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CENTER FOR LATIN AMERICAN MONETARY STUDIES

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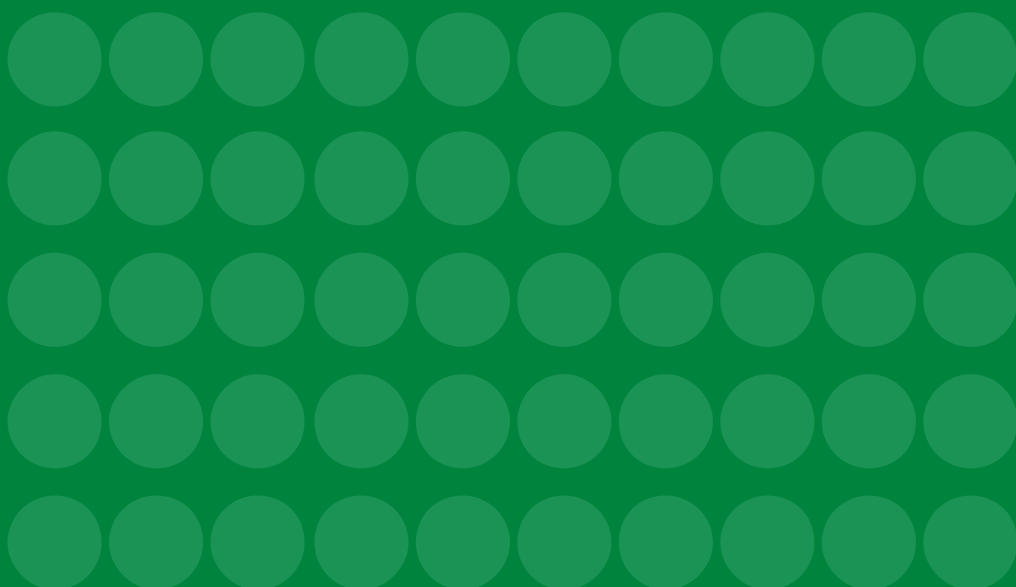DEVELOPMENT BANK
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Researchers Network

Financial Decisions of Households and Financial Inclusion: Evidence for Latin America and the Caribbean

Editors:
María José Roa and Diana Mejía

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PREFACE

Over the last few decades the interest in understanding household financial decision making has been growing. This interest has partly been due to its close relation with two phenomena of particular importance to developing economies: financial inclusion and financial literacy. A set of recent macroeconomic studies have shown how financial inclusion is positively related to financial stability, economic growth, equality and poverty reduction. As a consequence, many emerging countries, including those of Latin America, has created national financial inclusion strategies.

As a first step towards designing such strategies, different surveys have been conducted that attempt to collect information on the access and usage of formal and informal financial products and services. The evidence demonstrates how people use informal saving, credit and payment instruments and that levels of financial inclusion among the population are very low. Moreover, the data shows that even people who participate in the formal financial sector use informal financial instruments. CAF-Development Bank of Latin America and several central banks of the region have actively participated in elaborating and compiling financial inclusion databases.

In Latin America and the Caribbean, recurrent financial and economic crises have undermined people's confidence in the formal financial sector, and have led to the coexistence of formal and informal financial products and services in the market. Although lack of trust is a significant barrier to financial inclusion in the region, it is not the only one. Peer or social

pressure, certain biases identified by behavioral economics, and a lack of financial literacy have also proved to be equally important barriers. On the supply side, high transaction costs and physical barriers also restrict the participation of a large proportion of the population living in rural areas. Thus, different interventions have been made during recent years in an attempt to offset or reduce some of these barriers, such as the introduction of mobile banking, correspondent agents, basic low-cost products, products with liquidity restrictions and saving plans, and financial education programs, among others. Central banks have actively participated in formulating many of the regulations for these new financial channels and products, working as key players in the national strategies.

One of the main lessons learnt from the 2007 financial crisis is the relevance of clearly and fully understanding how the financial system works, on the supply as well as the demand side. On the demand side, this evidence was used in planning and creating national financial literacy strategies; promoting international surveys on financial skills; and even assessing the effect of a lack of financial skills among citizens on a nation's economy. In the last decade, financial literacy has been considered as a key determinant of people's financial decisions and, ultimately, of their wellbeing. Financial literacy emerges as a critical factor, given that it not only facilitates the effective use of financial products, but also helps people to acquire the skills necessary for comparing and choosing those that are best adapted to their needs and possibilities, empowering them to exercise their rights and responsibilities, and encouraging their participation in formal financial markets.

Different surveys around the world demonstrate that financial literacy are low, especially among individuals with less education and lower incomes, women, the young, the old and inhabitants of rural areas, among others. For the case of Latin America and the Caribbean these surveys have been done thanks to the leadership of CAF, which in some countries has received support from central banks and superintendencies.

Under this context, in 2015 CEMLA and CAF invited central bank researchers to take part in joint research that would be based on data from the financial capabilities surveys of CAF and other national financial education and inclusion surveys. The proposal was presented at the 2015 Meeting of the Central Bank Researchers Network in the Dominican Republic. At the end of December 2015, the central banks of Bolivia, Brazil, Colombia, Dominican Republic, Ecuador, Mexico, Peru, and Uruguay, along with CEMLA, confirmed their participation in said research, resulting in the 13 research papers contained in this book. The papers included here take different approaches to analyze household financial decision making, participation in the formal and informal sector, and the role of education in financial decisions. We hope this body of work enriches discussion and leads to a better understanding of these topics, which are key to promoting sustainable development in Latin America and the Caribbean.

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Introduction

Maria José Roa
Diana Mejía

In recent decades, there has been much emphasis on the importance of financial inclusion as a key factor in countries' development. Nevertheless, it should be remembered that it was not until the start of the year 2000 that the topic of financial access became an enormously important common objective on the agendas of G20 countries, governments, ministries of finance, international bodies and central banks, among others. There were three main reasons for this. First, the appearance of a series of studies demonstrating the high level of correlation between poverty and exclusion from the formal financial sector. Second, concerns among the bodies responsible for financial stability that stemmed from the fact that some types of financial inclusion could become a source of instability. Finally, that commercial banks had started to view financial access as a niche for expanding their business. It was at this point that the problem of access to financial services began to form part of a wider concept: financial inclusion (Roa, 2013).

In Latin America, access to financial services is growing, as reflected by a sustained increase in supply indicators such as the amount of bank branches and correspondents, number of accounts at formal financial

institutions, and number of automated teller machines (ATMs) (Cavallo and Serebrisky, 2016). However, the use of these financial products and services is still limited because of the low levels of financial education among the population (Demirgüç-Kunt et al., 2015).

In recent years, globalization and technological progress have brought a set of changes in patterns of social and economic exchanges. These have increased the complexity and multiplied the number of financial products and services available, which has increased the need to improve levels of knowledge among individuals so they are able to make economic and financial decisions conducive to their well-being. As a result, financial knowledge, attitudes, and behavior can have a major impact on the wealth of households and their standards of living, as well as on the functioning of markets.

One of the most important lessons learned from the 2008 international financial crisis is that the lack of knowledge and information among a large segment of the population concerning basic economics and financial topics limits their capacity to make responsible, conscious, and appropriate decisions. Financial education is therefore crucial for inclusion, not only because it facilitates the effective use of financial products, but also because it helps individuals to develop abilities for purchasing and selecting those best adapted to their requirements and possibilities. This enables them to exercise their rights and responsibilities (Mejía and Rodríguez, 2016).

At the end of 2013, CAF-Development Bank of Latin America conducted a survey to measure the financial capabilities of four Andean countries: Bolivia, Colombia, Ecuador and Peru. The aim of this survey was to carry out a diagnosis of the level of financial inclusion that allowed for identification of the knowledge, skills, attitudes, and behaviors of individuals regarding financial topics and their relation with financial inclusion. The sample size for each country was around 1,200 respondents at the national level (Mejía and Rodríguez, 2016).

The survey consisted of 33 questions on financial behaviors, knowledge, and attitudes, as well as questions on financial inclusion and sociodemographic information. An initial analysis based on comparative indexes according to sociodemographic variables obtained the following preliminary conclusions:

1) It is important to establish different strategies for different population segments, of which those with lower financial capabilities stand out: individuals with low levels of education,

low-income individuals, people with irregular income, people living in rural areas, women, young people, old people, and those not able to save.

2) The ability to save, especially through formal arrangements such as savings accounts, has a very significant impact on an individual's financial capabilities. This implies that financial inclusion and education programs should not only focus on the transmission of concepts and knowledge, but also on changing attitudes related to the importance of saving and the relative costs of informal saving.

3) Sex difference does not affect all women in the same way. Women who are heads of household, for instance, exhibit better financial attitudes and behaviors.

4) Recipients of government transfers or subsidies record worse results in ideas and knowledge indexes, and exhibit attitudes opposed to saving. These findings show that beneficiaries of these types of social programs should have training on basic financial concepts, and provide innovative strategies for promoting saving.

The results highlight the importance of carrying out a more detailed and robust empirical study that allows assessment of the different hypotheses and questions that emerge. In 2015, Center for Latin American Monetary Studies (CEMLA) and CAF invited researchers from the central banks of Bolivia, Colombia, Ecuador and Peru to participate in a joint research project based on the database of the CAF survey. The proposal was presented at the 2015 Meeting of the Central Bank Researchers Network in the Dominican Republic. At this technical meeting, the central banks of other countries expressed interest in participating in the research, given that they have already conducted national financial surveys among households in their own countries. For this reason, and with the endorsement of CAF, the invitation to participate in the project "Households' Financial Decision Making" was extended to the research heads of all CEMLA member central banks. By the end of December 2015, the central banks of the following countries had confirmed their participation: Bolivia, Brazil, Colombia (three papers), Ecuador, Mexico (two

papers), Dominican Republic (two papers), Peru and Uruguay (two papers) and CEMLA; giving a final total of thirteen research papers.

The idea for a team of central bank researchers to analyze data from the financial capabilities survey stems from two areas. First, studies have found that financial education and inclusion programs in the central banks of the region are of growing importance (García et al., 2013; Roa et al., 2014; Mehrotra and Yetman, 2015). Second, there has been recent interest among central banks in understanding households' financial behavior, and in obtaining data and information on such behavior (Bank of England, 2015; Alamsyah, 2015).

For central banks, financial inclusion is key for increasing the effectiveness of monetary policy, as a large percentage of the population having access to formal financial services enhances monetary policy transmission and its countercyclical role. However, if a process of inclusion is not developed that considers market and regulatory failures, it can have adverse effects on financial stability. Regulation and supervision, financial consumer protection, and financial education programs would appear to be crucial for achieving efficient access and usage of formal financial markets that do not jeopardize financial stability (Roa, 2016).

A recent paper from the Bank for International Settlements (Mehrotra and Yetman, 2015) shows how greater financial inclusion can make interest rates a much more effective policy tool, as they would influence the behavior of a larger number of households and small firms. The authors also state that although financial inclusion has a positive impact on financial stability by providing a more diversified and broader base of depositors, it can also pose a threat to it if greater access results in rapid credit growth and the expansion of some unregulated, or more loosely regulated, parts of the financial sector.

At present, various central banks are increasing their interest in understanding the financial behavior of households, as well as in obtaining detailed periodic data and information on them. The Federal Reserve Bank of New York points to several reasons for this (Dudley, 2015). First, the recent financial crisis highlighted that understanding and anticipating households' behavior is essential for achieving a strong and robust economy. Second, it is crucial to find out how interventions aimed at changing the incentives for household's behavior really affect it. Finally, research on household finance will help to support the central bank's commitment to the community and the fulfillment of its mission and duties.

In achieving a greater understanding of household finance, central banks emphasize the importance of firstly elaborating databases with information on households' financial and economic behaviors. An increasingly large number of central banks are promoting be it from the central bank itself or with the support of other institutions such as ministries of finance or national statistics institutes the preparation of demand-side databases on financial consumers.

Thus, the report elaborated by the Bank of England (2015) underlines the importance of using new data, methodologies, and approaches to help understand households' financial and economic behavior. It also suggests that exploring different assumptions on households' behavior would help in understanding behaviors such as not saving sufficiently for retirement, investing in too risky or too conservative assets, not exploiting tax benefits, having costly mortgages, participating in the informal financial sector, and carrying too much debt. It would also help identify the determinants of waves of enthusiasm or pessimism among the population, which can lead to financial booms or crises (Akerlof and Shiller, 2009). The Bank of England report emphasizes that, as financial stability becomes more important in central bank mandates, it is important to research and gain thorough knowledge of the possible links between households' financial decision-making and subsequent financial crises.

We therefore believe this joint research has enhanced the understanding of households' behavior in the region, providing valuable information on how financial attitudes, knowledge, and sociodemographic variables determine financial decision-making. These results could also be valuable for the design and implementation of effective financial education and inclusion programs.

The research aimed at achieving a greater understanding of the factors underlying and determining financial decisions and behaviors in the countries of the region regarding saving, budget planning, and the use of different formal and informal saving, credit, and insurance instruments. Specifically, the variables were the use of different financial products, participation in formal and informal financial markets, and financial behaviors and attitudes. The initial hypothesis was that these variables could mainly be explained by financial knowledge, respondents' propensity to save versus spend, time and risk preferences, and some sociodemographic variables.

The research identified the sociodemographic gaps that divide populations. This will enable appropriate financial inclusion and

education interventions according to needs. The fact that it was a demand-side survey means the results are extremely useful for designing such strategies. We believe surveys related to demand-side financial behavior should serve as a starting point and are the first step towards developing effective financial education and inclusion programs.

One thing of great importance is that because various countries used the same measurement methodology, comparative studies across countries were elaborated. The results of the survey are specific for each country, but important sociodemographic gaps can be identified, particularly those related to sex, geographic environment (urban, rural), and education and income levels.

The joint research was coordinated by María José Roa, Senior Researcher, Economic Research Division, CEMLA, and by Diana Mejía, Senior Specialist, Department of Productive and Financial Development, CAF. Moreover, international experts, specifically Annamaria Lusardi, Dean Karlan, Leora Klaper, Olympia Bover, Diana Mejía, Pratibha Joshi, and Marina Dimova supported the research throughout 2016 with virtual seminars[1]. It also had the assistance of: *1)* regular virtual meetings at which participants made draft presentations of their work (during June, July and August); *2)* one in-person meeting at CEMLA's offices on September 23 and 24, and *3)* three panel discussions during the 2016 Researchers Network held in Brasilia on November 7 and 8. We also counted on the assistance of CAF at all times during the process.

This book brings together the papers elaborated during the joint research on Households' Financial Decision Making. The papers in the first part of the book aim to analyze the main determinants of households' financial decisions related to the use of savings and credit products, and particularly the different use of formal or informal financial products. The latter point is especially relevant in the region, where formal and informal financial products coexist harmoniously (Demirgüç-Kunt et al., 2015). The studies show that sociodemographic variables (mainly sex, education, level of income and employment), financial education, numeracy skills, and

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[1] Virtual seminars are available at: <https://www.youtube.com/watch?v=c38v1u6rgvM&feature=youtu.be> ☑, <https://www.youtube.com/watch?v=PUpFbpBxbEg&feature=youtu.be> ☑, <https://www.youtube.com/watch?v=xJPv5gX39OM&feature=youtu.be> ☑.

personality traits are fundamental in the financial decision-making of households in the region.

For Bolivia, Angélica del Carmen Calle, analyzes the determinants for holding formal and informal financial products. The results show that holding financial products in that country mostly depends on socioeconomic level. Specifically, for informal financial products, the author finds that being a woman, having only a primary education, and earning a low income increases the possibility of having these types of products. The possession of both informal and formal products is more probable in households with an average socioeconomic level, people with a secondary complete or incomplete level of education, and people with medium to high financial knowledge.

Gabriel Garber and Sergio Koyama of the Banco Central do Brasil use a technique that combines variables and weightings to: *1)* produce measures for financial knowledge and financial attitudes; and *2)* allow for measuring the impact of financial knowledge and attitudes. The methodology employs the predicted impact of financial knowledge and attitudes on behavior to assign weightings to consider for policy interventions, such as financial education programs. They carry out the study with the CAF survey for Bolivia, Colombia, Ecuador and Peru. The effects of financial attitudes and knowledge on behavior vary across countries, as do the weightings on which to base the interventions. Although weightings vary from one group of countries to another, the authors conclude that financial attitudes especially the tendency to set long term goals are a key determinant of households' financial decision-making.

For the case of Colombia, Ana María Iregui-Bohórquez, Ligia Melo-Becerra, Maria Teresa Ramírez-Giraldo and Ana María Tribín-Uribe empirically analyze the determinants of saving among low- to middle-income individuals in urban and rural zones. Their results show how the probability of saving increases with education, income, employment, and home ownership. On the other hand, the results indicate that education and income increase the likelihood of saving in banks and decrease the probability of informal saving in both urban and rural zones.

Also for Colombia, in another study in this book, the authors provide empirical evidence on the determinants of the probability of a household having formal or informal credit, as well as the likelihood of households being in arrears with their loan payments. The results show that the probability of a household having credit

positively relates to whether a person is married, level of education and income, size of household, home ownership, and employment. The estimates show that income and education positively correlate to having formal credit and negatively correlate to the probability of having informal credit. Finally, income, loan allocation, and some unexpected events explain the likelihood of being in arrears.

Daisy Pacheco and Ana María Yaruro, also analyze the variables that determine whether people decide to acquire financial products and services in Colombia, but with one innovation: they relate the fact of having a financial product to that of knowing about the said product or not. To do this, the authors use two-way contingency tables to estimate the dependence between knowledge and the possession of financial products, using sociodemographic factors and households' financial attitudes, among other variables. The results indicate that not possessing a financial product, in spite of knowing it exists, relates to low levels of education, income, and a lack of a budget, among other things.

María José Roa, Ignacio Garrón and Jonathan Barboza of CEMLA use the survey coordinated by CAF to study the role of cognitive characteristics, personality traits, and financial education in saving and credit decisions in Bolivia, Colombia, Ecuador and Peru. This paper performs an analysis that includes alternative determinants of financial decisions, different from those pointed out by traditional economic theory. Its results show that diligent individuals with greater numerical skills are more likely to participate in formal credit and saving markets, and have a greater tendency to save. According to the paper, financial education is important for having credit and for participating in the formal financial sector.

In Peru, Augusta Alfageme and Nelson Ramírez firstly describe a general overview of the evolution of access to financial services. Their descriptive study shows substantial differences in bankarization according to levels of income, saving possibilities, and the education of the head of household, among others. In spite of these gaps, they also observe unbanked sectors in the wealthiest quintile and among those who have a higher level of education. On the saving side, their analysis shows that lower income households also save, while there are households with high levels of income that are unbanked. Secondly, they analyze the main determinants of the access to financial services through a standard probit model of binary variables. They define access as the situation where one household

member has some kind of bank product. The authors find a positive relation between income, education, and age in bankarization levels; and a negative relation between bankarization levels and the population in rural areas that are in a state of poverty.

In the Dominican Republic, Harold Vásquez and Maria del Mar Castaños assess how the lack of information and math skills affect the probability of an individual obtaining informal credit. The authors also try to identify some of the main factors that determine households' financial decisions. Using a multinomial logit model, they find that having low-income levels, not being a bank customer, and not understanding basic financial concepts increase the likelihood of acquiring a loan from informal sources.

In the same country, Carlos Delgado analyzes the determinants for the probability that a household has at least one bank product, using probability models for binary response variables. The results indicate that this probability mainly depends on variables related to employment status, income level, formal education, and households' financial attitudes. With respect to the latter factor specifically, planning purchases and monitoring financial matters displayed the most marginal effects.

