***	-0.273 ***	0.106 **	-0.384 ***	0.063	1.000

Notes: Stata command *pwcorr* was used to compute the Pearson correlation coefficients matrix; ***, **, and * denote statistical significance levels at 1%, 5%, and 10%, respectively

In addition, the VIF statistics (Belsley et al., 1980) were also calculated, which are displayed in Table 5.

Table 5. Variance inflation factors

Variable	Level		First differences	
	VIF	1/VIF	VIF	1/VIF
LM2P	1.35	0.743367	1.1	0.905507
LBNS	1.64	0.611506	1.04	0.960362
LCCT	1.23	0.812879	1.03	0.974104
LHSE	1.38	0.723438	1.47	0.679687
LYPC	1.7	0.589039	1.49	0.669175
LA2P	1.5	0.666812	1.2	0.832828
LEDU	1.13	0.887416	1.1	0.906248
Mean VIF	1.42		1.21	

Notes: Stata command *estat vif* was used to compute the variance inflation factors after a linear regression with NPL as the dependent variable (with the Stata command *regress*), as it is one of the dependent variables of the research with more observations available

After observing the results, and since, in both cases, low values are presented, it is possible to put aside the presence of collinearity and multicollinearity and the risks associated with them.

Cross-sectional dependency tests (Pesaran, 2004) were also performed to ensure that the conclusions produced are robust, with the results being presented in Table 6. Under the null

hypothesis that variables have cross-sectional independence, almost all variables indicated cross-sectional dependence, except DLACC.

Table 6. Cross-sectional dependence tests

Variables	Level			First differences		
	CD-test	corr	abs(corr)	CD-test	corr	abs(corr)
LACC	29.04 ***	0.583	0.732	0.58	0.012	0.635
LA2A	20.44 ***	0.307	0.56	25.38 ***	0.397	0.417
LD2Y	27.5 ***	0.414	0.569	7.62 ***	0.115	0.263
LNPL	23.81 ***	0.358	0.556	26.44 ***	0.398	0.417
LM2P	26.93 ***	0.405	0.681	4.44 ***	0.067	0.587
LBNS	51.36 ***	0.773	0.773	3.66 ***	0.057	0.203
LCCT	4.44 ***	0.067	0.349	2.38 **	0.036	0.287
LHSE	16.07 ***	0.262	0.495	17.77 ***	0.292	0.451
LYPE	51.55 ***	0.776	0.863	29.05 ***	0.437	0.48
LEDU	48.1 ***	0.739	0.772	6.01 ***	0.09	0.25
LA2P	36.87 ***	0.555	0.885	32.75 ***	0.493	0.589

Notes: Stata command *xtcd* was used to compute the cross-sectional dependence tests; ***, and ** denote statistical significance levels at 1%, and 5%, respectively

In turn, to assess the presence of unit roots in the time series that tested for the presence of cross-sectional dependence, the second-generation unit root CIPS tests (Pesaran, 2007; Pesaran & Shin, 1995) were applied. Nevertheless, the first-generation unit root Maddala and Wu tests (Maddala & Wu, 1999) was applied to the only variable that presented cross-sectional independence, particularly DLACC. The results are shown in Table 7.

Table 7. First- and second-generation unit root tests

Variables	Lags	Level		First differences	
		Specification without trend	Specification with trend	Specification without trend	Specification with trend
		$Z_{t\text{-bar}}$	$Z_{t\text{-bar}}$	$\chi^2 / Z_{t\text{-bar}}$	$\chi^2 / Z_{t\text{-bar}}$
LACC	1	-2.398 ***	12.216	1080.292 *** ⁽¹⁾	436.688 *** ⁽¹⁾
LA2A	1	1.76	2.07	-1.297 *	-2.07 **
LD2Y	1	-1.253	-1.661 **	-6.791 ***	-4.274 ***
LNPL	1	-0.734	1.884	-1.842 **	0.633
LM2P	1	-14.671 ***	-14.722 ***	-14.284 ***	-4.665 ***
LBNS	1	-0.974	-0.412	-4.377 ***	-0.498
LCCT	1	-0.638	3.632	-4.021 ***	-4.23 ***
LHSE	1	-0.329	-1.951 **	-3.016 ***	0.224
LYPE	1	-0.741	1.214	-2.01 **	-0.746
LEDU	1	-0.671	3.67	-2.56 ***	-2.395 ***
LA2P	1	-5.414 ***	-2.398 ***	-3.316 ***	-6.243 ***