In Uruguay, Gerardo Licandro and Miguel Mello diverge from the objectives and themes of previous works in the book by studying factors associated to the financial and cultural dollarization of Uruguayan households. The authors estimate the phenomenon of cultural dollarization using the option for respondents to report by currencies, while they define financial dollarization as the proportion of total bank assets denominated in dollars. On the one hand, the authors find that savings and the household's wealth mainly explains the level of dollarization of bank savings. On the other, they find that cultural dollarization is associated to wealth, being a homeowner, age, and number of years in formal education. The authors conclude that the weight of real assets in wealth, and of those in dollarization and cultural dollarization, suggest that the dollarization of prices of high-value goods in Uruguay (houses and automobiles) is a key factor for explaining cultural dollarization. Furthermore, all the factors that reinforce the idea that large amounts should be quoted in dollars further contribute to deepening cultural dollarization.

Part 2 of the book groups together a set of papers that focus on analyzing the impact of different policies linked to financial

inclusion on households' financial decision-making with respect to saving and credit. As we mentioned at the beginning, financial inclusion has become increasingly important on the agendas of organizations, governments, and public and private institutions. In many countries, this importance has translated into practical interventions and even national financial inclusion strategies (Roa et al., 2014).

In Mexico, Mauricio Carabarín, Adrián de la Garza, Juan Pedro González, and Antonio Pompa assess the impact of the correspondent agents model on financial inclusion in that country, specifically on the number of active bank accounts and the total volume of bank deposits. To do this they use a difference-in-differences model. The preliminary results show a positive effect of correspondent agents on both measures of formal saving. The authors do not find different effects for rural communities, but do find evidence of a spillover effect at municipal level, which suggests that bank saving could decrease if clients begin a relation with a correspondent agent.

Also for Mexico, Carolina Rodríguez studies the effect of an increase in the Value-Added Tax (VAT) on the probability of having a bank account, considering that informality is the main channel for this effect. In particular, it is assumed that raising the VAT rate increases the benefits of being informal, which decreases the probability of small firms having a bank account in order to avoid supervision. To achieve her objective the author employs difference-in-differences estimation based on a change in VAT legislation that took place in Mexico in 2014. This tax reform represents a natural experiment, comparing microentrepreneurs in the areas affected by the tax amendment with microentrepreneurs in other areas before and after the reform. The results suggest that an increase in VAT has a negative impact on financial inclusion among microentrepreneurs.

Finally, for the Uruguayan case, María Victoria Landaberry carries out an estimation of models on the default probability of households considering their sociodemographic and financial characteristics. The author finds that household income, the relation between expenses and income, and the age of the head of household are significant for explaining the default probability in all credit segments, while the education of the head of household is only relevant

for the non-mortgage credit segment. The paper also evaluates the effect of the obligation to pay wages through electronic media, implemented by the Law of Financial Inclusion, on households' non-payment of debt. According to the results, access to bank accounts by households increases the number of households with non-mortgage and credit card debt, each of which involve different types of risks.

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Determinants of Households Financial Decision-Making in the Region

Analysis of the Ownership of Financial Products: Evidence to Contribute to Financial Inclusion in Bolivia

Angélica del Carmen Calle Sarmiento

Abstract

This paper analyzes the determinants of owning financial products as opposed to not owning any, placing special emphasis on variables such as households' socioeconomic level, education, and financial literacy. To complement this, the behavior of households was assessed in relation to their ownership of informal products, and their ownership of formal products together with informal ones, evaluating the outcomes using the same set of variables. The results showed that ownership of financial products in Bolivia mostly depends on households' socioeconomic level. It was seen that women are more likely than men to own informal financial products. Moreover, households with a low socioeconomic level and adults with a primary education level are the most likely to use these types of products. In the case of financial literacy, the likelihood of using these products was similar for people with medium to high literacy. As for owning informal and formal products together, a growing probability was observed, but it was only significant for households with lower-middle and upper-middle socioeconomic level. Adults with only a secondary education level are more likely to acquire both products, while people with medium and high financial literacy are similarly likely to own such products.

Keywords: financial inclusion, probit, multinomial logit, marginal effects.
JEL classification: C81, G1.

1. INTRODUCTION

Financial inclusion (FI) has been treated as a matter of interest by different international institutions since the year 2000 and became more important after the 2007-2009 financial crisis. Such interest stems from various studies that demonstrated a strong correlation between poverty and exclusion from the formal financial sector, as well as the impact greater FI can have in reducing the vulnerability of low-income households by giving them the ability to smooth their consumption patterns and better confront events that might jeopardize their regular income flows.

Levels of FI can be affected by the percentage of the population, mostly the vulnerable and poor, that turns to informal channels or their own resources to be able to make the majority of their financial transactions, including transferring money to family members, saving, investing in education, leveraging work opportunities, or facing shocks (Allen et al., 2012). These alternative channels, outside the financial sector, are more costly, limited, and unsafe (Karlan, Ratan and Zinman, 2014), and can worsen the standards of living in such households (Morduch, 1994; Holzman et al., 2003).

The financial system in Bolivia has improved substantially, driven by the country's sustained economic growth over the last 10 years, low inflation, and greater political stability. In 2007, the number of financial service points (FSPs) was 1,673, while by 2015 this number had tripled to 5,130. In terms of location, these services had significant coverage in rural areas with a total of 261 FSPS in 2007, which by 2015 had reached 4,946. The number of branches, agencies, and other FSPS tripled, while automated teller machines (ATMs) increased fivefold. Moreover, according to the Financial System Supervisory Authority (Autoridad de Supervisión del Sistema Financiero, ASFI) data, the total number of deposit accounts grew by 219% between 2007 and 2015, while the number of borrowers increased 52% between 2010 and 2015.

However, the Financial Capabilities Survey in the Andean Countries of Colombia, Ecuador, Peru, and Bolivia (FCS) has shown that, in terms of financial product ownership, 35% of respondents in Bolivia mentioned having a savings account. This was the largest proportion, followed in second place by those having credit cards with 14%, and those having current accounts with 12%, while 33% of respondents reported not having any financial products.

The main objective of this study, therefore, is to determine what type of socioeconomic characteristics influence the likelihood that a Bolivian household has some kind of financial product as opposed to not having any at all. It will also consider the probability that households have some kind of informal product or own an informal product alongside a formal product, taking into account their socioeconomic characteristics. To carry out the analysis, we employed the FCS elaborated by the CAF-Development Bank of Latin America, and a probit regression and a multinomial logit regression. We observed that, in Bolivia, people with a higher socioeconomic level and those with greater financial literacy are more likely to own financial products. Meanwhile, individuals with a lower socioeconomic level and less education generally tend to turn to the ownership of informal products. Nevertheless, financial literacy could have less influence on this decision given that the probabilities of acquiring such products remained the same for individuals with a medium level of financial literacy as for those with a high level. Finally, there is a significant growth in the number of people owning both formal and informal products among households with lower- and upper-middle socioeconomic levels, individuals with primary and secondary education, and people with medium or high financial literacy.

The paper is organized as follows: Section 2 examines the definition of FI, its demand-side determinants, and FI in Bolivia. Section 3 describes the results of the FCS in terms of financial literacy and ownership of financial products for the case of Bolivia. Section 4 outlines the model used and the main results obtained. Finally, Section 5 presents the conclusions of the study.

2. FINANCIAL INCLUSION

The International Network on Financial Education defined FI as the process of promoting affordable, timely and adequate access to a wide range of regulated financial products and services, broadening their use by all segments of society through the implementation of existing tailored and innovative approaches, including financial awareness and education, with a view to promoting financial welfare, as well as economic and social inclusion. Meanwhile, the Alliance for Financial Inclusion cites that financial inclusion should be defined based on four dimensions: access, usage, quality, and welfare.

Access is understood as "the ability to use the products and services offered by formal financial institutions," and usage as "the depth or extent of financial services and product use." Quality would indicate whether the attributes of products and services meet the needs of customers and whether product development takes such needs into account. Finally, welfare is defined as "the positive impact that a financial device or service has had on the lives of customers" (AFI, 2011).

Since the start of 2000, financial inclusion (FI), along with financial education (FE), has been a matter of interest for different international bodies.[1] Such interest stems from the publication of several studies demonstrating that there is a high level of correlation between poverty and exclusion from the formal financial sector. Thus, governments of the Latin America and the Caribbean region, as well as the rest of the world, have seen in the policies of FI and FE as a tool to encourage economic growth and social equity, within a context of financial stability (Roa et al., 2014).

Olloqui et al. (2015) state that the aim of FI is to provide the necessary tools for individuals to be able to sustain their livelihoods and more effectively create assets, smooth consumption and manage idiosyncratic risks such as those related to health, unemployment, death, and other shocks that destabilize household consumption patterns. All the aforementioned are in addition to the basic benefit of being able to manage daily transactions more practically and safely.

In the case of households, which obtain different levels of excess income according to their consumption, it is also important to take into account the volatility of these consumption flows. Thus, household saving is an important variable for absorbing unexpected flows in consumption. If markets were complete, agents would have an asset portfolio that maximized their income and therefore favor their consumption and contribute to reducing volatility. However, this scenario is subject to some significant deviations that undermine the most vulnerable households.

The distribution of assets in vulnerable households includes accumulating low yield but highly appropriate assets, which can be liquid (cash) or illiquid, depending on preferences and income patterns.

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[1] The G20, the World Bank, the United Nations, the International Network on Financial Education, and the Alliance for Financial Inclusion are among the most important.

In both cases, this allocation can result in relatively high losses in value. Policies that enable assets to be reallocated into appropriate financial instruments can considerably improve the yields households obtain, as well as reduce the losses incurred during severe disturbances that in the absence of such instruments would have to be met by selling assets (Olloqui et al., 2015).

Thus, it can be seen how two important effects of access to financial services contribute to reducing the vulnerability of the poorest households. First, financial inclusion smooths the variability of consumption, using mechanisms that allow adverse shocks (be they on income or prices) to be addressed more effectively. And second, it increases the value of assets, be they human capital (health and education) or physical/productive.

FI not only affects the well-being of households, but also the stability of the financial system in general, and thereby economic growth. Hence, greater FI reflected in broader access to and use of bank deposits can significantly mitigate bank deposit withdrawals in times of financial stress (Han and Melecky, 2013). In the same way, at the macro level, increased access to financial services has positive effects on growth and on reducing inequality. With respect to the latter, inequality rises as countries progress through the early stages of financial development, but declines substantially in the intermediate and advanced stages (Jahan and McDonald, 2011). Studies show how financial inclusion has the potential to reduce inequality and poverty, and drive economic growth. In particular, a 10% increase in access to financial services has been shown to generate a reduction of 0.6 points in the Gini inequality index (Honohan, 2007).

On the demand-side, it has been demonstrated how FI faces the following obstacles (Cano et al., 2013): *1)* low levels of information on existing financial products among the population; *2)* low levels of financial capabilities or education[2] among the population; *3)* the high costs associated with opening and maintaining financial

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[2] According to the Organization for Economic Cooperation and Development (OECD, 2005), financial education is defined as the process by which financial consumers/investors improve their understanding of financial products, concepts and risks and, through information, instruction, and/or objective advice, develop the skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being.

products, *4*) agents' inability to supply all the required documentation; *5*) lack of technical or specialized advice from experts that explain clearly and independently the portfolios of financial services available, their costs, advantages, and disadvantages; *6*) lack of collateral or guarantees that satisfy banks' demands, and a general incapacity to back operations with their income when not in formal and stable employment; and *7*) distrust among some segments of the population for formal financial institutions.

In addition, Simpson and Buckland (2009) compared results from 1999 to 2005 and found that one of the reasons why individuals do not use the financial system is that they do not understand the products offered by financial institutions. The results showed that unbanked individuals generally have low incomes and wealth, are young with low levels of education and a large family, and belong to areas specifically characterized by poverty. Furthermore, age, income, and wealth have a nonlinear relation with bankarization according to the life cycle theory.

Under the above scheme it was possible to identify that levels of FI are affected by households' socioeconomic characteristics, specifically those of the vulnerable and/or poor population that turn to their own resources or informal channels to be able to perform the majority of their financial transactions, including transferring money to family members, saving, investing in education, leveraging employment (income generating) opportunities or facing shocks (Allen et al., 2012). These alternative channels outside the financial sector are more costly, limited, and unsafe (Karlan et al., 2014), and can worsen even further the standards of living of these households (Morduch, 1994; Holzman et al., 2003). Moreover, private debt in the informal sector can become a potential source of systemic risk, either directly or through its connection with the regulated financial system.

Despite the significant progress made in terms of financial inclusion, substantial differences still exist between regions, income levels, sex, and other dimensions. The most recent demand-side study is the Global Financial Inclusion (Global Findex) Database of the World Bank and the Bill and Melinda Gates Foundation (Demirgüç-Kunt et al., 2014). This study provides detailed data for 2011 and 2014 on how individuals save, lend, make payments, and manage risk. In 2014, this database had over 100 indicators that can be broken down by sex, age group, and household income. The indicators

were calculated based on surveys conducted among 150,000 randomly chosen adults over the age of 15 representing each of 143 selected countries.

Between 2011 and 2014, 700 million adults became account holders, while the number of adults without an account fell by 20% to 2 billlion. At the international level, 61% of adults had a bank account in 2014 as compared to 51% in 2011. In Latin America, the percentage of adults with accounts at a financial institution rose 12 percentage points, the second largest increase behind Asia. In the case of loans, the trajectory was also upwards, although the size was smaller than the trend for bank accounts. This trajectory might be a result of the cyclical path of the economy, an extension in alternative sources of financing or the still weak recovery from the global financial crisis in many parts of the world. Finally, it is important to mention that compared to high-income OECD countries, all other regions are at a disadvantage given that 94% of the adult population in developed countries have an account and 18% have a loan (Demirgüç-Kunt et al., 2014; Sahay et al., 2015).

Furthermore, although the first step in financial inclusion is having a bank account, the degree of usage of these accounts is more important. In this regard, the Global Findex estimated that, in 2014, 37% of adults with a bank account did not make any deposits or withdrawals for one month. In Latin America, 18% of individuals use their account to receive government payments and 6% use accounts to pay for services, figures similar to those registered at the international level, but below those observed for developed countries.

2.1 Financial Inclusion in Bolivia

In Bolivia, the financial system has strengthened significantly, driven by the sustained economic growth of the last 10 years, low inflation, and greater political stability. Thus, in mid-2013, the government introduced Financial Services Law No. 393,[3] which modified the

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[3] Financial Services Law No. 393 of 2013 replaced Bank Law No. 1488 of 2004. The new law benefits the manufacturing and social interest housing sectors by granting them preferential interest rates set by the government, not charging the reference interest rate, establishing maximum commissions financial entities can charge, setting a minimum annual rate of 2% for individual savings bank accounts in domestic currency for persons that maintain an average monthly

functioning of the Bolivian financial system, demanding that financial institutions implement and put into practice tasks and programs that did not exist previously. For 2015, according to data from the Financial System Supervisory Authority, the strengthened Bolivian financial system recorded outstanding figures, and deposits as a percentage of gross domestic product (GDP) grew from 38% in 2005 to 63% in 2015. In the same way, the portfolio as a percentage of GDP increased from 35% in 2005 to 50% in 2015. As for coverage, the number of financial services points tripled between 2007 and 2015, benefitting both urban and rural areas of the country.

The structure of financial system intermediaries in Bolivia consists of 52 institutions, 17 of which are banks and 35 are nonbank entities. Among bank entities, there are a total of 14 commercial banks and three small and medium enterprise (SME) banks, while nonbank entities include eight mortgage lending institutions and 27 open savings and credit cooperatives. There are also 58 entities in the process of adaptation, of which 12 are development banks and 46 are savings and credit cooperatives and credit unions.

The coverage of financial services has improved considerably in Bolivia during recent years. In 2007, there was a total of 1,673 financial access points, of which 806 were ATMs and 867 were branches, agencies, and others. The number of FSPs tripled in 2015, reaching a total of 5,130, of which 2,810 are ATMs and 2,320 are branches, agencies, or others. In terms of location, these services extended considerably into rural areas: In 2007 there were 261, while in 2015 there were 4,946. A break down by type of service reveals that branches, agencies, and others tripled in number, and ATMs increased fivefold. Furthermore, according to data from the ASFI, the number of deposit accounts grew 219% between 2007 and 2015, while the number of borrowers increased by 52% between 2010 and 2015.

Since mid-2014, monetary policy in Bolivia has followed an expansive countercyclical path. Thus, by 2015 there was a downward trend in passive interest rates on fixed term deposits (FTD) and savings accounts in domestic currency, while interest rates on foreign

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balance of above BOB 70,000 (USD 10,000), and a minimum interest rate for individuals who at the time of making a fixed term deposit (FTD) do not have more than BOB 70,000 (USD 10,000 approximately). In these types of deposits, for instance, an individual with an FTD of 361 at 720 days would obtain a minimum rate of 4 per cent.

currency denominated FTD and savings accounts also remained at historically low levels. Moreover, the domestic currency interest rate of reference decreased. As for active rates, these also fell significantly, in line with that set forth in the new Financial Services Law No. 393.

To compliment the above, data from the survey conducted by the World Bank Global Findex (Global Financial Inclusion Database) shows the number of bank accounts and loans for individuals over the age of 15. With respect to the former, the growth rate of bank accounts between 2011 and 2014 placed Bolivia in fourth place behind Uruguay, Chile, and Argentina, and above Peru, Colombia, and Brazil (Figure 1), while loans recorded a positive rate of growth that was only higher than that reported for Peru (Figure 2). Looking at data on account and loan ownership by sex, it can be seen that both men and women had more accounts and loans at financial institutions in 2014 than in 2011 (Figure 3). Meanwhile, account holding has also increased among individuals belonging to the 40% of the population with low income and those belonging to the 60% of the population with higher income. Nevertheless, it stands out that in the case of loans, the increase is small for the population belonging

Figure 1
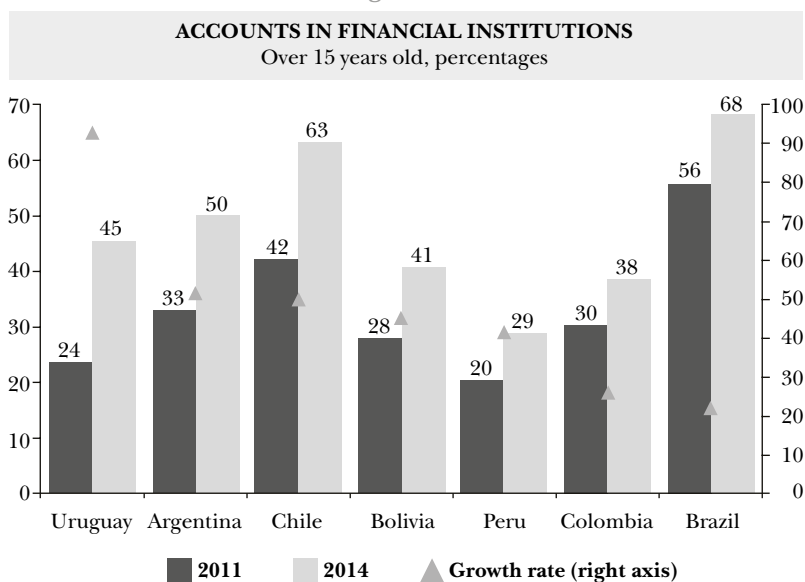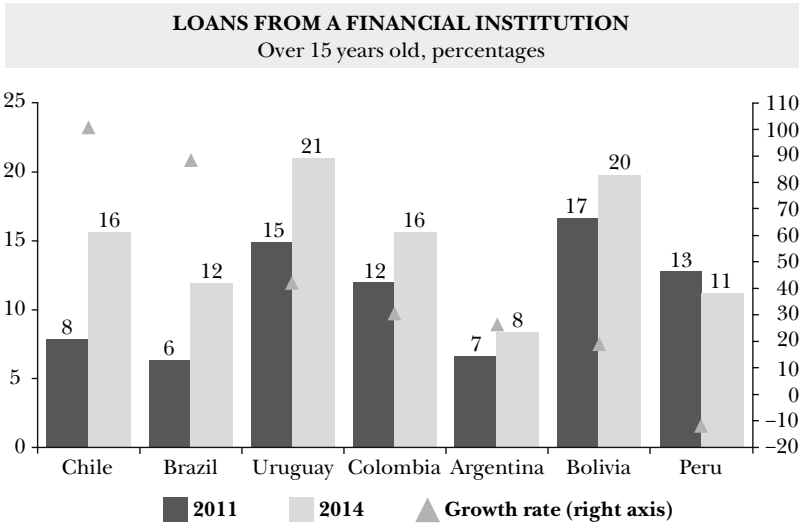
ACCOUNTS IN FINANCIAL INSTITUTIONS
Over 15 years old, percentages

Source: Global Findex-World Bank.