Notes: Stata command *multipurt* was used to compute the first- and second-generation unit root tests; ⁽¹⁾ refers to the χ^2 test of first-generation unit root tests; ***, **, and * denote statistical significance levels at 1%, 5%, and 10%, respectively

With the null hypothesis being that the variables are integrated in order 1 (I(1)), all variables proven to be stationary in first differences, that is, all variables under analysis are I(0) or

I(1), a fundamental rule for the application of ARDL models, according to the developments of Pesaran and Shin (1995). Consecutively, several specification tests were performed, which can be observed in Table 8.

Table 8. Specification tests

Tests	Models (1)	(2)	(3)	(4)
	DLACC	DLA2A	DLD2Y	DLNPL
Hausman	40.01 ***	110.07 ***	32.25 ***	94.52 ***
Modified Wald	2,057.04 ***	2,509.35 ***	2,566.85 ***	2,872.52 ***
Pesaran	-0.021	-0.038	3.280 ***	3.543 ***
Frees	5.641	1.182	0.929	1.846
Friedman	7.429	6.229	24.250	7.813
Wooldridge	654.313 ***	47.583 ***	106.194 ***	9.579 ***
Likelihood ratio	9.10	5.82	4.17	-14.53
Ramsey RESET (fit ²)	0.13	3.47 *	1.13	3.48 *

Notes: Stata command *hausman* used to compute Hausman tests, *xttest3* to compute modified Wald statistical tests, *xtcsd* to compute contemporaneous correlation tests by Pesaran, Frees, and Friedman, *xtserial* to compute Wooldridge tests for serial correlation, *lrtest* to compute likelihood-ratio tests, and *test* to compute Ramsey RESET tests; *** and * denote statistical significance levels at 1% and 10%, respectively

Among the tests carried out, Hausman tests (Hausman, 1978) were performed to detect the presence of fixed or random effects in the regressions and, under the null hypothesis of the models having random effects and consequent rejection in all cases, the existence of fixed effects in all models was verified, at a 1% significance level.

Also performed were the modified Wald statistical tests (Greene, 2002) to verify the presence of group heteroscedasticity in models with fixed effects. Under the null hypothesis of homoscedasticity, heteroscedasticity in all models was verified at a 1% significance level.

The contemporaneous correlation tests developed by Frees (Frees, 1995), Friedman (Friedman, 1937), and Pesaran (Pesaran, 2004), used to identify the presence of cross-sectional dependence, have as null hypothesis that the residuals are uncorrelated. However, most tests pointed to the existence of independence in all models.

Wooldridge tests for autocorrelation (Drukker, 2003), aiming at detecting first-order autocorrelation and being the null hypothesis the non-existence of first-order autocorrelation, with the rejection in all cases, the occurrence of serial correlation in all models was confirmed, at a 1% significance level.

Since the specification tests detected the presence of first-order autocorrelation, group heteroskedasticity, and contemporaneous correlation in all models, it was expected that the Driscoll and Kraay estimators (Driscoll & Kraay, 1998) were robust enough to deal with these situations (Marques et al., 2018). Moreover, ARDL models allow the determination of

both short and long-run relationships between variables by capturing short-run impacts and long-run computed elasticities, which seems appropriate for the models of the research due to the possible presence of long memory.

Thus, to obtain the parsimonious models, that is, a simpler model that presents a greater explanatory power, the regressors with standard errors without statistical significance at 5% were successively removed until all the remaining variables were statistically significant. In the case of Eq. (4), a statistical significance of 10% was considered because the previous method did not result in a more fitted model.

To test the correct specification of the parsimonious models, likelihood ratio specifications tests (Wilks, 1938) were applied, with the results being displayed in Table 8. Under the null hypothesis that the restricted model is more fitted than the unrestricted, all the parsimonious were concluded to be significantly better than the unrestricted ones.

Panel data RESET tests (Ramsey, 1969) were also performed to check for omitted variables in the parsimonious models through the significance tests of the square linear predictions of the models, whose results can be seen in Table 8. With the null hypothesis being that the model is correctly specified, at a significance level of 5%, the null hypothesis was not rejected in any case, thus leading to the assumption that the models are well specified.

In the next chapter, the coefficients of each model are analyzed and interpreted to conclude the influence that the variables have on each other.

Chapter 5 Results and Discussion

After selecting the parsimonious models to obtain the simplest possible models, simultaneously presenting a greater explanatory power, and since the tests performed indicated that the models are well specified, the short-run impacts and long-run multipliers were generated, which can be found in Table 9.

Additionally, the AIC (Akaike, 1974) and the BIC (Schwarz, 1978) estimators of both the parsimonious and unrestricted models were generated, as displayed in Table 9, where it is possible to see that the parsimonious ones present lower values, indicating that they are more fitted than the unrestricted ones.

Table 9. Short-run impacts, speeds of adjustments, long-run multipliers, and statistics

Variables	Models (1) DLACC	(2) DLA2A	(3) DLD2Y	(4) DLNPL
Constant	0.3311577 **	1.219027 ***	0.6111466 **	-2.204527
<i>Short-run impacts</i>				
DLHSE		0.0532903 **		-1.811288 ***
DLYPC				-0.9935765 *
DLA2P	-3.264057 ***	3.174405 ***		-17.76938 *
<i>Speeds of adjustment</i>				
ECM	-0.1914335 ***	-0.1047806 **	-0.1478377 ***	-0.2658925 ***
<i>Long-run multipliers</i>				
LM2P(-1)	0.0737641 ***		0.1837288 ***	-0.8941783 **
LBNS(-1)	-0.0886623 ***	-0.0966492 ***		0.4220535 ***
LCCT(-1)	0.0125128 **			
LHSE(-1)	0.0546055 ***		0.0500365 **	
LYPC(-1)				-0.8321715 ***
LEDU(-1)			0.0902354 **	0.5540361 *
LA2P(-1)		0.7747061 ***	0.8278368 ***	
<i>Dummy variables</i>				
id2009				0.2816565 ***
<i>Statistics</i>				
Observations	192	333	345	331
R ²	0.6417	0.2933	0.1168	0.5622
AIC (restricted)	-1,247.07	-1,105.429	-978.1998	53.52616
AIC (unrestricted)	-1,238.166	-1,091.245	-962.3666	80.05311
BIC (restricted)	-1,227.525	-1,086.388	-958.9821	87.74523
BIC (unrestricted)	-1,189.461	-1,034.442	-905.3802	137.0395

Notes: Stata command *xtsc* was used to compute short-run impacts, speeds of adjustment, and long-run multipliers, and *estat ic* to compute AIC and BIC statistics; ***, **, and * denote statistical significance levels at 1%, 5%, and 10%, respectively

After obtaining the regressors coefficients of each parsimonious model, the long-run elasticities were computed, dividing the long-run multipliers by the symmetric of the ECM (Fuinhas et al., 2015), which can be found in Table 10.

Table 10. Computed elasticities (long-run)

Variables	Models			
	(1)	(2)	(3)	(4)
	DLACC	DLA2A	DLD2Y	DLNPL
LM2P(-1)	0.3853252 ***		1.242774 **	-3.362931 ***
LBNS(-1)	-0.4631493 ***	-0.9223956 ***		1.587309 ***
LCCT(-1)	0.0653635 ***			
LHSE(-1)	0.2852451 ***		0.3384557 ***	
LYPC(-1)				-3.129729 ***
LEDU(-1)			0.610368 **	2.083684 **
LA2P(-1)		7.393601 **		

Notes: Stata command *nlcom* was used to compute the long-run elasticities by dividing the long-run multipliers by the symmetric of the error correction models (Fuinhas et al., 2015); *** and ** denote statistical significance levels at 1% and 5%, respectively

5.1 Financial inclusion

The financial inclusion econometric models correspond to the ones in which the dependent variables are the quantifications of the main three financial inclusion dimensions. More precisely, the penetration of financial services, measured through the share of the population with a bank account (ACC); the availability of financial services, quantified through the density of ATMs per 100,000 adults (A2A); and the usage of financial services, calculated through bank deposits to GDP (D2Y).

Moreover, the ECM of all models are negative and statistically significant, which supports the presence of long memory. In other words, this means that 19.14% of the disequilibrium of ACC is corrected within one year, at a significance level of 1%; 10.47% in the case of A2A, at a significance level of 5%; and 14.78% concerning D2Y, at a significance level of 1%.