Figure 2

LOANS FROM A FINANCIAL INSTITUTION
Over 15 years old, percentages

Source: Global Findex-World Bank.

Figure 3

ACCOUNTS HOLDING AND LOANS IN/FROM FINANCIAL INSTITUTIONS BY SEX
Over 15 years old, percentages

Source: Global Findex-World Bank.

Figure 4

**ACCOUNTS AND LOANS IN/FROM FINANCIAL INSTITUTIONS
BY INCOME DISTRIBUTION**
Over 15 years old, percentages
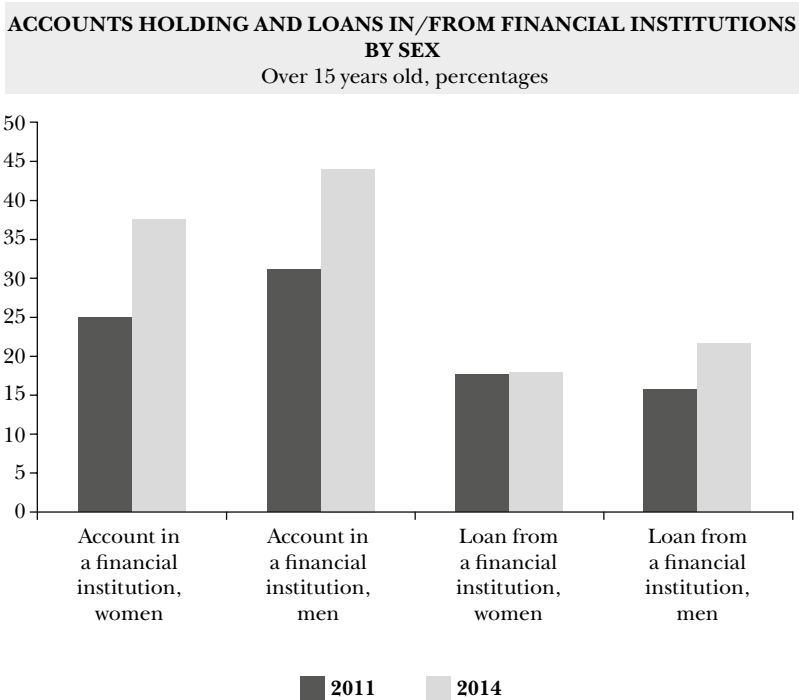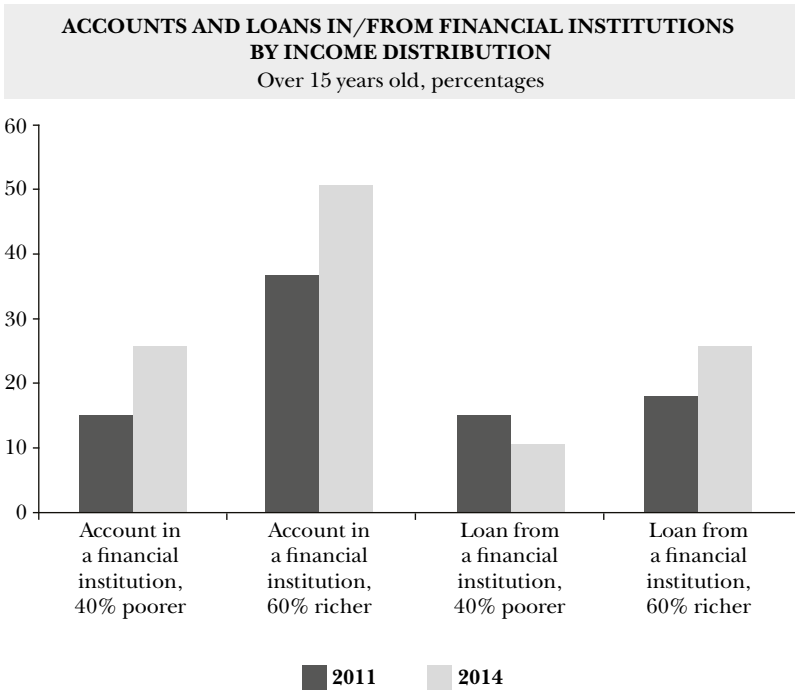
Source: Global Findex-World Bank.

to the 40% with lower income, while the population with higher income exhibited a sharp upward trajectory (Figure 4).

The above description highlights the progress made in Bolivia regarding access to the financial system by the population and reflects improvements in terms of FI. However, it is important to continue increasing access to accounts as well as loans at financial institutions and identify any shortcomings that might be hampering the progress of FI in Bolivia. In fact, the data described above allows for identifying patterns that should be considered in the case of loans, given that it can been seen how the number of women with loans grew only marginally and remained relatively constant between 2011 and 2014, while the increase has been larger among men. Moreover, when looking at income distribution it can be seen that the population with higher income generally has a larger percentage of loans as compared to the population with lower incomes.

As established in the previous section, the most vulnerable households, characterized by lower levels of income and education, tend to turn to the financial system less and use more informal sources of financing.[4] According to data from the Global Findex for Bolivia, in 2014 2.8% of the population over the age of 15 used an informal private lender, while 14% saved through informal means such as savings clubs or with someone different from their family environment. Compared to women, men have a larger percentage of loans from informal institutions and save more through informal methods. In terms of income, the 40% of the population with the lowest income has more loans with informal private institutions than the 60% of the population with higher incomes. The opposite behavior is observed for savings, where the 60% of the population with greater resources has more savings in these types of institutions. Finally, it can be seen that individuals with a secondary or higher level of education have a larger percentage of savings and loans with these types of intermediaries (Figures 5-8).

One of the lessons that can be learned from the 2008 international financial crisis is the lack of knowledge and information among a large part of the population regarding basic economic and financial matters, which limits their ability to make responsible, conscious, and competent decisions. Thus, FI depends heavily on financial education, given that the latter not only facilitates the effective use of financial products, but also helps people develop the skills for comparing and selecting the products that are best suited to their needs, and empowering them to exercise their rights and responsibilities (Roa et al., 2014).

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[4] The term *informal* used throughout this paper also encompasses unregulated institutions. Informal loans include lenders and pawnshops that are among the answer options for the question on whether the respondent knows/has any financial products. In the case of saving products, answer options for the question on whether the respondent has been saving money in any of the following, include the option of saving in groups (*pasanaku*) and saving at home. Nevertheless, it is possible that lenders have sufficient capital to set themselves up as financial institutions, but are in the process of adaptation. For instance, the option of saving in groups includes savings in Promujer, an institution that is in the process of adaptation according to the Financial System Supervisory Authority. Such institutions are unregulated rather than informal.

Figure 5
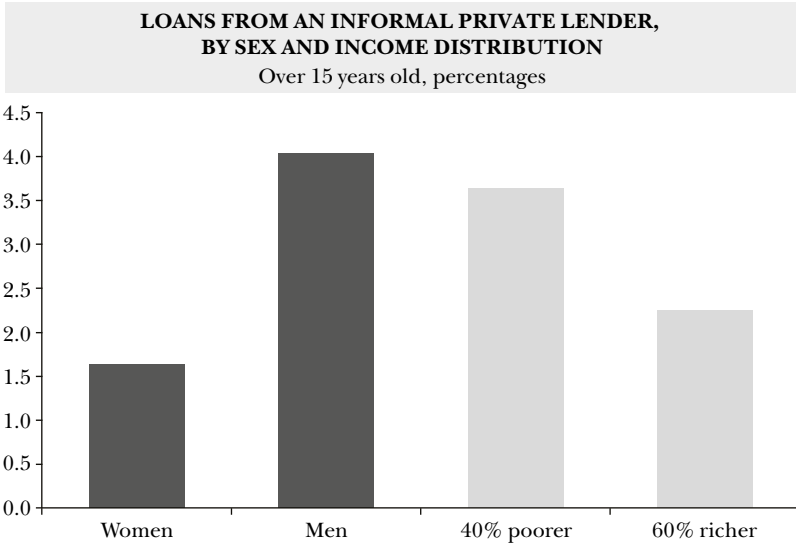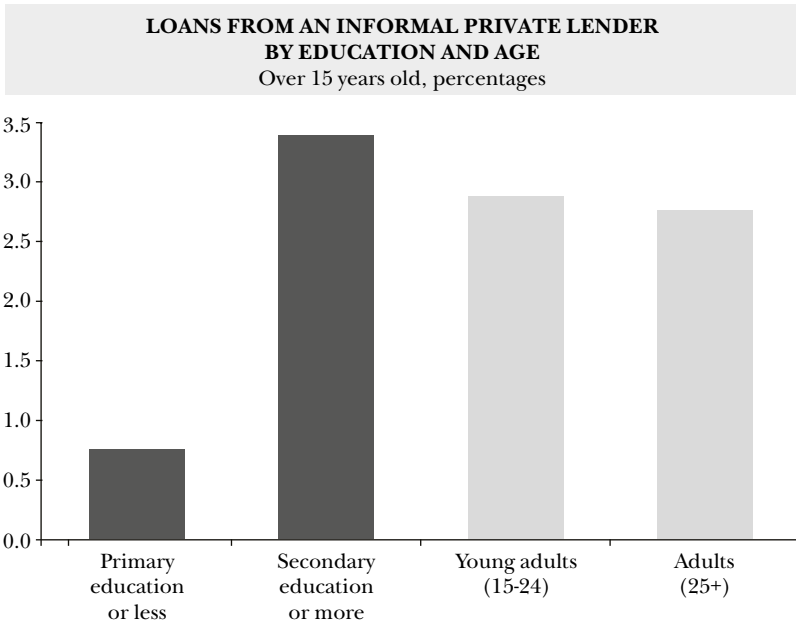
**LOANS FROM AN INFORMAL PRIVATE LENDER,
BY SEX AND INCOME DISTRIBUTION**

Over 15 years old, percentages

Source: Global Findex-World Bank.

Figure 6

**LOANS FROM AN INFORMAL PRIVATE LENDER
BY EDUCATION AND AGE**

Over 15 years old, percentages

Source: Global Findex-World Bank.

Figure 7

**SAVINGS IN INFORMAL INSTITUTIONS
BY SEX AND INCOME DISTRIBUTION**

Over 15 years old, percentages

Source: Global Findex-World Bank.

Figure 8

**SAVINGS IN INFORMAL INSTITUTIONS
BY EDUCATION AND AGE**

Over 15 years old, percentages
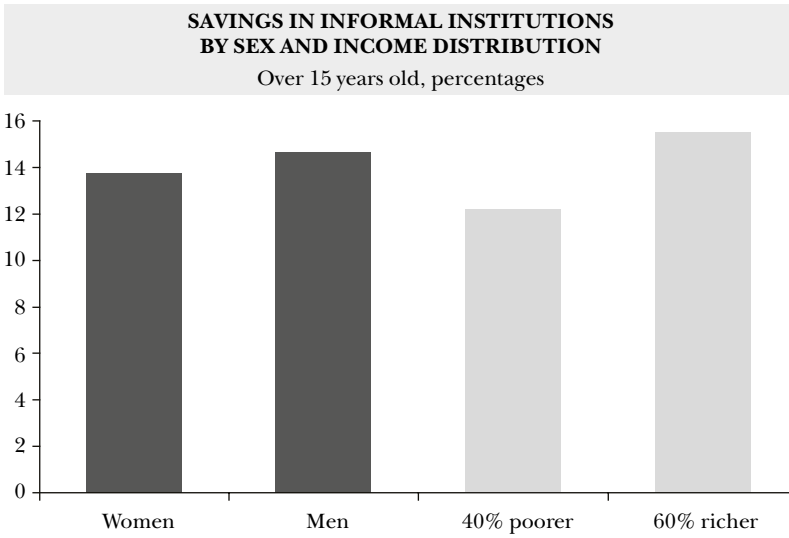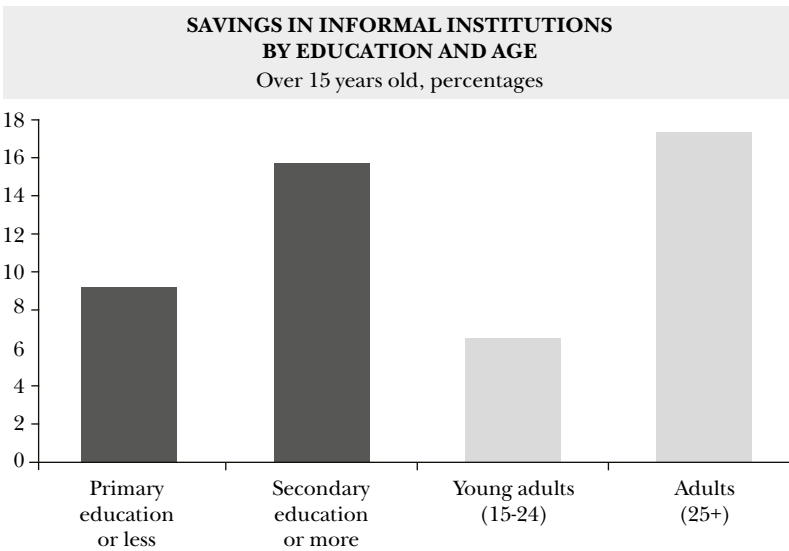
Source: Global Findex-World Bank.

3. OWNERSHIP AND KNOWLEDGE OF FINANCIAL PRODUCTS

In 2013, the CAF, through the Asociación Solidaridad Países Emergentes, Consorcio de Organizaciones Privadas de Promoción al Desarrollo de la Micro y Pequeña Empresa (Copeme), and the Organization for Economic Cooperation and Development, conducted the Financial Capabilities Survey in four countries of the Andean region: Bolivia, Colombia, Ecuador, and Peru. The survey was designed to identify the knowledge, skills, attitudes, and behaviors of individuals with regards to financial topics.

The total database consists of 1,200 respondents, half men and half women. Respondents from urban areas amount to 780 individuals (65%), while 420 are from rural areas (35%). By taking a demand-side approach, the database identified population characteristics connected with financial education and inclusion, demonstrating among its main results the existence of significant sociodemographic gaps, mainly associated to sex, geographic environment, education, and income levels. In the majority of aspects studied, education and income levels mark the most important differences (Mejía et al., 2014).

In the case of Bolivia, the main results of the FCS regarding financial literacy were that[5] when respondents were asked to report the types of financial products they know–from a list including savings account, fixed term deposit, small/midsize business loan, credit card, money lender, and pawnshop, among others–78% of respondents had heard of savings accounts, 55% of credit cards, and 54% of current accounts (Figure 9).

In geographical terms, the financial products on offer are better known in urban than rural areas, except for the product named *money lender*. With respect to the latter, answers affirming knowledge of this informal product in rural areas appear in 45% of cases, while in urban areas they do so in 42%. Greater knowledge of money lenders in rural areas is consistent with the smaller penetration of formal financial products in such areas. Meanwhile, it was found that individuals in the 25-39 age group know more about financial

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[5] The question asked in the survey was: Please tell me, have you heard of any of the following financial products offered by financial institutions such as banks, finance companies, cooperatives, or others?

Figure 9

KNOWLEDGE ABOUT FINANCIAL PRODUCTS
Percentages

Savings account	78
Car insurance-SOAT	70
Health insurance	62
Credit card	55
Check account	54
Fixed-term deposit	47
Mortgage loan	46
Pension funds-AFP	44
Lenders	43
Insurance	38
Loans (consumption)	38
Loans (SME)	37
Pawnshops	33
Credit lines	23
Life microinsurance	21
Microinsurance	15
Investment funds	14
Collateral	13
Letters of credit	10
Stock exchange investment	9
Overdraft in checks account	8
Factoring	7
Financial leasing	7
None	5

Note: Total database of interviewees, 1,200.
Source: Financial Capabilities Survey in Andean Countries-CAF.

products offered by the market, while the over 40s know less about such products. According to socioeconomic strata, it can be seen how households in the highest strata know most about the different financial products. Moreover, as would be expected, respondents with the highest levels of education are those who know most about financial products in Bolivia.

In terms of ownership for the same range of products, it was found that 35% of respondents mentioned having a savings account, this being the largest percentage, with credit cards coming in second with 14%, followed by current accounts with 12%. One result that stands out is that 33% of respondents reported not having any type of financial product (Figure 10).
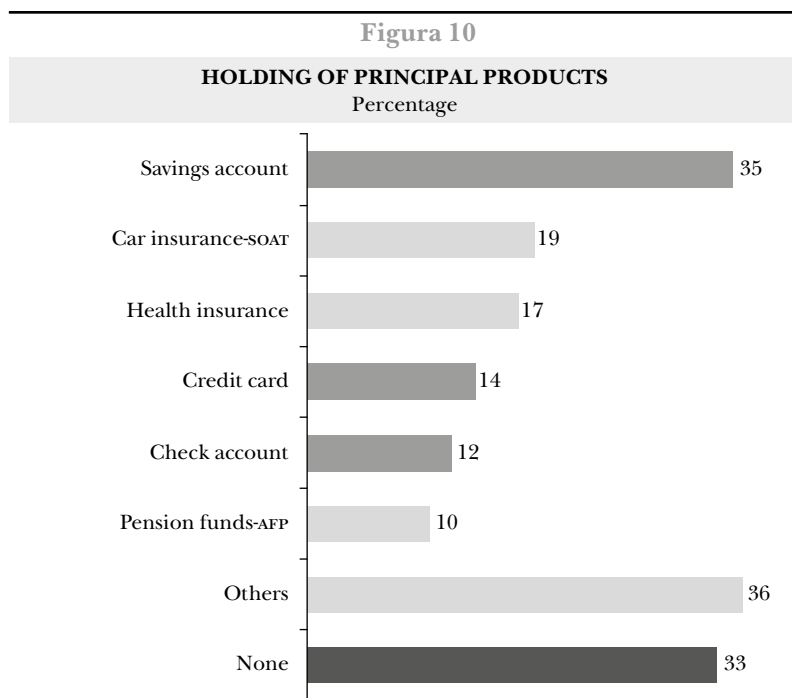
Figura 10

HOLDING OF PRINCIPAL PRODUCTS
Percentage

Note: Total database of interviewees, 1,200.
Source: Financial Capabilities Survey in Andean Countries-CAF.

In addition, in the same way as for knowledge of financial products, the lower the socioeconomic level the lower the possession of financial products. The same panorama can be seen for education, where the higher the level of completed studies, the higher the ownership of financial products. Finally, those who possess financial products are mainly individuals who work as employees.