In the first place, one financial inclusion model concerns the penetration of financial services, in terms of the share of the population with a bank account (ACC). In this case, all the macroeconomic and institutional factors considered in this research present long-run computed elasticities at a significance level of 1%.

The data shows that a 1% increase in the international migrant stock to the total population of the country of origin (M2P) corresponds to a positive and significant elasticity of 0.39% in the share of the population with a bank account. That is aligned with the literature review conclusions, which highlighted that the needs of family members of emigrants that remained in their homelands would need a bank account to receive the remittances sent by their emigrated relatives (Anzoategui et al., 2014).

In the case of bureaucracy, a 1% increase in the score of starting a business (BNS) corresponds to a decrease of 0.46% in the share of the population with a bank account, being within expectations since bureaucracy is one barrier to access financial systems (Karpowicz & Cerra, 2014), meaning that the greater the bureaucracy of societies, the lower the penetration of financial services tend to be.

In the long run, a 1% increase in banking concentration (CCT) raises the penetration of financial services by 0.07%. Thus, the results align with what was expected during the literature review, which concluded that increasing banking concentration could positively impact financial inclusion due to reduced banking costs (Owen & Pereira, 2018).

Another explanatory variable that presents statistically significant impacts is the real house price index (HSE). In the long run, a 1% increase positively influences the penetration of financial services by 0.29%. These results align with the literature review inferences in the sense that an increase in housing prices increases the probability of individuals having to resort to financial institutions to obtain loans for the purchase of a house, which consequently increases the interaction with the financial system (Milana & Ashta, 2020).

Regarding the control variables related to the key financial literacy determinants, only one shows statistically significant coefficients, at a significance level of 1%, in the financial services penetration model. More precisely, the results indicate that in the short run, a 1p.p. increase in the share of the population with 15-64 years (A2P) decreases the penetration of financial services by 3.26p.p. This effect opposes what was expected in the literature, where it was suggested that increasing the workforce would increase financial inclusion (Xiao et al., 2015). Nevertheless, the effects in question are in the short run, which do not necessarily contradict the literature if it is assumed that only the long-run effects of age can positively impact financial inclusion.

Secondly, another financial inclusion model is about the availability of financial services, measured by the density of ATMs per 100,000 adults (A2A). Among the explanatory variables, only one has statistically significant coefficients, at a significance level of 1%, namely bureaucracy (BNS), where, in the long run, a 1% increase leads to a 0.92% decrease in the availability of financial services. As in the previous model, these impacts are in line with what was concluded during the literature review when an idea was formulated that increased bureaucracy would lead to decreased inclusion (Karpowicz & Cerra, 2014).

Another explanatory variable that presents statistically significant impacts is the real house price index (HSE), at a significance level of 5%. In the short run, a 1p.p. increase positively influences the penetration of financial services by 0.05p.p. These results align with what was formulated during the literature review in where an increase in housing prices increases the probability of individuals resorting to financial institutions, which consequently increases the interaction with the financial system (Milana & Ashta, 2020).

About the control variables, only age (A2P) presents statistically significant coefficients, with a significance level of at least 5%, both in the short and long run. Specifically, a 1p.p. increase implies an increase of 3.17p.p. in the availability of financial services in the short run, and a 1% increase causes a 7.39% increase in the long run. Both results are in line with the conclusions obtained during the literature review. There, it was expected that the increase in the workforce population would be a driver for financial inclusion development since a more significant proportion of the population sees the financial world as less complex (Xiao et al., 2015).

Finally, only statistically significant long-run computed elasticities were captured in the financial services usage model, expressed through bank deposits to GDP (D2Y). At a significance level of 5%, one of them is emigration (M2P), where the estimations show that a 1% increase raises bank deposits to GDP in the long run by 1.24%. This result is in line with what was expected in the literature, where a rise in emigration is set to increase financial inclusion (Anzoategui et al., 2014). That is, higher emigration leads to increases in incoming remittances, which would lead to savings accumulation in banks.

Another statistically significant variable is housing prices (HSE), at a significance level of 1%. The results indicate that in the long run, a 1% increase raises the usage of financial services by 0.34%. During the literature review, increases in housing prices were expected to lead to greater financial inclusion due to a greater need for borrowing (Milana & Ashta, 2020). The increase observed in bank deposits to GDP may be due, in turn, to the desire of individuals to have higher savings to use as a down payment for the purchase of a house or because of waiting for hypothetical decreases in housing prices, a situation where the acquisition would be more affordable.