Considering the results described above, the main objective of this study is to determine what type of socioeconomic characteristics influence the probability of a Bolivian household having some kind of financial product as opposed to not having any. It will also explore the likelihood of households having an informal product, and owning informal products together with formal products, according to their socioeconomic characteristics.

3.1 Data

The data employed for carrying out the analysis was obtained from the FCS and based on the question asked to respondents regarding the ownership of different financial products. The question was answered by 1,132 individuals, of which 372 reported not having any financial products and 760 said they had some kind of saving, credit, or insurance product offered by financial institutions such as banks, finance companies, or cooperatives. Moreover, out of the individuals that have some type of financial product, it can be observed that 676 report owning formal financial products (saving or credit), 61 report owning some type of formal as well as informal financial products (saving or credit), and 23 report only owning some type of informal financial product (saving or credit).

To identify the households that only have informal financial products (saving and credit) and those that own some type of informal financial product together with formal products, answers to two questions from the FCS were studied. The first one is: Please tell me, do you currently own (personally or jointly with another person or other persons) any of these products? Where answer options were "Lender" and "Pawnshop." The second question is: During the last 12 months, have you saved money in any of the following ways? Where an answer option was: "Group saving (informal collective fund, e.g. Promujer, *pasanaku*)."

As stated previously, the survey on the ownership of financial products is available for a total of 1,132 individuals, a sample that might be considered limited if a more detailed analysis is required.

Hence, the number of persons that reported only having credit or saving products is small, 65 and 132, respectively. Most respondents mentioned owning saving as well as credit products. An analysis that assesses the specific behavior for saving and credit products separately would consequently produce erroneous results. The constructed variables did not, therefore, distinguish between saving and credit products, given that this allows for having a larger sample, and estimates that can produce relevant outcomes.

Despite these limitations, it is still important to carry out an analysis of the available sample, considering that there is a large number of individuals that reported not having any financial product. The initial analysis, therefore, focuses on observing the type of socioeconomic determinants that generally influence the ownership of financial products by Bolivian households. To complement this, a simple analysis is also performed regarding households' ownership of informal products, considering households that only own informal financial products and those that have formal as well as informal products. It is important to point out that respondents who mentioned not having any financial product could be potential customers for informal lending or saving institutions, or may have this type of product but do not mention it.

The FCS is the first survey with a true financial approach for the case of Bolivia that also considers important variables such as income, education, and financial literacy, among others. The analysis carried out in this paper, therefore, firstly assesses the socioeconomic determinants of financial product ownership in Bolivia.

In accordance with the proposed objective, the FCS is used to study the impact of households' socioeconomic characteristics, such as respondents' employment status, sex, geographic location, age, socioeconomic level, level of education, and a variable that allows for assessing financial literacy. With respect to the latter, this variable is related to the understanding of key concepts, as well as the capability and skill individuals have for applying it to their daily life (Mejía et al., 2015). Thus, this variable takes into account eight questions that assess the level of financial literacy among people surveyed, obtaining an overall score according to the number of correct answers each respondent gave, and then using this to assess whether they have a low, medium, or high level of financial literacy.[6]

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[6]   This variable was calculated using the description in the 2015 Financial Capabilities Survey in Andean Countries: Bolivia, Colombia, Ecuador,

4. METHODOLOGY AND RESULTS

To be able to assess the likelihood of owning some type of financial product as opposed to not owning any at all for the socioeconomic variables mentioned above, a probit regression was employed. At the same time, a multinomial logistic regression was used to determine the likelihood of households owning just informal financial products, formal and informal products together, just formal products or no products at all. In the latter case, the multinomial logit regression was used while considering that there was a nominal dependent variable with more than two categories (polytomous), this being a multivariate extension of the classic logit regression.

One example of the use of a multinomial logit regression is that applied by Schmidt and Strauss (1975), who estimate a model for predicting occupation based on a sample of 1,000 observations over three years. For each sample, individual data consists of the occupation variable that takes value 0 if menial, 1 if blue collar, 2 if craft, 3 if white collar and 4 if professional. Independent variables are education, experience, race, sex, and a constant. The model would, therefore, be written as follows,

1 $$\text{Prob}\left(Y_i = j\right) = \frac{e^{\beta'_j x_i}}{\sum_{k=0}^{4} e^{\beta'_k x_i}}, \quad j = 0, 1, \ldots, 4.$$

Model 1 is known as a multinomial logistic regression. The estimated equations provide a set of probabilities for *J+1* choices of a decision-maker, with characteristics x_i.

Multinomial logistic regressions should generally consider that it is important to remove indeterminacy from the model. Therefore, by defining $\beta^*_j = \beta_j + q$ for any q vector, probabilities can be reformulated using β^*_j that produce the same set of probabilities because all the terms that involve q are eliminated. A suitable normalization that solves the problem is fixing $\beta_0 = 0$. (This is possible because the

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and Peru (Mejía et al.), which also shows that Bolivia achieves outstanding scores in terms of financial literacy and education.

probabilities sum to one, therefore only parameter vectors are required to determine the $J+1$ probabilities). Probabilities are:

$$2 \qquad \text{Prob}\left(Y_i = j\middle|x_i\right) = \frac{e^{\beta'_j x_i}}{1+\sum_{k=1}^{J} e^{\beta'_k x_i}}, \quad \text{for } j = 0, 2, ..., J, \beta_0 = 0.$$

The model, therefore, implies that J log-odds ratios can be calculated

$$\ln\left[\frac{P_{ij}}{P_{ik}}\right] = x'_i\left(\beta_j - \beta_k\right) = x'_i\beta_j \quad \text{if } k = 0.$$

Finally, log-likelihood can be derived by defining $d_{ij} = 1$ if individual j chooses alternative i, and 0 if they do not choose it, for possible results $J-1$. Therefore, for each i, only one of all d_{ij} is 1. The log-likelihood is a generalization of the former for a probit or logit binomial.

$$\ln L = \sum_{i=1}^{n}\sum_{j=0}^{J} d_{ij} \ln \text{Prob}\left(Y_i = j\right).$$

To obtain derivatives:

$$\frac{d\ln L}{d\beta_j} = \sum_{i}^{n}\left(d_{ij} - P_{ij}\right)x_i \quad \text{for } j = 1, ..., J.$$

The coefficients of this model are difficult to interpret given that β_j can be associated with the j-th result, which is misleading. The method to observe this is obtained from Equation 2, where the marginal effects of the characteristics on probabilities are:

$$3 \qquad \delta_j = \frac{dP_j}{dx_i} = P_j\left[\beta_j - \sum_{k=0}^{J} P_k\beta_k\right] = P_j\left[\beta_j - \bar{\beta}\right].$$

Thus, each subvector of β is found in each marginal effect through the probabilities as well as the weighted average that appears in δ_j. These values can be calculated from the estimated parameters.

Under the above scheme, a probit model was estimated whose dependent variable takes a value of 1 if the household has any financial saving or credit product and 0 if it does not have any. The multinomial regression also has a dependent variable that takes a value of 0 if the household does not own any financial product, 1 if the household only has informal saving or credit products, 2 if the household owns formal as well as informal saving and credit products, and 3 if it has formal financial products. To estimate the multinomial logit, "The household does not have any financial product" has been chosen as a baseline category.

The independent variables used in both estimations were age, sex as a dichotomous variable that takes a value of 1 if the respondent is a man and 0 if it is a woman, geographical location that takes a value of 1 if the household belongs to an urban area and 0 if a rural area, and the level of education of the respondent with values of 1 if they have no education (includes uneducated persons or those with incomplete primary education), 2 if they have completed primary education, 3 if they have secondary education and 4 for individuals with higher education. For the households' socioeconomic status, the FCS identified four socioeconomic levels based on a study of socioeconomic levels in Bolivia conducted by the market research company Ipsos[7] among 2,651 heads of household. This variable is equal to 1 if the household has a low socioeconomic level and 4 if it has a high socioeconomic level. Finally, a financial capability indicator (described in the previous section) was taken with values from 0 to 2, taking a value of 0 if the respondent has low financial literacy and 2 if their level of financial literacy is high.

The first results observed are those of the probit model (Table 1), for which two models were estimated: one that only includes the education variable, and another that includes education and financial literacy. The results and significance of the variables did not display large differences. It can be observed that the likelihood of having financial products as opposed to not having any is significant and becomes larger as the socioeconomic level rises, meaning

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[7]   In 2009, the study of socio-economic status by Ipsos presented socio-demographic data divided into five levels or strata, which are internationally identified in the market research area by letters A, B, C, D and E. The report explains the main characteristics of each level (profiles), as well as their size (number of individuals and households).

higher income households are more likely to have financial products than not to have them. One outstanding result is that associated with financial education and literacy. In the case of education, the variable is not significant but shows that more educated individuals have a greater probability of having financial products. On the other hand, the financial literacy variable is significant and its behavior displays an upward path, showing that greater financial literacy implies a higher probability of having financial products as opposed to not having any.

As for marginal effects (Table 2), it could be seen that higher levels of education lead to higher probabilities of having financial products, in the same way as greater financial literacy. The values of marginal effects for both variables are similar, meaning it could be concluded that education and financial literacy are both important for the ownership of financial products. Meanwhile, the socioeconomic variable reported marginal effects with slightly higher values, showing that households at higher socioeconomic levels are more likely to acquire financial products. It can also be seen that a household belonging to a high socioeconomic level is almost twice as likely to have some type of financial product as a household belonging to a low socioeconomic level. Thus, there is a wide gap between the probability of households with a low socioeconomic level and those with a high level with respect to acquiring financial products. This result is not observed in the case of education or financial literacy, making it possible to conclude that the income variable plays an important role in the ownership of financial products.

The multinomial logit regression was estimated for three models: Model 1 includes education and financial literacy variables; Model 2 only considers the education variable, and Model 3 only includes financial literacy. Table 3 shows the estimation in the case of households with informal financial products. The estimation with the three models shows that only the sex variable is significant, which also has a negative sign that determines women are more likely than men to use this type of financial product, as opposed to none at all. The other variables were not significant, with the calculation of marginal effects remaining pending.

For the case where households own formal as well as informal financial products (Table 4), it was seen that the employment status variable is significant and negative, showing that households with independent employment or other types of status (inactive or

Table 1

PROBIT MODEL ESTIMATION FOR OWNERSHIP
OF FINANCIAL PRODUCTS

Variables 1	Model 1 b/se	Model 2 b/se
Constant	−0.748[b]	−1.155[c]
	(0.24)	(0.26)
Urban/rural (urban = 1)	0.117	0.103
	(0.09)	(0.09)
Depend./indep. (dependent = 1)		
Independent	−0.189	−0.166
	(0.11)	(0.11)
Other	−0.466[c]	−0.427[c]
	(0.12)	(0.12)
Sex (man = 1)	−0.137	−0.162
	(0.09)	(0.09)
Socioeconomic level (lowest = 1)		
Lower-middle	0.666[c]	0.640[c]
	(0.14)	(0.14)
Upper-middle	1.154[c]	1.089[c]
	(0.16)	(0.16)
Highest	1.481[c]	1.364[c]
	(0.21)	(0.22)
Education (none = 1)		
Primary	0.002	−0.041
	(0.13)	(0.13
Secondary	0.143	0.082
	(0.13)	(0.13)
Higher	0.362[a]	0.262
	(0.16)	(0.16)
Age = 1 (between 18 and 24)		
Between 25 and 39	0.171	0.168
	(0.13)	(0.14)
Over 40	−0.309	−0.282
	(0.23)	(0.23)
Age2	0.014[a]	0.014[a]
	(0.01)	(0.01)
Financial literacy (low lit. = 1)		
Medium literacy		0.409[b]
		(0.13)
High literacy		0.643[c]
		(0.13)

Note: [1] the dependent variable takes a value of one if the household has financial products and zero if it does not have any. [a] $p<0.05$, [b] $p<0.01$, [c] $p<0.001$.

Table 2

PROBIT MODEL MARGINAL EFFECTS

Has some type of financial product?

	Margin	Standard error[1]	z	P>|z|	95% confidence interval	
Socioeconomic level						
Lowest	0.3880	0.0492	7.89	0.000	0.291897	0.484846
Lower-middle	0.6234	0.0225	27.69	0.000	0.579288	0.667540
Upper-middle	0.7685	0.0227	33.74	0.000	0.723858	0.813150
Highest	0.8387	0.0360	23.24	0.000	0.768063	0.909515
Education						
None	0.6500	0.0324	20.01	0.000	0.586380	0.713709
Primary	0.6367	0.0280	22.67	0.000	0.581738	0.691853
Secondary	0.6759	0.0228	29.56	0.000	0.631158	0.720804
Higher	0.7297	0.0327	22.29	0.000	0.665625	0.793959
Financial literacy						
Low	0.5126	0.0417	12.28	0.000	0.430827	0.594511
Medium	0.6524	0.0219	29.75	0.000	0.609472	0.695427
High	0.7253	0.0183	39.50	0.000	0.689343	0.761328

[1] Delta-method.

unemployed) are less likely to acquire both products as opposed to none. That is, a dependent worker is more likely to opt for owning both products. Moreover, the socioeconomic variable is significant and positive for all three models: A higher socioeconomic level leads to a higher probability of households having both products as opposed to none. Lastly, in this case, it was seen that only the higher financial literacy variable is significant and positive, meaning a high level of financial literacy implies a greater probability of acquiring both products.

Finally, in the case of households that only own formal financial products (Table 5), it could be seen that households with dependent employment status are more likely to have formal financial products as compared to households that are independent or in another type of employment status. In addition, the socioeconomic variable was positive and significant, showing once again that the socioeconomic level of a household is important in the ownership of those

Table 3

MULTINOMIAL LOGIT ESTIMATION
Has some type of informal financial product?[1]

	Model 1 b/se	Model 2 b/se	Model 3 b/se
Constant	−3.918[b]	−2.906[a]	−4.353[c]
	(1.39)	(1.21)	(1.32)
Urban/rural (urban = 1)	−0.170	−0.157	−0.177
	(0.45)	(0.45)	(0.45)
Depend./indep. (dependent = 1)			
Independent	−0.073	−0.145	0.086
	(0.59)	(0.59)	(0.57)
Other	−0.894	0.982	−0.739
	(0.67)	(0.67)	(0.65)
Sex (male = 1)	−1.524[b]	−1.469[b]	−1.545[b]
	(0.53)	(0.53)	(0.53)
Socieconomic_level (lowest = 1)			
Lower-middle	0.264	0.358	0.214
	(0.62)	(0.61)	(0.60)
Upper-middle	0.393	0.535	0.073
	(0.78)	(0.78)	(0.72)
Highest	−13.607	−11.773	−13.337
	(1,195.47)	(531.89)	(852.90)
Education (none = 1)			
Primary	0.086	0.126	
	(0.57)	(0.57)	
Secondary	−0.803	−0.702	
	(0.69)	(0.69)	
Higher	−0.709	−0.579	
	(0.97)	(0.97)	
Financial literacy (low = 1)			
Medium	1.127		1.041
	(0.80)		(0.80)
High	1.291		1.193
	(0.82)		(0.82)
Age = 1 (between 18 and 24)			
Between 25 and 39	0.091	0.068	0.176
	(0.72)	(0.71)	(0.71)
Over 40	−2.130	−2.223	−1.945
	(1.37)	(1.36)	(1.36)
Age2	0.048	0.047	0.052
	(0.03)	(0.03)	(0.03)

Note: [1]Results are compared to the baseline category of "the household does not have any financial products." [a] $p<0.05$, [b] $p<0.01$, [c] $p<0.001$

Table 4

MULTINOMIAL LOGIT ESTIMATION

Has some type of informal as well as formal financial product?[1]

	Model 1 b/se	Model 2 b/se	Model 3 b/se
Constant	−6.285^c	−4.980^c	−5.837^c
	(1.45)	(1.28)	(1.39)
Urban/rural (urban = 1)	−0.336	−0.310	−0.355
	(0.32)	(0.32)	(0.32)
Depend./indep. (dependent = 1)			
Independent	−1.012^b	−1.043^b	−0.997^b
	(0.36)	(0.36)	(0.35)
Other	−1.305^b	−1.366^c	−1.235^b
	(0.41)	(0.41)	(0.40)
Sex (male = 1)	−0.509	−0.455	−0.468
	(0.30)	(0.30)	(0.30)
Socieconomic_level (lowest = 1)			
Lower-middle	1,694	1,764	1,790
	(1.05)	(1.05)	(1.05)
Upper-middle	3.026^b	3.157^b	3.205^b
	(1.06)	(1.06)	(1.04)
Highest	3.832^c	4.077^c	3.995^c
	(1.13)	(1.13)	(1.10)
Education (none = 1)			
Primary	0.416	0.500	
	(0.58)	(0.58)	
Secondary	0.687	0.796	
	(0.57)	(0.57)	
Higher	0.473	0.656	
	(0.63)	(0.62)	
Financial literacy (low = 1)			
Medium	1.404		1.405
	(0.77)		(0.77)
High	1.748^a		1.750^a
	(0.76)		(0.76)
Age = 1 (between 18 and 24)			
Between 25 and 39	0.725	0.726	0.647
	(0.53)	(0.53)	(0.52)
Over 40	−0.094	−0.164	−0.250
	(0.86)	(0.86)	(0.85)
Age2	0.032	0.031	0.031
	(0.02)	(0.02)	(0.02)

Note: [1]Results are compared to the baseline category of "the household does not have any financial products". ^{a} $p<0.05$, ^{b} $p<0.01$, ^{c} $p<0.001$.

Table 5

MULTINOMIAL LOGIT ESTIMATION
Has some type of formal financial product?[1]

	Model 1 b/se	Model 2 b/se	Model 3 b/se
Constant	−2.060[c]	−1.423[c]	−2.031[c]
	(0.46)	(0.41)	(0.43)
Urban/rural (urban = 1)	0.245	0.265	0.252
	(0.15)	(0.15)	(0.15)
Depend./indep. (dependent = 1)			
Independent	−0.221	−0.272	−0.299
	(0.19)	(0.19)	(0.19)
Other	−0.672[b]	−0.743[c]	−0.743[c]
	(0.21)	(0.21)	(0.21)
Sex (male = 1)	−0.208	−0.156	−0.199
	(0.15)	(0.15)	(0.15)
Socioeconomic level (lowest = 1)			
Lower-middle	1.079[c]	1.117[c]	1.072[c]
	(0.25)	(0.25)	(0.25)
Upper-middle	1.815[c]	1.913[c]	1.977[c]
	(0.28)	(0.28)	(0.27)
Highest	2.252[c]	2.447[c]	2.489[c]
	(0.39)	(0.38)	(0.37)
Education (none = 1)			
Primary	−0.111	−0.039	
	(0.22)	(0.21)	
Secondary	0.135	0.233	
	(0.22)	(0.22)	
Higher	0.514	0.668[a]	
	(0.28)	(0.28)	
Financial literacy (low lit. = 1)			
Medium	0.595[b]		0.622[b]
	(0.23)		(0.23)
High	1.031[c]		1.077[c]
	(0.23)		(0.23)
Age = 1 (between 18 and 24)			
Between 25 and 39	0.243	0.241	0.299
	(0.23)	(0.23)	(0.23)
Over 40	−0.453	−0.494	−0.469
	(0.40)	(0.39)	(0.39)
Age2	0.022[a]	0.022[a]	0.023[a]
	(0.01)	(0.01)	(0.01)

Note: [1]Results are compared to the baseline category of "the household does not have any financial products". [a] $p<0.05$, [b] $p<0.01$, [c] $p<0.001$.

Table 6

MULTINOMIAL LOGIT MARGINAL EFFECTS - INFORMAL FINANCIAL PRODUCT

Has some type of informal product?

	Margin	Standard error[1]	z	P>|z|	95% confidence interval	
Socioeconomic level						
Lowest	0.0318	0.0168	1.90	0.058	−0.001081	0.064869
Lower-middle	0.0239	0.0067	3.55	0.000	0.010741	0.037159
Upper-middle	0.0159	0.0074	2.14	0.033	0.001310	0.030639
Highest	9.32e-09	0.0000	0.00	0.999	−0.000022	0.000022
Education						
None	0.0292	0.0125	2.33	0.020	0.004605	0.053936
Primary	0.0330	0.0111	2.96	0.003	0.011132	0.054916
Secondary	0.0121	0.0054	2.22	0.027	0.001403	0.022901
Higher	0.0106	0.0081	1.31	0.189	−0.005269	0.026626
Financial literacy						
Low	0.0110	0.0078	1.40	0.162	−0.004412	0.026461
Medium	0.0236	0.0070	3.38	0.001	0.009962	0.037420
High	0.0215	0.0067	3.18	0.001	0.008289	0.034906

[1] Delta-method.

products. One significant result was that only the financial literacy variable was significant and positive, while education did not exhibit the same behavior.

The conditional likelihoods consist of an initial calculation and various reference-only cases, meaning it is important to assess marginal effects. Taking into account the previous results, marginal effects were evaluated for socioeconomic, education, and financial literacy variables, which are the ones that exhibit important behaviors according to the results of the estimation. In the case of owning some type of informal product, Table 6 shows that the probability decreases as the socioeconomic level rises and stops being significant at the highest level. In the case of education, the probability increases until the household has primary education, after which it falls and

MULTINOMIAL LOGIT MARGINAL EFFECTS-INFORMAL AS WELL AS FORMAL FINANCIAL PRODUCTS

Has some type of formal as well as informal products?

	Margin	Standard error[1]	z	P> |z|	95% confidence interval	
Socioeconomic level						
Lowest	0.0113	0.0113	1.00	0.320	−0.010959	0.033571
Lower-middle	0.0337	0.0086	3.90	0.000	0.016783	0.050626
Upper-middle	0.0719	0.0135	5.31	0.000	0.045355	0.098480
Highest	0.1091	0.0241	0.05	0.957	−3.891848	4.110079
Education						
None	0.0398	0.0184	2.15	0.031	0.003596	0.076083
Primary	0.0624	0.0185	3.37	0.001	0.026174	0.098738
Secondary	0.0689	0.0136	5.04	0.000	0.042119	0.095773
Higher	0.0433	0.0104	4.14	0.000	0.022856	0.063908
Financial literacy						
Low	0.0221	0.0155	1.43	0.154	−0.008291	0.052545
Medium	0.0561	0.0121	4.62	0.000	0.032345	0.080034
High	0.0571	0.0090	6.28	0.000	0.039319	0.074990

[1] Delta-method.

is not significant for the most educated households either. Finally, with respect to financial literacy, it can be seen that the likelihood of having some type of informal financial product is only significant for households with medium and high literacy, and the likelihoods do not show any large differences in the values reached.

In the case of owning informal as well as formal financial products (Table 7), it can be seen that lower-middle and upper-middle socio-economic levels have a higher and more significant probability of acquiring such products as opposed to acquiring none. In terms of education, the likelihood increases for individuals that have a secondary education, but decreases for those with higher education. Finally, with respect to financial literacy, just as with owning some

Table 8

MULTINOMIAL LOGIT MARGINAL EFFECTS-FORMAL FINANCIAL PRODUCT

Has some type of formal product?

	Margin	Standard error[1]	z	P>|z|	95 % confidence interval	
Socioeconomic level						
Lowest	0.3453	0.0493	6.99	0.000	0.248562	0.442149
Lower-middle	0.5672	0.0231	24.48	0.000	0.521841	0.612672
Upper-middle	0.6820	0.0252	27.04	0.000	0.632586	0.731446
Highest	0.7271	0.0448	16.22	0.000	0.639280	0.814990
Education						
None	0.5809	0.0360	16.12	0.000	0.510340	0.651604
Primary	0.5416	0.0313	17.28	0.000	0.480192	0.603090
Secondary	0.5944	0.0249	23.83	0.000	0.545532	0.643321
Higher	0.6805	0.0349	19.46	0.000	0.612051	0.749125
Financial literacy						
Low	0.4820	0.0426	11.29	0.000	0.398421	0.565778
Medium	0.5708	0.0233	24.41	0.000	0.525012	0.616665
High	0.6488	0.0197	32.80	0.000	0.610094	0.687629

[1] Delta-method.

kind of informal product, the likelihood increases as literacy declines, but remains steady when the household reports having medium and high literacy.

Finally, in the case of formal financial products, all the marginal effects were significant, while the likelihoods are high and above those observed in the two previous cases (Table 8). The behavior is as would be expected, higher socioeconomic levels do indeed increase the likelihood of having formal financial products, in the same way as higher levels of education and financial literacy increase the likelihood that households have formal products rather than none at all.

5. CONCLUSIONS AND RECOMMENDATIONS

Microdata analysis is important for determining how households behave or what type of characteristics influence their day-to-day saving and investment decisions, and thereby FI. It has been established that FI levels can be particularly affected by the decision of the population to use informal channels or their own resources to be able to carry out most of their financial transactions. Such channels are more costly, limited, and unsafe, and can worsen households' standards of living.

This paper analyzed the determinants of owning financial products as opposed to not owning any, placing special emphasis on socioeconomic determinants such as socioeconomic level, education, and financial literacy. It also assessed households' behavior as regards owning informal products and owning formal products together with informal products, for the same socioeconomic variables. The results of the estimation show that ownership of financial products in Bolivia is more likely among higher-income households, there being a significant gap between households with low and high socioeconomic levels. It should also be emphasized that education and financial literacy play a leading role in the ownership of financial products.

In the case of informal financial products, it has been seen that women are more likely to own such products than men. Moreover, as would be expected, households with high socioeconomic levels are less likely to use informal products, in the same way as people with higher levels of education. In the case of financial literacy, it has been seen how this characteristic would not influence the decision to acquire informal products; the likelihood instead remaining constant for those with medium and high literacy. Ownership of informal and formal products together is more likely among households with a middle (lower-upper) socioeconomic level. As for the education variable, the likelihood of acquisition is higher among households with only primary and secondary education. Finally, in the case of financial literacy, the behavior is similar to that for education, the likelihood remains constant for medium and high levels of literacy.

The results obtained show that socioeconomic level constitutes an important variable in the ownership of formal financial products among households. Education and financial literacy also stand out,

and are variables that need to be strengthened in order to encourage households to acquire formal financial products.

It is important to point out that lower income households tend to have informal products, while households with a middle socioeconomic level prefer to use a combination of formal and informal products. This suggests that these households still face restrictions for acquiring formal financial products such as the range of requirements formal financial institutions demand for granting loans, the drawn out processes this involves, financial service offerings that still do not meet households' saving requirements, a lack of collateral or guarantees that satisfy the demands of financial institutions, and finally, a certain amount of distrust for formal financial institutions among some segments of the population. Another interesting result is that financial literacy is not a determinant in the acquisition of informal products, or formal and informal financial products combined, given that households with high and low literacy levels have the same likelihood of acquiring said products.

Significant progress has been made in Bolivia in increasing the income of the population. The minimum wage has more than tripled over the last ten years and this has been higher than in other countries such as Peru and Mexico. Social indicators have recorded improved figures, while inequality and poverty have decreased considerably, reflecting the impact of government policies. Significant progress has also been made in terms of FI and FE. The new Financial Services Law No. 393 is a testimony to this, and as a result increasingly more people have begun to access and acquire different financial products in recent years. Furthermore, the Banco Central de Bolivia has played an important role in promoting financial education and inclusion, by organizing activities in schools that enable the population to become familiar with the common financial terminology, and by providing saving options that promote FI among all socioeconomic strata.

It is therefore important to analyze more deeply the restrictions faced by the population in matters of access to financial products, study the requirements requested by financial institutions, and assess the financial products on offer, without ignoring the associated risks. Finally, it is also essential to continue the promotion and implementation of a national strategy to further improve levels of FI and FE, as well as economic literacy among the population as a whole.

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Policy-effective Financial Knowledge and Attitude Factors in Latin America

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Abstract

In this research we implement a technique that produces measures of financial knowledge and attitudes by combining variables with weights that capture their impact on financial behavior variables, thus providing guidance to policy design. We use data gathered by CAF-Development Bank of Latin America in Bolivia, Colombia, Ecuador, and Peru. It is the first time that this technique has been used in a cross-country setting. We show that the composition and the weight vary from one country to another. However, the importance of attitude variables stands out in all countries, especially regarding the setting of long-term goals by individuals.

Keywords: financial inclusion, financial literacy, financial knowledge, factors, scores.

JEL classification: D83, G29, A20, D12, D14, I28.

1. INTRODUCTION

The promotion of welfare enhancement through access to and adequate use of financial products by citizens is a worldwide goal. In fact, 6 of the 17 United Nations Sustainable Development Goals to be achieved by 2030[1] explicitly include financial services in the list of targets they rely on. There are several supply issues concerning the markets that provide such services, but on the

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[1] See <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>. The goals–and targets by 2030–that rely partially on financial services are the following. *Goal 1:* No poverty–ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, and ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology, and financial services (including microfinance). *Goal 2:* No hunger–double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets, and opportunities for value addition and non-farm employment. *Goal 3:* Good health and well-being–achieve universal health coverage, including financial risk protection, access to quality essential healthcare services and access to safe, effective, quality, affordable, and essential medicines and vaccines for all. *Goal 5:* Sex equality–undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance, and natural resources, in accordance with national laws. *Goal 8*: Decent work and economic growth–promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services. Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance, and financial services for all. And, *Goal 9:* Industry, innovation and infrastructure–increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets. Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological, and technical support to African countries, least-developed countries, landlocked developing countries and small island developing states.

demand side financial literacy[2] is the key element that enables the pursuit of these objectives.

The assessment of the financial literacy of a population generally relies on the use of surveys, with sets of questions not only about financial knowledge but also about attitudes. The emerging literature seems to have reached some degree of consensus about which are the main facets of financial literacy to assess. Researchers, governments, and other stakeholders have ubiquitously employed the set of questions stemming from Lusardi and Mitchell (2008).

Once in agreement about the dimensions to assess, it is natural to look for benchmarks that make adequate diagnosis possible, with the aim of producing policy recommendations. A natural strategy for finding these benchmarks is the comparison of different populations. In 2009, a group of specialists from the OECD International Network of Financial Education (OECD/INFE) developed the first version of a survey aimed at measuring the degree of financial education in populations of different countries. The core of the survey inquiries about financial knowledge, attitudes, and behavior regarding several aspects of financial education, and includes questions about the household budget, money management, short- and long-term financial planning, as well as the financial products choice process. The initial number of 14 countries collecting this data increased to 30 in 2015, and countries and researchers that pursue independent data gathering consistently employ the toolkit as a starting point.

Figure 1 reproduces a comparison of financial knowledge among the countries, from the first OECD data collection. The scale used there for comparison is the percentage of surveyed individuals in each country who answered at least six of eight questions correctly.[3] This score conveys a comparison between countries in a simple manner, and readers may grasp where they are likely to find the gravest problems in terms of financial knowledge. Scales such as this one are widespread in the literature and have the priceless characteristics of being simple and transparent.

However, in this paper, we argue for the need for a different type of measurement when reorienting our goal from making a general

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[2]   See Lusardi and Mitchell (2014) for a definition.

[3]   Actually, a correct answer to the compound interest rate question was only taken into account if the individual had a correct answer in the (easier) simple interest rate question. We also adopt this strategy below.

diagnosis to crafting policy that applies to a specific population. When we face the problem of spending limited resources in order to enhance a population's financial knowledge, or to improve its financial attitudes, we expect this to have an impact on adequate use of financial services,[4] because in the end this should improve welfare (such as the adequate use of financial products by small farmers and entrepreneurs). Thus, we have developed a technique that uses the predicted impact of financial knowledge and financial attitude variables on behavior to assign the weights that they should have in measures used for policy purposes. This is carried out using a system of equations to predict several behavioral outcomes that are regarded as important goals.

Figure 1

FINANCIAL KNOWLEDGE: PERCENTAGE SCORING SIX OR MORE OUT OF EIGHT QUESTIONS
Percentages
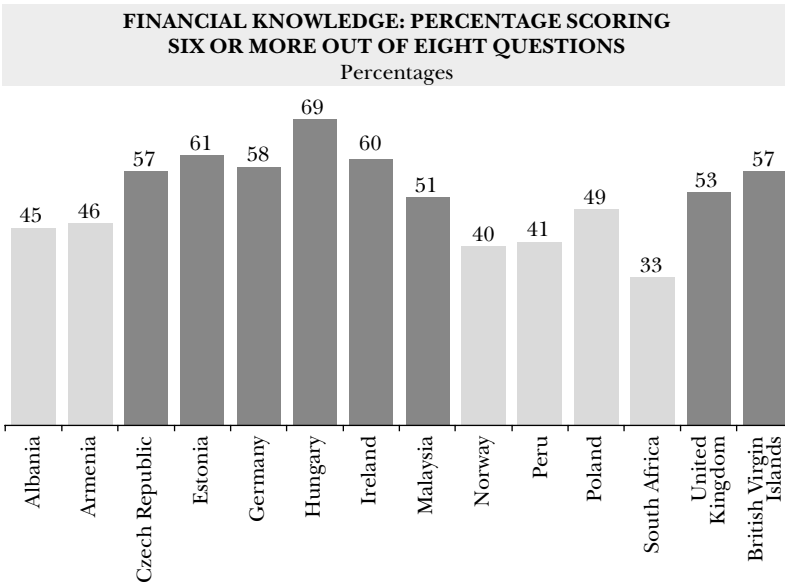
Source: Atkinson and Messy (2012). Lighter shaded columns indicate countries where fewer than 50% achieved a score of six or more.

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4   These elements also affect the economic cost of access to financial services.

There is nothing intrinsic in the questions that causes the different pieces of knowledge behind the comparison in Figure 1 to have the same effect on behaviors that policymakers wish to promote. We provide evidence that this is not the case, and that these effects change from country to country. Consequently, addressing policy design in the context of internationally comparable scales seems to be a suboptimal usage of information and policy funding resources. The main questions may be the same, but their effects on behavior–and thus welfare–vary from one country to another.

Yet the literature that investigates the impact of financial literacy on the behavior of particular populations seems to be reluctant to forsake some simplicity in order to obtain measures that are better predictors of behavior, and that could shed light on the selection of specific contents of educational interventions that could yield the most beneficial behavioral change.

In previous work, we implemented a new technique to address this issue, using Brazilian data gathered using the OECD-INFE toolkit together with some additional questions. Results implied that the design of financial literacy programs should consider the effectiveness of variables reflecting financial knowledge in predicting policy objectives, especially given that they are quite heterogeneous and that several variables do not seem to have an effect on financial inclusion at all.

In this study, we use this technique to explore data gathered by the CAF-Development Bank of Latin America[5] from four other Latin American countries and explore the differences and similarities among them. We find that the knowledge and attitude variables combine differently when correlated with behavioral factors. However, there are recurrent attitude variables that stand out in more than one country.

The paper continues as follows. In Section 2, we provide a brief literature review, concentrating on measures and methodological techniques. In Section 3, we explain the econometric modeling we use to bring policy objectives into the computation of financial knowledge and attitudes factors. Section 4 presents the results, and we conclude our study in Section 5.

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[5] Data gathered in 2013-2014, *Encuesta de Medición de Capacidades Financieras en los Países Andinos,* see <http://scioteca.caf.com/handle/123456789/743>.

2. LITERATURE

Lusardi and Mitchell (2014) provide a comprehensive survey of the literature concerning several aspects of financial literacy. Our work relates to the literature that investigates whether high financial knowledge and positive financial attitude measures predict desirable behavioral outcomes. In short, several studies show that the level of financial knowledge (measured in different ways) relates to holding precautionary savings, planning for retirement, using less costly financing, and avoiding fees.

In this Section, we focus on another aspect: How the literature translated responses to survey questions into measures of knowledge and attitude. In the case of financial knowledge, there are two direct ways of doing this. First, authors have used a dummy variable that takes on the value of one if the individual gets all the questions right and zero otherwise. For example, Lusardi and Mitchell (2011)[6] take this approach. Since this is generally applied to a short list of questions–the first three in Lusardi and Mitchell (2008) have become classics–that address the pillars of financial knowledge, it makes sense to give zero to anyone who is unable to get all the questions right. The main caveat is that while everyone assigned the score of one gives the exact same answers, there is a heterogeneity in the group receiving zero that is lost when using this method of measurement.

This calls for the other widely applied method of turning answer profiles into scores: giving one point for every question properly answered. Atkinson and Messy (2012) and Finke, Howe and Huston (2011) compute measures based on this scoring method.[7] This approach preserves heterogeneity and is more appealing to surveys with longer lists of questions. Thus, an individual who scored a zero could be separated from an individual who scored a nine, just short of perfect, on a ten-question survey. The problem with this way of computing scores is that all questions are weighted equally. As such, everyone that gets four correct answers is attributed the same score, no matter which subset of financial knowledge the individual has.

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[6] See Lusardi and Mitchell (2014), Table 2, for a list of papers that employed this approach around the world.

[7] Hung, Parker and Yoong (2009) provide a table including several papers and the scales they used.

The same body of literature provides examples of this, as we show in Table 1. These papers analyze the relation between retirement planning and financial literacy. All of them use three questions that assess knowledge of interest rates, inflation, and risk diversification, then compute both of these common scales and use them as explanatory variables in regressions.[8] Additionally, they perform the same regressions adding separate dummies for the right answer in each of the questions. Assume for a moment that you are a policymaker in one of these countries, concerned with promoting retirement planning in the population and that there is a tight budget constraint. You might be inclined to invest resources in improving knowledge related to only one of these themes. It might be that this particular population knows little about inflation and that it only takes a relatively cheap tool, such as a media campaign, to address the deficiency effectively. A look at the individual question estimates could prevent what would probably be a policy mistake, since people that know relatively more about inflation do not perform better in retirement planning than those that do not, holding everything else constant.[9] Unfortunately, many papers do not present disaggregate-question coefficients.

Still, a line of reasoning could be that these questions only capture a noisy signal from an inherent unobservable stock of financial literacy, and thus the analysis of individual questions does not result in anything meaningful. However, the common measures we presented before are not fit for these analyses. Although less frequent, some studies have used factor analysis as way to group questions that are correlated, for example in Lusardi and Mitchell (2007b) and Van Rooij et al. (2011).[10] This is useful since it avoids arbitrarily summarizing points and, at the same time, can indicate whether the answers result from similar or different pieces of underlying knowledge. However, this approach emphasizes commonality among

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[8] They also perform regressions that deal with the endogeneity issue, but then we do not have the coefficients of the separate questions to make this point.

[9] In the case of all right criterions, one could argue that the different pieces of knowledge matter in the presence of one another. To pursue the testing of this hypothesis, one should compare the all right dummy results with those single question dummies plus their interactions.

[10] Huston, Finke and Smith (2012) use this approach to compute a financial sophistication proxy.