Finally, regarding the key financial literacy determinants used as control variables, in particular education (EDU), the data presented indicate that a 1% increase in the share of the population between 25-64 years with at least upper secondary education attained increases

bank deposits to GDP by 0.61% in the long run, at a significance level of 5%. It confirms that an increase in the proportion of people who understand basic financial concepts increases the level of usage of each country's financial systems (Arthur, 2012).

In short, since all the macroeconomic and institutional factors considered in the research significantly influence at least one of the three financial inclusion dimensions, controlling for the effects of financial literacy, it is possible to support Hypothesis 1.

5.2 Financial illiteracy consequences

During the literature review, there was a concern that when financial literacy is insufficient to support each individual's financial inclusion, negative outcomes, such as over-indebtedness, may come to the surface (Gathergood, 2012). Thus, a model was developed in which, for the same macroeconomic and institutional factors and key financial literacy determinants considered in the previous models, the financial inclusion dimensions were replaced by bank non-performing loans to gross loans (NPL), as a proxy of over-indebtedness.

Moreover, to capture the 2008 financial crisis effects, a dummy referring to 2009 was introduced since it is a year when the shocks are most noticeable in the time series. In contrast to the other models, including a dummy for 2009 proved to be statistically significant in this case. As in the financial inclusion models, the ECM shows a statistically significant coefficient at a 1% significance level, indicating that within one year 26.59% of the variable disequilibrium is corrected.

Three macroeconomic and institutional factors coefficients were found to be statistically significant at a 1% significance level. One factor is emigration (M2P), whose long-run computed elasticities indicate that a 1% increase makes over-indebtedness decrease by 3.36%. A possible justification may be due to the remittances working as an alternative to loans for families, which in turn would avoid negative consequences that could arise with loan defaults.

Another statistically significant factor is bureaucracy (BNS). The data shows that in the long run, a 1% increase leads to a 1.59% increase in over-indebtedness. Such result can be due to an increase in the complexity of financial terms and legislation surrounding the financial system leading to less understanding of financial responsibilities by individuals, making them more likely to be financially insolvent.

An explanatory variable that also presents statistically significant impacts is the real house price index (HSE). In the short run, a 1p.p. increase negatively influences the penetration of financial services by 1.81p.p. These results can lead to the supposition that, if on the one hand, increases in housing prices leads to more significant interaction with banking institutions (Milana & Ashta, 2020), on the other hand, as the amount to be lent increases, the institutions supervision may also become higher, which would justify the decrease in the proportion of non-performing loans.

Concerning the critical financial literacy determinants, considered as control variables, only GDP *per capita* (YPC) and education (EDU) showed statistically significant coefficients. In the case of the GDP *per capita* (YPC), at a significance level of 1%, the coefficient indicates that, in the long run, a 1% increase leads to a 3.13% decrease in bank non-performing loans to gross loans. Such a result leads to the belief that for higher income, the dependence by individuals on financial agents is lower, which leads to the suppression of eventual problems related, for instance, to loan default.

In the opposite direction, education (EDU) positively impacts over-indebtedness at a 5% significance level. Specifically, in the long run, a 1% increase leads to a 2.08% increase in bank non-performing loans to gross loans. Although it was expected that education would bring higher levels of awareness about the risks of borrowing, the results here obtained may lead to the assumption that increasing the proportion of the educated population may lead to greater adherence to the financial system, incurring in financial consequences anyway.

Thus, considering that some macroeconomic and institutional factors identified in the literature influence one financial illiteracy consequence, controlling the effects of financial literacy, it is possible to corroborate Hypothesis 2.

Chapter 6 Conclusion

This project work analyzed the impact on the main three financial inclusion dimensions of macroeconomic and institutional factors, specifically, emigration, bureaucracy, banking concentration, and housing prices, controlling for the effects of the key financial literacy determinants, income, education, and age. In addition, the impact of these same explanatory and control variables on over-indebtedness, a consequence of financial illiteracy, was also analyzed. Thus, it is hoped that this study has brought additional contributions to the research field related to financial inclusion through the approach adopted and the variables considered in the analysis.