Table 1

ORDINARY LEAST SQUARES REGRESSIONS OF RETIREMENT PLANNING ON FINANCIAL LITERACY VARIABLES

Reference	Alessie, van Rooij, Lusardi (2011)	Lusardi and Mitchell (2011)	Bucher-Koenen, and Lusardi (2011)	Agnew, Bateman and Thorp (2013)
Country	Netherlands	United States	Germany	Australia
Coefficients				
(1) All correct criterion	0.126[a]	0.091[a]	0.06	0.123[a]
(2) Count of right answers criterion	0.101[a]	0.043[b]	0.04[b]	0.059[a]
(3) Separate dummies for right answers (included simultaneously)				
Interest question	0.173[a]	0.009	0.01	0.054
Inflation question	−0.00621	0.042	0.04	−0.022
Risk diversification question	0.142[a]	0.078[b]	0.06	0.135[a]

Note: Ordinary least square estimates with controls. [a]$p<0.01$, [b]$p<0.05$.

variables, which could be a drawback if we are interested in behavioral outcomes. This is because if all variables are highly correlated (which is good as far as factor analysis is concerned), then other uncorrelated dimensions might add discriminatory and explanatory power.[11] Behrman et al. (2012) made interesting progress on this issue, proposing a measure of financial knowledge based on a two-step procedure: The first step generates weights that more severely punish the individuals who get something wrong that most others get right, while the second uses principal components analysis to consider correlations between questions.

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[11] One alternative for addressing this issue, in line with what we propose in this paper, would be to use canonical correlations to produce knowledge and attitude factors by maximizing correlation with behavior outcomes.

We propose that it is more useful to have a measurement of financial knowledge that can combine different and potentially uncorrelated indicators of knowledge, and weight them according to their importance in predicting behavior.

3. METHODOLOGY

3.1 Model and Econometric Implementation

In order to illustrate our approach, consider again the second column of Table 1. We argued that the sum of points of all three questions is not an adequate measure if we are to design an intervention on financial knowledge. However, the estimation with separate dummies suggests a natural indicator: Give weights according to the estimated coefficients to the variables that are significant and exclude the variable that is not. Thus, we would obtain a measure (I_K) given by:

$$I_k = 0.173 \mathrm{D}_{\mathrm{interest}} + 0.142 \mathrm{D}_{\mathrm{diversification}},$$

where $\mathrm{D}_{\mathrm{interest}}$ assumes a value of one if the interest question is answered correctly, and $\mathrm{D}_{\mathrm{diversification}}$ is the analogous variable for risk diversification.

What we do is to transfer this interpretation to a context with several policy objectives instead of only one.[12] The start point is an unrestricted system with equations similar to those used in the papers referred in Table 1. In system 1, there are m equations, one for each of the financial behavior goals, y_i. The regressors are a vector of ones, a matrix of demographic controls *(D)*, and a matrix of attitude variables *(A)*. In order to simplify the explanation of the technique, we show the knowledge variables, k_j, directly, instead of gathering them in a matrix *K*. The disturbances are represented by ε_i.

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[12] In Garber and Koyama (2016), we show that the technique used in the present study can be viewed as a way to simplify the policymakers' decision-making process by rendering the subjective weight attributed to different financial inclusion policy goals irrelevant. As a result, all efforts can be directed to a simple cost-benefit analysis of the different contents that could be a focus of financial literacy programs and interventions.

1

$$y_1 = C_{0,1} + D\beta_{D,1} + \left[\beta_{k,1,1}k_1 + \beta_{k,1,2}k_2 + \beta_{k,1,3}k_3 + \ldots + \beta_{k,1,J}k_J\right] + A\beta_{a,1} + \varepsilon_1$$

$$y_2 = C_{0,2} + D\beta_{D,2} + \left[\beta_{k,2,1}k_1 + \beta_{k,2,2}k_2 + \beta_{k,2,3}k_3 + \ldots + \beta_{k,2,J}k_J\right] + A\beta_{a,2} + \varepsilon_2$$

$$\vdots$$

$$y_m = C_{0,m} + D\beta_{D,m} + \left[\beta_{k,m,1}k_1 + \beta_{k,m,2}k_2 + \beta_{k,m,3}k_3 + \ldots + \beta_{k,m,J}k_J\right] + A\beta_{a,m} + \varepsilon_m$$

This would result in a different I_k index for each outcome. In order to obtain only one weight for each of the variables considered, we need to impose restrictions on the estimation. The ideal result would be a system like 2, in which we have–in the brackets–the same linear combination of the knowledge variables in all equations, with an unrestricted coefficient multiplying in each of them[13]. We call this linear combination a policy-effective knowledge factor.

2

$$y_1 = C_{0,1} + D\beta_{D,1} + g_1\left[f_1 k_1 + f_2 k_2 + f_3 k_3 + \ldots + f_J k_J\right] + A\beta_{a,1} + \varepsilon_1$$

$$y_2 = C_{0,2} + D\beta_{D,2} + g_2\left[f_1 k_1 + f_2 k_2 + f_3 k_3 + \ldots + f_J k_J\right] + A\beta_{a,2} + \varepsilon_2$$

$$\vdots$$

$$y_m = C_{0,m} + D\beta_{D,m} + g_m\left[f_1 k_1 + f_2 k_2 + f_3 k_3 + \ldots + f_J k_J\right] + A\beta_{a,m} + \varepsilon_m$$

The drawback of substituting 2 for 1 is that some of the many restrictions implied by 2 might be rejected by the data. In order to test them explicitly, we use an iterative procedure to specify the model that is as close as possible to 2, without the imposition of restrictions that are rejected. We start with an estimation using a system that includes only controls and search for the knowledge variables that would be significant in the largest possible set of equations. Then we test if the coefficients of these variables are proportional along equations,[14] which allow us to define a factor. Subsequently, the inclusion of other knowledge variables in this factor is tested, until there are no variables left which could be included in the factor and

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[13] Identification requires fixing one of these coefficients.

[14] That is,

$$H_0 : \beta_{k,1,1} \big/ \beta_{k,2,1} = \beta_{k,1,2} \big/ \beta_{k,2,2} \ , \ldots, \ \beta_{k,1,1} \big/ \beta_{k,m,1} = \beta_{k,1,2} \big/ \beta_{k,m,2}.$$

would have a significant coefficient in it. We allow the formation of more than one factor, and–after considering all the knowledge variables–we then start the process with attitude variables.

We estimate the system using nonlinear seemingly unrelated regression (SUR), with robust standard errors. The testing and imposition of restrictions in the estimation make the simultaneous estimation of the system necessary, thus there is no reason not to explore efficiency gains. Although we nest our approach in a linear probability model, a nonlinear estimator is necessary to obtain the factors, since there is coefficient multiplication. This allows us to directly implement Wald restriction tests to verify if the coefficients of a knowledge (or attitude) variable are proportional to the coefficients of another variable along the equations of the system.

There is no theoretical reason for choosing a linear probability structure instead of a logit one. Both structures are widely used in financial literacy applications. However, the linear probability model requires fewer computational resources and allows the instrumentation by three stages least squares, instead of requiring a bootstrap to deal with the generated regressor problem, as implemented in Garber and Koyama (2016).

Therefore, the results we present in Section 4 can be divided into two groups, one containing the list of variables that can be grouped into a policy-effective factor along with their coefficients (corresponding to the f_j in system 2), and the other being the list of target variables that they affect, along with the coefficients that measure these impacts (the g_i).

3.2 Variables

In this subsection, we present the variables from the dataset used as dependent (policy targets), controls, knowledge and attitude variables.

Table 2 shows the dependent variables for each equation. In order to choose the behaviors that we could employ as dependent variables when considering all four countries together, we required that at least a certain number of individuals exhibited that behavior. We lowered this threshold to 4% in order to have 12 equations. The least frequent behavior we included is borrowing from loan sharks.

Table 3 shows the controls included in *D*. Since there are several controls, we exclude them from those equations where they are not

Table 2

DEPENDENT VARIABLES

Variable	Description	Percentage of observations
Savings, last 12 months	The individual has saved in the preceding 12 months.	59
Savings, last 12 months, in financial sector	The individual has saved in the preceding 12 months in the financial sector. Includes: • Purchase of financial investment products other than pension funds. • Leaving some money in a savings or checking account. • Making deposits in a checking account or a term deposit. • Frequently depositing money in a savings account.	28
Prepared	If the individual lost his or her main income, his or her living expenses could be covered for at least three months.	17
Budget	The individual has a budget.	56
Exact budget	The individual has an exact budget.	18
Binding to budget	The individual has a budget and always follows it.	30
Comparison	In the latest choice of a financial product, the individual compared various options (either from different financial institutions or within one).	43
Checking account	The individual has a checking account.	9
Savings account	The individual has a savings account.	34
Loan shark	The individual owes money to a loan shark.	4
Credit card	The individual has a credit card.	34
Consumption credit	The individual has a consumption loan, including vehicles (some heterogeneity between countries).	23

Table 3

CONTROLS

Variable	Description
Insufficient income	Dummy indicating individuals whose income has been insufficient to cover expenditure at least once in the previous 12 months
Social program	Dummy indicating individuals who participate in some social program
Stable income	Dummy indicating individuals who consider their income stable
Male	Dummy indicating males
Age, Age^2	Age and squared age
Education	A set of 12 dummies for educational level
Number of children	Number of children in the household
Presence of children	Dummy indicating the presence of at least one child in the household
Number of adults	Number of other adults in the household
Presence of adults	Dummy indicating the presence of other adults in the household
Marital status	A set of seven marital status dummies
Socioeconomic level	A set of socioeconomic level dummies for each country
Income level	A set of income level dummies for each country
Employment status	A set of 12 employment status dummies
Community description	A set of four dummies: rural, small urban, medium urban, and large urban

statistically significant. The reason for this is twofold. First, it makes the nonlinear SUR (NLSUR) computationally lighter by reducing the equation. Second, it produces some variables that may be used as instruments. Given that endogeneity in our equations is a major concern, after defining the knowledge and attitude factors, we re-estimate the system using three stages least squares and the full set of controls as instruments. Although these are not variables specifically designed to work as instruments, the excluded ones allow identification of the coefficients. In addition, most researchers accept these variables as exogenous, given that they frequently use them as controls. In these estimations, all factors–along with other knowledge and attitude variables that enter the equations–are regarded as endogenous. In an additional estimation, we allow the instrumented factors to enter all the equations since we wish to check if the documented[15] downward bias in the estimations without instrumentation rendered the coefficients not significant in some equations. Thus, when we present the results corresponding to the g_i in system 2, we show three estimates: the first one endogenous, the second instrumenting the endogenous specification, and the third allowing instrumented factors to enter all equations.

Table 4 presents the financial knowledge questions in the survey, and the names we assign them for ease of reference. We convert the answers into variables by assigning 1 if the answer is correct and 0 otherwise, including the cases with no answer. Although we acknowledge that the answer "I do not know" is different from a wrong one, it is complex to interpret what this difference means in term of policy. That is, we should know more about the effect of improving confidence on taking the wrong decisions instead of avoiding choice.

The attitude variables are based on eight statements. The surveyed individuals are asked to say how much they agree with them, on a scale that goes from 1 (completely disagree) to 5 (completely agree). The variables are computed as increasing from 1 (most undesirable answer) to 5 (most desirable answer). In order to make all the variables increase with the desirability of the answer, some of the original scales were inverted. Table 5 shows the statements and indicates which the inverted ones are.

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[15] See Garber and Koyama (2016) for a brief review of this topic.

Table 4

KNOWLEDGE VARIABLES

Variable	Question
Division	Imagine that five brothers are given a gift of $1,000. If the brothers have to share the money equally, how much does each one get?
Inflation in practice	Now imagine that the brothers have to wait for one year to get their share of the $1,000 and inflation stays at X percent. In one year's time will they be able to buy: (four alternatives)
Interest definition	You lend $20 to a friend one evening and he gives you $20 back the next day. Has he paid any interest on this loan? (Yes/No)
Simple interest	Suppose you put $100 into a savings account with a guaranteed interest rate of 2% per year. You do not make any further payments into this account and you do not withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?
Compound interest– double correct	And how much would be in the account at the end of five years? (four alternatives, only considered correct if the previous question was correct)
Risk and return	An investment with a high return is likely to be high risk (True/False).
Inflation definition	High inflation means that the cost of living is increasing rapidly (True/False).
Diversification	It is less likely that you will lose all your money if you invest it in more than one place (True/False).

Table 5

ATTITUDE VARIABLES

Variable	Statement
Conscientious consumer	Before I buy something I carefully consider whether I can afford it.
Carpe diem	I tend to live for today and let tomorrow take care of itself (inverted scale).
Impatient	I find it more satisfying to spend money than to save it for the long term (inverted scale).
Responsible	I pay my bills on time.
Bold	I am prepared to risk some of my own money when saving or making an investment.
Conscientious in finance	I keep a close personal watch on my financial affairs.
Planner	I set long-term financial goals and strive to achieve them.
Spender	Money is there to be spent (inverted scale).

4. RESULTS

In this Section, we present the results of the country-level factor specification and estimation. The weights of the variables included in each factor should be understood as relative weights, since their levels depend on the equation that is chosen to fix the factor coefficient as a unit, for normalization and identification. After the estimation, all factors were standardized and represented on a scale of 0 to 100. For this standardization, the theoretical (not necessarily equal to the observed) minimum and maximum values of the factors are used to center and rescale values.

As we show below, in two countries (Peru and Bolivia) the methodology combines variables into factors that seem to capture most of the impact of financial knowledge and especially of financial

attitudes on financial behaviors. In Ecuador and Colombia, only a factor of attitudes combining two variables is found, and it is significant in a smaller number of equations. This does not invalidate the analysis, since it reflects the characteristics of the different populations. It indicates, however, that policymakers in these countries will not have the availability of a single factor that affects several behavior variables simultaneously, as far as our technique is concerned. Thus, these policymakers face the problem of defining which financial behavior variables are the most important ones when they design interventions.

For all of the countries, we analyze how the discovered factors vary along observable characteristics. However, we should point out that for Ecuador and Colombia this analysis is less important, since we cannot incorporate most of the information about attitudes. At the conclusion of this Section, we comment on findings of regular patterns among the countries.

4.1 Peru

In the Peruvian dataset, the technique results in the specification of only one attitude factor. Table 6 displays the included variables and their weights.

	Table 6
PERU: ATTITUDE FACTOR	
Variable	*Weight*
Bold	0.006[b]
Conscientious at finance	0.041[a]
Planner	0.008[b]

[a] *p*-value <1%, and [b] *p*-value <5%.

The computed Peruvian financial attitude factor is significant in the equations that explain several financial behavior outcomes, as can be seen in the second and third columns of Table 7.

Table 7

PERU: ATTITUDE FACTOR

Equation	NLSUR coefficient	NLSUR p-value	3SLS coefficient	3SLS p-value	3SLS-all coefficient	3SLS-all p-value
Savings, last 12 months	1 (fixed)		3.382	<0.001	3.626	0.000
Savings, last 12 months, in financial sector	0.455	0.013	2.009	0.008	2.364	0.002
Prepared	–		–		1.672	0.033
Budget	0.735	0.012	2.139	0.009	2.397	0.004
Exact budget	–		–		0.376	0.003
Binding to budget	0.736	0.001	2.088	0.000	2.133	0.000
Comparison	0.793	0.001	0.692	0.162	0.812	0.103
Checking account	–		–		0.902	0.045
Savings account	–		–		0.499	0.474
Loan shark	–0.291	0.049	0.028	0.562	0.025	0.611
Credit card	0.573	0.002	0.524	0.028	0.551	0.021
Consumption credit	–	–			0.154	0.811

First stage: $F_{(52, 964)} = 3.02$, Prob.>F = 0.000
Note: NLSUR stands for nonlinear SUR, and 3SLS for three stages least squares.

We analyzed how this factor varies with the sampled individuals' characteristics. It generally increases with education level, although this is not true for the two lowest levels, for which we have a very small sample. It also seems to increase with social class. In terms of sex, the factor is on average higher for males. Finally, the factor exhibits a mild inverted U-shape with respect to age. Figure 2 gives details of these features.

Figure 2

PERU: ATTITUDE FACTOR
Average along descriptive variables
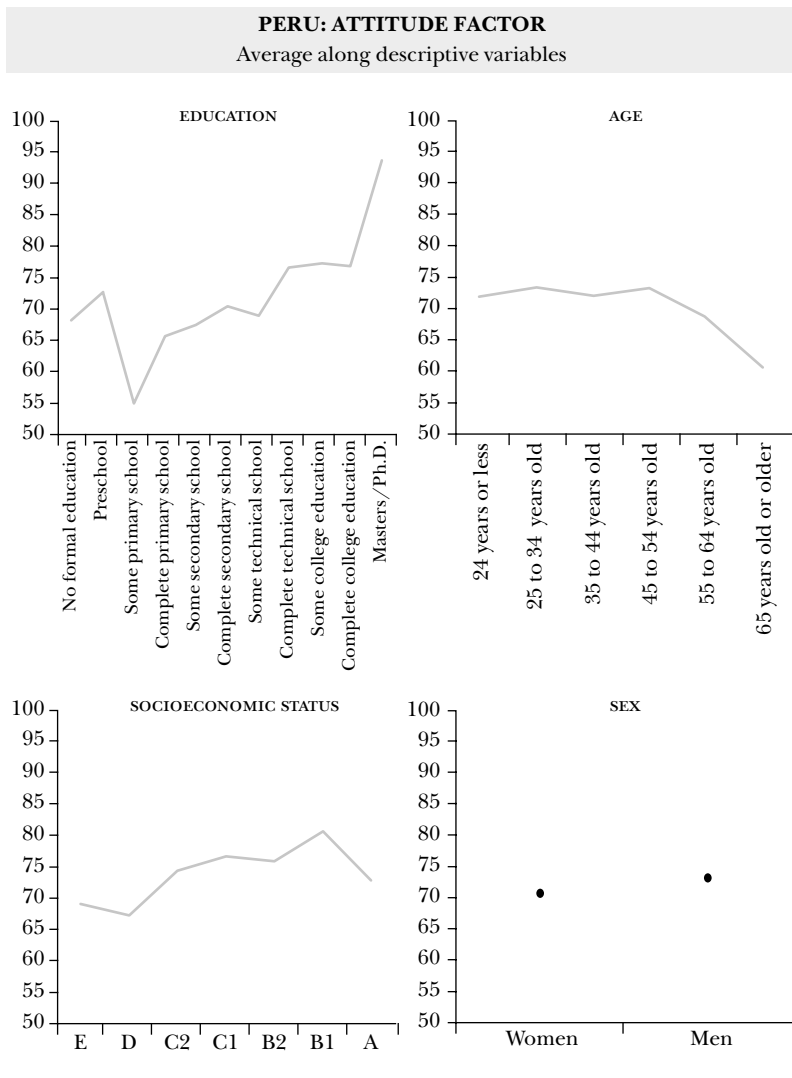
Going back to Table 7, in the fourth and fifth columns we display the results of the three stages least squares (3SLS) estimation. Some interesting features arise. As expected, the comparison of columns two and four indicates downward bias estimation for most of the coefficients. Unfortunately, the three stages least squares estimation loses precision in the coefficient of the loan sharks and on the comparison equations, rendering the coefficient insignificant. Analysis of the last two columns, which consider the inclusion of the instrumented factor in all equations, shows that this downward bias results in the exclusion of the attitude factor from some equations in the endogenous version: The instrumented regression indicates a positive and significant coefficient in three extra equations.

In Table 8, we show the p-value of the coefficients of knowledge and attitude variables that do not belong in factors, but are significant at the 10% level in some equations. None of them seem to affect many variables, except for simple interest. Taking as a reference the 3SLS estimation with the inclusion of the instrumented factor in all equations, the attitude factor is significant in eight equations, thus affecting most of the financial behavior variables. This makes the attitudes pertinent to the questions in Table 6 particularly interesting for interventions. Furthermore, although the costs of addressing these topics should be assessed in terms of benefits, the level of being conscientious at finance stands out from the other two attitudes in the factor: The coefficient is more than five times as large as those of the other variables.