6.1 Main results

ARDL models were used to capture short-run impacts and long-run multipliers and to calculate long-run computed elasticities. After verifying the presence of cross-sectional dependence and performing first- and second-generation unit root tests, all variables were concluded to be $I(0)$ and $I(1)$, a fundamental condition for applying ARDL models. After performing specification tests, all models tested for fixed effects, group heteroscedasticity, contemporaneous correlations, and first-order autocorrelations. After obtaining the parsimonious models, which were pointed out to be well specified, to avoid potential problems related to cointegrations, the Driscoll and Kraay estimators were used, as they are robust enough to deal with the previously mentioned conditions.

Thus, with the parsimonious models of the financial inclusion dimensions, each macroeconomic and institutional factor was found to have statistically significant coefficients with at least one of the main three financial inclusion dimensions. In general, emigration increases the penetration and usage of financial services in the long run, that is, of two financial inclusion dimensions. This situation means that the increase in the remittances received raises the number of people with a bank account and the usage of these same instruments.

On the other hand, an increase in bureaucracy was also noted to reduce the penetration and availability of financial services in the long run. This behavior reaffirms that the documentation required in the financial system has the potential to keep users away from the financial world, leading institutions to invest less in ways of being closer to the population.

Regarding banking concentration, only positive impacts on the penetration of financial services were detected in the long run, that is, the increase in economies of scale can affect the costs supported by the end users of financial services.

Finally, it was observed that an increase in housing pricing positively impacts the penetration and usage of financial services in the long run and availability in the short run. This way, it is possible to conclude that an increase in the amount needed to pay for a house increases the interaction with financial institutions.

Concerning the key financial literacy determinants, positive long-run impacts of education were detected on the usage of financial services. These impacts show that education makes it simpler for people to understand how the financial system works, leading to more significant interactions. Concerning increases in the workforce, positive short- and long-run impacts were found on the availability of financial services. However, negative short-run ones were detected on penetration. This situation indicates that education has a better effect on understanding complex financial terms the more people are willing to use them, primarily in the long run.

About the financial illiteracy consequences model, where the bank non-performing loans to gross loans take the place of the dependent variable, used to quantify excessive indebtedness, it was found that, in the long run, increases in emigration reduce over-indebtedness and bureaucracy increase it. However, in the short run, increases in housing prices seems to reduce over-indebtedness. Regarding the effects of financial literacy, in the long run, the increase in income decreases over-indebtedness, while increases in education positively impact bank non-performing loans to gross loans.

In other words, almost all the signs of the effects that the independent variables had in the financial inclusion models are the opposite of those found in the financial illiteracy consequences model. This finding leads us to the conclusion that while an increase in the key financial literacy determinants and the macroeconomic and institutional factors considered show beneficial impacts on financial inclusion, they also decrease the disequilibrium between financial literacy and inclusion, thus reducing the negative effects of financial illiteracy.

6.2 Policy implications

The impacts between variables obtained during the research make it possible to understand the different contributions that some macroeconomic and institutional factors cause in the

different variables of financial inclusion and over-indebtedness. If, on the one hand, the countries' authorities can immediately influence financial inclusion and over-indebtedness, on the other hand, some desired effects are only achieved or obtained more effectively if there is more significant planning and timely implementation of measures aimed at the financial development of populations.

6.3 Study limitations

Some limitations encountered during this research were the lack of observations, either for some OECD countries in certain time series, which left out of the analysis some largest world economies, or to quantify the penetration of financial services through the share of the population with a bank account since it only began in 2011 and presents some temporal gaps.

Moreover, financial literacy was one of the main concepts considered in the analysis. However, given the lack of data available regularly over time, it was necessary to use the primary financial literacy determinants, which, although they are good indicators of the literacy of countries, do not necessarily compose a homogenous variable that is widely used in the literature.

6.4 Further research

The focus of this work was on OECD countries, to restrict the sample to developed countries only. This option means that the conclusions drawn here can only apply to such countries, as they embody specific unique characteristics that may not apply to less developed ones. A future research path could be to conduct a similar study that would only consider or encompass countries in development.

On the other hand, the analysis only considers observations up to 2019 to avoid biased conclusions caused by the pandemic of COVID-19. Considering that the population interaction with the financial world substantially differed during the lockdown, a possible investigation could involve a study that encompasses the most critical periods of the pandemic. A path to follow would be to verify whether the impacts verified in this investigation were maintained or become more apparent.

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