4.2 Bolivia

In the Bolivian dataset, it was not possible to estimate the equation for personal credit. Two factors were found, one for knowledge and another for attitudes. The variables included in the knowledge factor and their weights are displayed in Table 9.

Variables compound interest (double correct) and inflation definition have a higher estimated weight and are more statistically significant than the others. The estimated knowledge factor coefficients in the behavior equations are shown in the second and third columns of Table 10.

The Bolivian financial knowledge factor increases with social class and formal education (except at the lowest level). It is slightly higher for men than women. In terms of age, the factor displays a

Table 8

PERU: *P*-VALUES OF KNOWLEDGE AND ATTITUDE VARIABLES NOT INCLUDED IN FACTORS

	1	2	3	4	5	6	7	8	9	10	11	12
Division			0.041									0
Inflation in practice		0.051									0.01	
Interest definition							0.092					
Simple interest		0.018		0.001	0.061				0.017			
Compound interest–double correct		0.031						0.004				
Risk and return			0.016									
Inflation definition												0.033
Diversification									0.019			
Conscientious consumer		0.089										

Table 8 (cont.)

PERU: P-VALUES OF KNOWLEDGE AND ATTITUDE VARIABLES NOT INCLUDED IN FACTORS

	1	2	3	4	5	6	7	8	9	10	11	12
Carpe diem (inverted scale)			0.048						0.061			
Impatient (inverted scale)			0.002									
Responsible												
Bold												
Conscientious at finance												
Planner												
Spender (inverted scale)	0.024					0.044						0.049

Note: Shaded variables enter the factor. 1 stands for savings last 12 months; 2, savings last 12 months in the financial sector; 3, prepared; 4, budget; 5, exact budget; 6, binding to budget; 7, comparison; 8, checking account; 9, savings account; 10, loan shark; 11, credit card; and 12, consumption credit.

Table 9

BOLIVIA: KNOWLEDGE FACTOR

Variable	Weight
Division	0.029[c]
Compound interest–double correct	0.057[b]
Risk and return	0.027[c]
Inflation definition	0.042[b]

[a] *p*-value <1%, [b] *p*-value <5%, and [c] *p*-value <10%

Table 10

BOLIVIA: KNOWLEDGE FACTOR

Equation	NLSUR coefficient	NLSUR p-value	3SLS coefficient	3SLS p-value	3SLS-all coefficient	3SLS-all p-value
Savings, last 12 months	0.989	0.035	2.959	0.054	3.393	0.028
Savings, last 12 months, in financial sector	1 (fixed)		1.641	0.472	2.562	0.270
Prepared	–		–		2.736	0.065
Budget	2.881	0.021	3.071	0.049	3.341	0.033
Exact budget	1.680	0.027	2.551	0.052	2.423	0.066
Binding to budget	1.766	0.029	2.626	0.095	2.788	0.077
Comparison	–		–		2.712	0.182
Checking account	–		–		1.656	0.201
Savings account	0.726	0.059	−0.866	0.696	0.035	0.988
Loan shark	–		–		0.199	0.623
Credit card	–		–		1.798	0.272

First stage: F(49, 1,056) = 4.05, Prob. > F = 0.0000.
Note: NLSUR stands for nonlinear SUR, and 3SLS for three stages least squares.

Figure 3

BOLIVIA: KNOWLEDGE FACTOR

Average along descriptive variables

EDUCATION

AGE

SOCIOECONOMIC STATUS

SEX
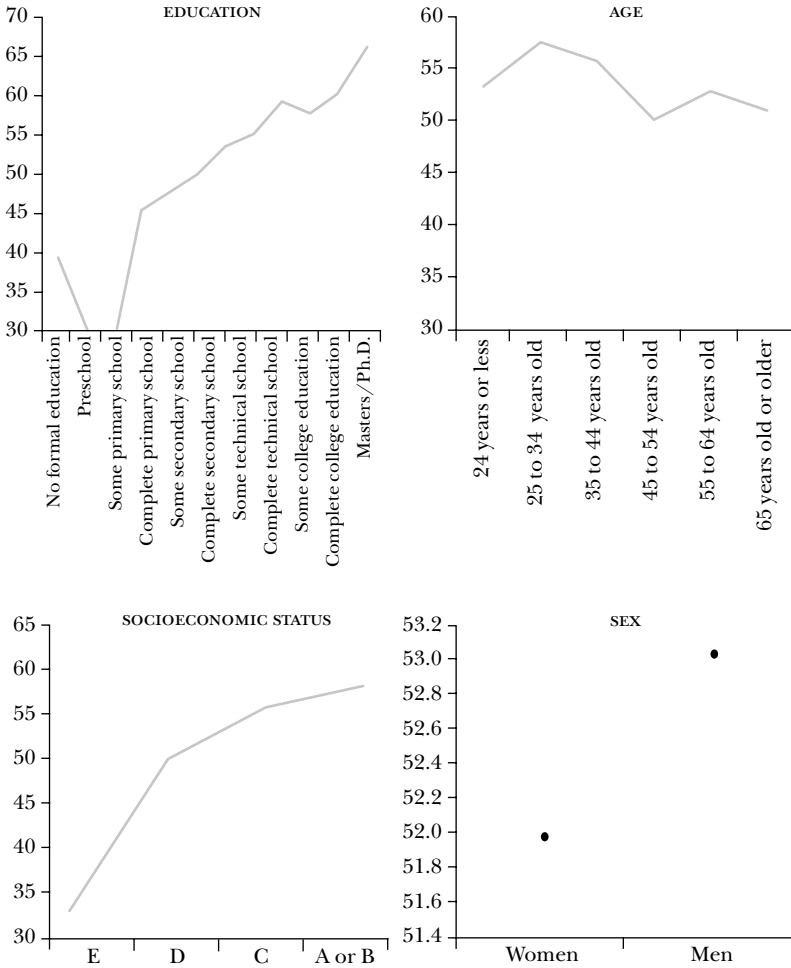
weak inverted U-shape, peaking at the 25 to 34-year-old age group. Figure 3 gives details of these features.

Still in Table 10, the fourth and fifth columns show the instrumented version of the system. Although the knowledge factor ceases being significant in two of the equations, in all of the others it shows the underestimation bias of the endogenous version. The exercise of including the instrumented factor in all the equations (sixth and seventh columns of Table 7) largely confirms the original specification, although the results indicate that the elimination of the downward bias results in the factor becoming significant in the equation of preparedness for negative shocks.

The variables and weights in the Bolivian financial attitude factor are shown in Table 11, while the estimated attitude factor coefficients in the behavior equations are shown in Table 12, where we see that they are significant in eight equations plus the fixed coefficient.

<div align="center">

Table 11

</div>

BOLIVIA: ATTITUDE FACTOR	
Variable	*Weight*
Responsible	0.030[a]
Bold	0.013[c]
Planner	0.031[a]

[a] *p*-value <1%, [b] *p*-value <5%, and [c] *p*-value <10 percent.

The attitude factor in Bolivia increases with social class as well as with formal education. The difference between men and women is very small, with a slightly smaller average for the latter. The behavior of this factor by age group resembles the one of the knowledge factor: a weak inverted U, peaking at 25 to 34 years old. Figure 4 gives details of these features.

Considering the instrumented versions of the system, the fourth and fifth columns of Table 12 once more confirm the presence of underestimation bias in the endogenous versions. The loss of precision renders the factor not statistically significant in three equations. Including the factor in all of the equations does not result in

Table 12

BOLIVIA: ATTITUDE FACTOR

Equation	NLSUR coefficient	NLSUR p-value	3SLS coefficient	3SLS p-value	3SLS-all coefficient	3SLS-all p-value
Savings, last 12 months	0.906	0.002	0.930	0.293	0.794	0.371
Savings, last 12 months, in financial sector	0.844	0.002	1.797	0.055	1.547	0.104
Prepared	0.445	0.029	1.407	0.095	0.674	0.469
Budget	0.732	<0.001	1.693	0.054	1.603	0.068
Exact budget	0.393	0.019	0.590	0.433	0.591	0.433
Binding to budget	1(fixed)		1.669	0.095	1.594	0.112
Comparison	0.550	0.019	2.017	0.008	1.389	0.126
Checking account	0.275	0.081	0.801	0.152	0.413	0.525
Savings account	0.744	0.006	2.591	0.005	2.367	0.013
Loan shark	–		–		0.074	0.771
Credit card	–		–		0.050	0.946

First stage: $F_{(49, 1,056)} = 3.04$, Prob. $> F = 0.0000$.
Note: NLSUR stands for nonlinear SUR, and 3SLS for three stages least squares.

Figure 4

BOLIVIA: ATTITUDE FACTOR
Average along descriptive variables

EDUCATION

AGE

SOCIOECONOMIC STATUS

SEX
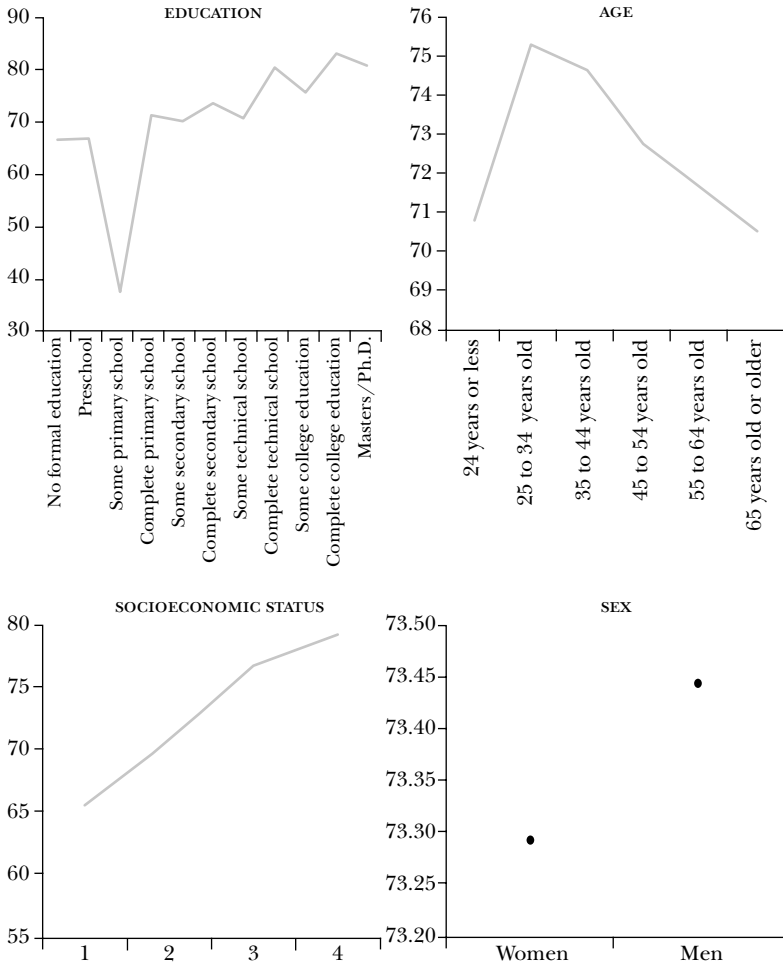
it being significant in any additional equation, as reflected in the sixth and seventh columns.

In Table 13, we show the *p*-values of knowledge and attitude variables that do not belong in the factors, but are significant at the 10% level in some equations. The influence appears to be scattered. This indicates that the factors capture most of the effect of financial knowledge and attitude variables on financial behavior variables. In the knowledge factor, the compound interest question is the one with the highest point estimate, followed by the understanding of inflation as changing prices. The attitude factor indicates that increasing the self-assessment of paying bills on time and of setting long-term goals, in terms of policy benefits, is preferable to promoting the attitude of being prepared to take risks in investments.

4.3 Ecuador

In the Ecuadorian dataset, only an attitude factor with two variables is found. Table 14 shows these variables.

In the second and third columns of Table 15, we show in which equations the factor is significant along with the coefficients of the endogenous version.

The attitude factor in Ecuador tends to increase with social class for almost all classes, but its increase with formal education is questionable. With regard to age, the factor decreases from 44 years of age onwards. The difference between sexes is very small, with men slightly ahead. Figure 5 gives details of these features.

The instrumented versions of the system are more imprecise (columns four through seven of Table 15). This is likely a result of low correlations between the instruments and the factor. Only in two equations do they retain significance. In these, the coefficient once more indicates underestimation bias in the endogenous version. The exercise of including the instrumented factor in all equations does not result in significance in any additional equation.

In Table 16, we show the attitude and knowledge variables that are significant even though they do not participate in a factor. Several variables are correlated with the behavior variables, but as their coefficients are not *proportional* along the equations, most of them cannot be included in factors, making the policy design more complex.

Table 13

BOLIVIA: P-VALUES OF KNOWLEDGE AND ATTITUDE VARIABLES NOT INCLUDED IN FACTORS

	1	2	3	4	5	6	7	8	9	10	11
Division											
Inflation in practice		0.025	<0.001		0.010						
Interest definition											
Simple interest			<0.001						0.028		
Compound interest–double correct											
Risk and return											
Inflation definition											
Diversification								0.008			0.050
Conscientious consumer						0.081					0.008
Carpe diem (inverted scale)											
Impatient (inverted scale)											0.029
Responsible											
Bold											
Conscientious at finance											
Planner											
Spender (inverted scale)											

Note: Shaded variables enter the factor. 1 stands for savings last 12 months; 2, savings last 12 months in the financial sector; 3, prepared; 4, budget; 5, exact budget; 6, binding to budget; 7, comparison; 8, checking account; 9, savings account; 10, loan shark; and 11, credit card.

Table 14

ECUADOR: ATTITUDE FACTOR

Variable	Weight
Responsible	0.019[a]
Planner	0.054[a]

[a] *p*-value <1 percent.

Table 15

ECUADOR: ATTITUDE FACTOR

Equation	NLSUR coefficient	NLSUR p-value	3SLS coefficient	3SLS p-value	3SLS-all coefficient	3SLS-all p-value
Savings, last 12 months	1(fixed)		−0.638	0.529	−0.584	0.565
Savings, last 12 months, in financial sector	0.912	<0.001	0.861	0.437	1.010	0.364
Prepared	–		–		−0.148	0.775
Budget	0.666	0.004	0.317	0.673	0.266	0.730
Exact budget	–		–		−0.185	0.716
Binding to budget	0.547	0.006	−0.262	0.658	−0.335	0.585
Comparison	1.119	<0.001	1.573	0.002	1.686	0.001
Checking account	–		–		0.404	0.250
Savings account	0.442	0.045	0.987	0.240	1.078	0.202
Loan shark	0.161	0.047	0.634	0.031	0.621	0.035
Credit card	–		–		0.565	0.19
Consumption credit	–		–		0.177	0.651

First stage: F(52, 1,118) = 3.44, Prob. > F = 0.0000.
Note: NLSUR stands for nonlinear SUR, and 3SLS for three stages least squares.

Figure 5

ECUADOR: ATTITUDE FACTOR

Average along descriptive variables

EDUCATION

AGE

SOCIOECONOMIC STATUS

SEX
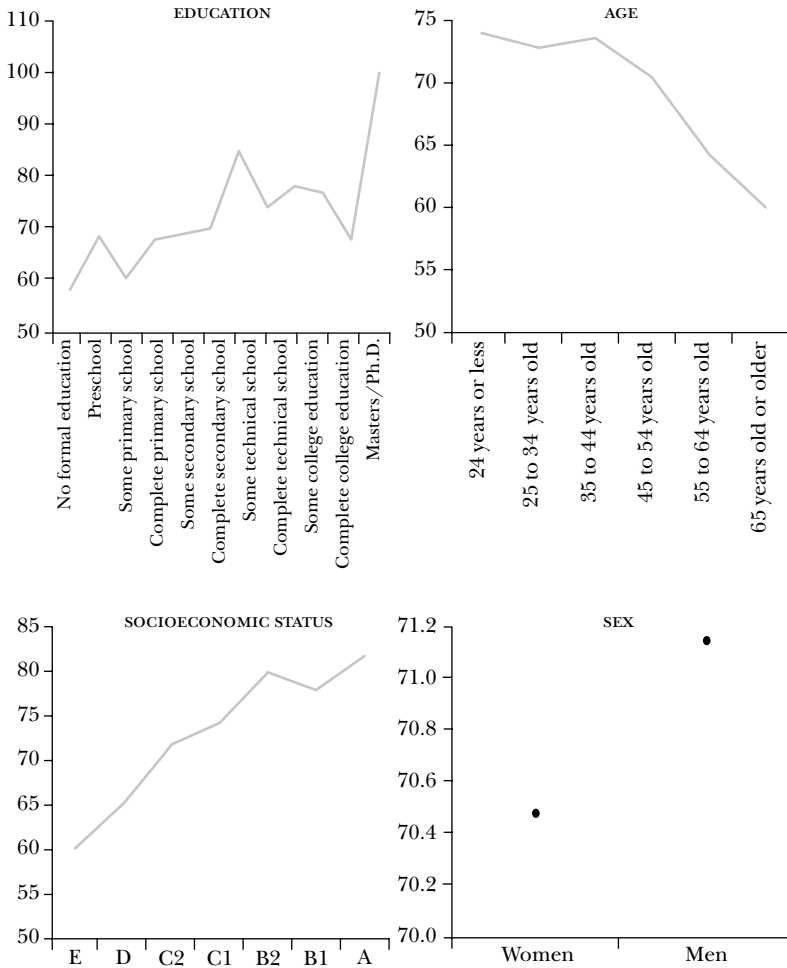
Table 16

ECUADOR: P-VALUES OF KNOWLEDGE AND ATTITUDE VARIABLES NOT INCLUDED IN FACTORS

	1	2	3	4	5	6	7	8	9	10	11	12
Division	0.097					0.056	0.024	0.005				0.097
Inflation in practice	<0.001	<0.001								0.023		0.000
Interest definition	0.039				0.007							0.039
Simple interest	0.031	0.026							<0.001			0.031
Compound interest–double correct										0.057	0.026	
Risk and return			0.072		0.094		0.016					
Inflation definition	<0.001	0.023	0.056									<0.001
Diversification									0.019		0.098	
Conscientious consumer		0.009							0.077			
Carpe diem (inverted scale)						0.013						
Impatient (inverted scale)			0.077	0.001	0.089	0.024						
Responsible												
Bold	0.083			0.056								0.083
Conscientious at finance			<0.001	0.052					0.061			
Planner												
Spender (inverted scale)	0.003	0.009	0.031		0.094						0.032	0.003

Note: Shaded variables enter the factor. 1 stands for savings last 12 months; 2, savings last 12 months in the financial sector; 3, prepared; 4, budget; 5, exact budget; 6, binding to budget; 7, comparison; 8, checking account; 9, savings account; 10, loan shark; 11, credit card; and 12, consumption credit.

4.4 Colombia

In the Colombian dataset, only an attitude factor with two variables is found. Table 17 presents these variables.

Table 17

COLOMBIA: ATTITUDE FACTOR

Variable	Weight
Impatient (inverted scale)	0.030[a]
Conscientious at finance	0.010[b]

[a] p-value <1%, and [b] p-value <5%.

In Table 18, we show in which equations the factor is significant along with its coefficients.

Table 18

COLOMBIA: ATTITUDE FACTOR

| Equation	NLSUR coefficient	NLSUR p-value	3SLS coefficient	3SLS p-value	3SLS-all coefficient	3SLS-all p-value
Savings, last 12 months	1(fixed)		2.048324	0.126	2.278	0.092
Savings, last 12 months, in financial sector	0.476	0.049	1.035	0.480	1.520	0.321
Prepared	–		–		0.974	0.424
Budget	0.533	0.073	−0.225	0.864	1.53	0.311
Exact budget	–		–		0.356	0.796
Binding to budget	–		–		3.821	0.013
Comparison	–		–		−0.816	0.518
Checking account	–		–		1.692	0.058
Savings account	–		–		1.472	0.355
Loan shark	–		–		−0.285	0.724
Credit card	–		–		1.147	0.323
Consumption credit	−0.371	0.087	−0.084	0.907	0.045	0.950

First stage: $F(52, 1{,}145) = 1.55$, Prob. $> F = 0.0083$.
Note: NLSUR stands for nonlinear SUR, and 3SLS for three stages least squares.

The attitude factor in Colombia increases with social class for almost all classes, but its increase with formal education appears weak. It terms of age, the factor decreases from 44 years of age onwards. The difference between sexes places women ahead of men, on average. Figure 6 gives details of these features.

The instrumented estimation of the system, shown in columns four and five of Table 18, render the coefficients as not significant in all equations. The inclusion of the factor in all equations, displayed in the last two columns of Table 18, results in three significant coefficients at the 10% level. Two of them do not belong in the endogenous estimation, indicating some presence of downward bias in it.

In Table 19, we show the attitude and knowledge variables that are significant even though they do not participate in a factor. As in the Ecuadorian case, many variables are correlated with financial behavior and most of them cannot be included in the factors, making the policy design more complex.

4.5 Cross-country Comparisons

Although this paper focuses on policy design, and thus advocates the need of addressing the relation between financial literacy and behavior variables separately for each country, it is interesting to notice some similarity in the results. In Table 20, we summarize the results of the NLSUR estimations, and we may grasp easily how each of the regressors of interest explains many objective variables. Variables that belong in a factor are marked with an F, and the number of behavior variables they affect can be seen in the lower panel, where we list the number of equations in which each factor is significant. To make visualization easier, the higher the number of behavior variables affected, the darker the color of the cell.

In analyzing Table 20, we find being a planner (setting long-term financial goals and striving to attain them) is important in all countries. This variable belongs in a factor in three of them and is significant by itself in five equations in the remaining one.

Some variables, on the other hand, seem to perform poorly, since they are correlated with very few dependent variables in all countries. This is the case of the carpe diem attitude (statement: "I tend to live for today and let tomorrow take care of itself") and the understanding of the definition of interest. Of course, it is possible that these questions are relevant for dimensions of financial behavior

Table 19

COLOMBIA: P-VALUES OF KNOWLEDGE AND ATTITUDE VARIABLES NOT INCLUDED IN FACTORS

	1	2	3	4	5	6	7	8	9	10	11	12
Division		0.041		0.003		0.007			0.047		0.005	
Inflation in practice							0.035					
Interest definition												
Simple interest							0.023					
Compound interest–double correct	0.016										0.039	0.016
Risk and return			0.066									
Inflation definition				0.041					0.081			
Diversification												
Conscientious consumer				0.000	0.005	0.001						
Carpe diem (inverted scale)												
Impatient (inverted scale)												
Responsible		0.028								0.037		
Bold				0.017								
Conscientious at finance												
Planner	<0.001		0.035					0.066		0.001		0.000
Spender (inverted scale)					0.028				0.051			

Note: Shaded variables enter the factor. 1 stands for savings last 12 months; 2, savings last 12 months in the financial sector; 3, prepared; 4, budget; 5, exact budget; 6, binding to budget; 7, comparison; 8, checking account; 9, savings account; 10, loan shark; 11, credit card; and 12, consumption credit.

Figure 6

COLOMBIA: ATTITUDE FACTOR

Average along descriptive variables

EDUCATION

AGE

SOCIOECONOMIC STATUS

SEX
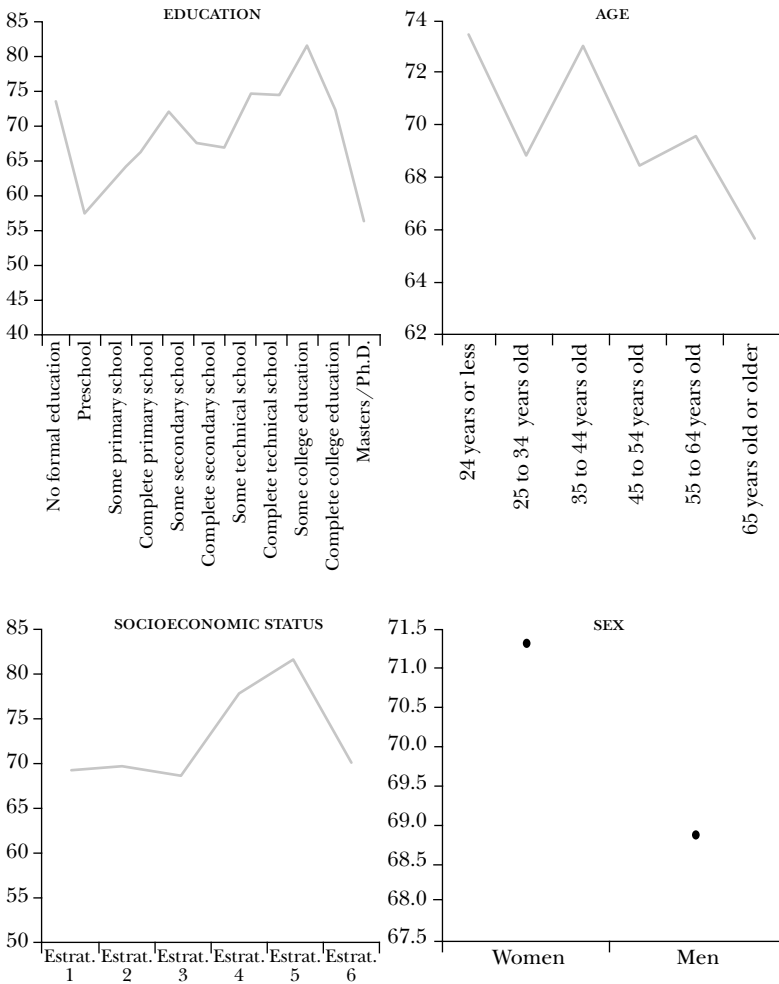
Table 20

RESULTS SUMMARY

	Peru	Bolivia	Ecuador	Colombia
Division	2	F	6	4
Inflation in practice	2	3	3	2
Interest definition	1	0	2	0
Simple interest	4	2	3	1
Compound interest–double correct	2	F	2	2
Risk and return	1	F	4	2
Inflation definition	1	F	3	2
Diversification	1	2	2	0
Conscientious consumer	1	2	3	3
Carpe diem (inverted scale)	2	0	1	0
Impatient (inverted scale)	1	1	4	F
Responsible	0	F	F	2
Bold	F	F	2	1
Conscientious at finance	F	0	3	F
Planner	F	F	F	5
Spender (inverted scale)	3	0	6	2
Attitude factor	6	8	6	3
Knowledge factor		5		

that could not be used in estimations, due to a very low number of users, or even for behaviors not assessed by the survey.

A related issue is the possibility that there are important questions specific to certain countries other than the widely agreed upon set used in the OECD kit. In comparing the results of the present paper with those obtained in Garber and Koyama (2016), we find that all the attitude-related questions that entered some factor in the present paper, except for "being prepared to risk some money when investing," enter one of the two attitude factors defined there. At the same time, some additional questions, not present in the CAF or OECD survey are important too, including one about the habit of buying products in installments, a common practice in Brazil. We list the questions that are important in Brazil, and the information about their presence in the CAF and OECD surveys in the Annex.

5. CONCLUSION

In this paper we implement for four Latin American countries a technique developed in Garber and Koyama (2016) to obtain financial knowledge and financial attitude measures that are meaningful in terms of policy objectives. This is the first paper to use that technique in a cross-country analysis. In each country, the technique resulted in the construction of at least one factor. We also documented the possibility of employing as instruments the controls that were no significant in the equations.

An interesting similarity is that the *weights* of the variables inside those factors are very heterogeneous among variables. This fact, combined with the notion that several knowledge and attitude variables fail to explain financial behavior, indicates that measures that sum *points* on survey questions could convey misleading measures for the design of programs aimed at enhancing financial literacy. Of course, this argument is only valid if the behavioral outcomes that we employed as targets are the ones that matter as policy goals. The fact that they were included as questions in such a careful survey appears to indicate that this is true.

In terms of the performance of specific variables, the attitude of being a planner stands out, affecting several outcomes in all the countries analyzed.

Finally, the fact that the set of knowledge and attitude variables affect financial behaviors varies from one country to another indicates that there may be questions not included in the survey that are relevant, even if that is only at the national level. In the case of Brazil, this was shown by Garber and Koyama (2016).

ANNEX

Comparison with Results for Brazil

In this Annex, we display the knowledge and attitude questions that proved to be relevant in the Brazilian case, but were not included in the CAF survey. We reproduce the tables for knowledge and attitude factors from Garber and Koyama (2016).

Table A.1				
QUESTIONS MEASURING THE FINANCIAL KNOWLEDGE FACTOR IN BRAZIL				
Question	*Value assigned*	*Coefficient (standard deviation)*	*OECD survey*	*CAF survey*
Suppose three friends win 1,500 BRL together in a lottery. If they decide to share the money equally, how much does each one get? (three alternatives or do not know)	Dummy = 1 if correct	0.984[a] (0.240)	Yes	Yes
A good way to control monthly expenditure is to make a budget. (True or false)	Dummy = 1 if correct	0.270[d] (0.159)	No	No
Having information about the included interest if a sale is made in installments is a basic consumer right. (True or false)	Dummy = 1 if correct	0.730[a] (0.227)	No	No

Question	Value assigned	Coefficient (standard deviation)	OECD survey	CAF survey
In Brazil in 2013, what was the level of inflation? (three alternatives or do not know)	Dummy = 1 if correct	0.463[a] (0.098)	No	No
How would you rate your level of financial knowledge on a scale of 1 to 5 where 1 is not at all knowledgeable and 5 is very knowledgeable? (1 through 5, do not know or refusal)	1 through 5	0.248[a] (0.051)	Yes	No
Suppose you borrow 100 BRL from a friend and pay him back 100 BRL after a week. How much interest have you paid on this loan? (three alternatives or do not know)	Dummy = 1 if correct	0.379[b] (0.1286657)	Yes	Yes
An investment with a high return is likely to be high risk. (True or false)	Dummy = 1 if correct	0.357[b] (0.130)	Yes	Yes

Note: Significant at [a]0.1%, [b]1%, [c]5%, and [d]10%. BRL stands for Brazilian real.
Source: Garber and Koyama (2016).

**QUESTIONS MEASURING THE FINANCIAL ATTITUDE FACTOR 1
IN BRAZIL**

Question	Value assigned	Coefficient (standard deviation)	OECD survey	CAF survey
How would you rate your level of financial stress? (1 through 5, do not know or refusal)	1 through 5	0.253[a] (0.050)	No	No
I keep a close personal watch on my financial affairs. (How much do you agree, 1 through 5)	1 through 5	0.113[b] (0.044)	Yes	Yes
I prefer to pay for a purchase in installments than to wait until I have the money to pay for it upfront. (How much do you disagree, 1 through 5)	1 through 5	0.064[c] (0.032)	No	No
I find it more satisfying to spend money than to save it for the long term. (How much do you disagree, 1 through 5)	1 through 5	0.107[a] (0.033)	Yes	Yes
I have too much debt right now. (How much do you disagree, 1 through 5)	1 through 5	0.111[b] (0.035)	Yes	No
I am satisfied with my present financial situation. (How much do you agree, 1 through 5)	1 through 5	0.135[a] (0.035)	Yes	No

Note: Significant at [a]0.1%, [b]1%, [c]5%, and [d]10%.
Source: Garber and Koyama (2016).

Table A.3

QUESTIONS ENTERING THE FINANCIAL ATTITUDE FACTOR 2 IN BRAZIL

Question	Value assigned	Coefficient (standard deviation)	OECD survey	CAF survey
In general, I feel capable of managing my personal finances by myself. (How much do you agree, 1 through 5)	1 through 5	0.100[b] (0.035)	No	No
How confident are you that you have done a good job of making financial plans for your retirement? (How much do you agree, 1 through 5)	1 through 5	0.088[b] (0.031)	Yes	No
I set long-term financial goals and strive to achieve them. (How much do you agree, 1 through 5)	1 through 5	0.057[c] (0.026)	Yes	Yes
Money is there to be spent. (How much do you disagree, 1 through 5)	1 through 5	0.074[b] (0.029)	Yes	Yes
I pay my bills on time. (How much do you agree, 1 through 5)	1 through 5	0.099[b] (0.035)	Yes	Yes
My financial situation limits my ability to do the things that are important to me. (How much do you disagree, 1 through 5)	1 through 5	0.067[c] (0.027)	Yes	No
I must admit that I purchase things because I know they will impress others (slightly different phrasing)[1]. (How much do you disagree, 1 through 5)	1 through 5	0.066[c] (0.027)	Yes	No

Note: Significant at [a]0.1%, [b]1%, [c]5%, and [d]10 percent. [1] For the paper in English, we used the original version of the questions in the OECD toolkit. By *slightly different phrasing* we mean that the question used in Portuguese is a bit different from this one. Still it is supposed to be the one corresponding to this original question. The version in Portuguese says: "When I buy something, I generally choose a brand which my friends and relatives approve of."
Source: Garber and Koyama (2016).

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Determinants of Formal and Informal Saving in Colombia

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Abstract

In this paper we perform an empirical study of the determinants of saving among middle- and low-income individuals living in urban and rural areas of Colombia. The results show that the likelihood of saving increases with education, income, labor market participation, and home ownership. The results also demonstrate that education and income increase the probability of saving in banks and decrease the likelihood of informal saving in both urban and rural areas.

Keywords: formal saving, informal saving, urban area, rural area, Colombia.

JEL classification: C25, D14, G21, R20.

1. INTRODUCTION

Household saving is important because it guarantees financial security during retirement, finances expenditure on housing, education, and health, helps cushion unexpected events (such as sickness, bad harvests, job losses, etc.), provides resources for setting up a business, and smooths consumption throughout life (Callen and Thimann, 1997; Banerjee and Duflo, 2011). These reasons, which vary according to the socioeconomic characteristics of the population, have been widely documented in the literature (Horioka and Watanabe, 1997; Browning and Lusardi, 1996).

Household level studies generally analyze the determinants of aggregate saving and do not take into account possible differences existing between areas of the same country. In Colombia, in particular, there is significant rural-urban diversity. For instance, according to data from the 2013 *Encuesta Longitudinal Colombiana de la Universidad de los Andes* (ELCA), 77% of people in rural areas have five years or less of education, while in urban areas the percentage is 35%. The available income of people in the sample also varies considerably: average income in urban areas is around 750 USD, and in rural areas it is approximately 50% of that figure. Moreover, 20% of household heads in rural areas are women, while in urban areas the figure is 37%. This paper aims to contribute to the literature by separately analyzing the determinants of the probability of saving in rural and urban areas, an aspect that has not been studied in depth for Colombia.

Another important aspect in the analysis of household saving is related to the development of the financial system and financial inclusion, given the constraints these might imply for saving in the formal sector (Bayoumi, 1993). In Colombia, a large percentage of the population in urban and rural areas use informal saving methods. To be specific, according to the ELCA, 50% of middle- and low-income individuals in urban areas save in cash. This figure increases to 82% in rural areas. Furthermore, 27% of people in urban areas and 16% in rural ones save at a bank or financial institution. This paper also contributes to the literature by separately studying formal and informal saving.

The aim of this research is to provide empirical evidence of the determinants of formal and informal saving among middle- and low-income individuals in urban and rural areas of Colombia using

data from the 2013 ELCA. The estimates suggest that the probability of saving increases with education, income, labor market participation, and home ownership. Education and income also increase the likelihood of saving at financial institutions and reduce that of doing so through informal means.

The paper is divided into four sections including this introduction. Section 2 presents a review of national and international literature. Section 3 describes the data and analyzes the factors that affect the likelihood of a person saving, as well as the possible determinants of the probability of saving in the formal or informal sector. Section 4 outlines the main conclusions.

2. LITERATURE REVIEW

Literature on saving in Latin America has focused on analyzing its macroeconomic determinants. These studies find that gross domestic product (GDP) growth, income per capita, and macroeconomic uncertainty have a positive impact on private saving rates because they encourage precautionary saving among individuals. In contrast, interest rate increases and easier ways to access credit have a significant negative impact on private saving rates (Loayza et al., 2000).

In Colombia, Easterly (1991), Cárdenas and Escobar (1998), and Ocampo and Tovar (1998) analyze the factors that determine private saving, taking into account the aggregate variables that influence its behavior. However, macroeconomic variables do not fully explain the reasons why people save; therefore, a new line of research has focused on microeconomic analysis aimed at explaining the factors that determine household saving. For instance, Castañeda (2001) finds that the decline in saving rates during the nineties was mainly due to the behavior of household saving. This result is explained by the demographic structure of the economically dependent population, high-income concentration, low levels of education among households, and lack of interest rate sensitivity of savings. More recently, Cadena and Quintero (2015), present descriptive statistics obtained from the results of the ELCA with respect to saving in rural and urban areas among household heads and their partners for 2010 and 2013. In particular, the authors characterize savers and study the main objectives of saving. Finally, Rodríguez-Raga and Riaño-Rodríguez (2016), use the first round (2010) of the ELCA to examine

the determinants of household access to formal saving products. The authors point out that higher household income, home ownership, education, and labor market participation foster private saving.

International literature has identified some household characteristics associated with the habit of saving. For instance, it has been shown that there is a positive relation between saving rates and income in both developed and developing countries[1]. On the other hand, the literature on the relation between saving and the level of education of the household head are ambiguous. Although some studies find a positive association between these two variables (Avery and Kennickell, 1991; Bernheim and Scholz, 1993; Attanasio, 1993; Browning and Lusardi, 1996; Attanasio and Székely, 1998; and Butelman and Gallego, 2000), others do not identify a significant relation, while some even find a negative one (Coronado, 1998; Denizer and Wolf, 1998; Bebczuk et al., 2015).

The influence of household composition on saving decisions has also been highlighted. For instance, people who are married behave differently than those who are single, since an additional source of income allows for having more savings. Single-head households with children tend to save less. Moreover, the household saving rate shrinks as the number of household members rise, but increases with the number of earners (Bosworth et al., 1991; Browning and Lusardi, 1996; Coronado, 1998; Butelman and Gallego, 2000). The role of women can be ambiguous with regards to saving. Studies such as those of Levenson and Besley (1996), Carpenter and Jensen (2002), Kedir and Ibrahim (2011), and Bebczuk et al. (2015) find that women participate more in informal saving schemes than formal ones.

Asset ownership can also play an important role in this topic. On the one hand, households that own financial assets tend to have higher rates of saving than those that do not (Castañeda, 2001; Bosworth et al., 1991). On the other hand, home ownership appears to have a more ambiguous effect. For instance, while Bebczuk et al. (2015) find that the saving rate in Latin America increases if households own

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[1]   For developed countries see, for instance, Bosworth et al. (1991), Poterba (1994), Browning and Lusardi (1996); for developing countries, see Coronado (1998), Székely (1998), Attanasio and Székely (1998), Denizer and Wolf (1998), Butelman and Gallego (2000), Castañeda (2001), Newman, et al. (2008), Bebczuk et al. (2015), and Schclarek and Caggia (2015).

their own home, Castañeda (2001) shows that in Colombia, households who own their home reduced their saving rate. Other factors that can positively influence saving are the household head being in formal employment (Bebzcuk et al., 2015), and belonging to religious or political groups (Newman et al., 2008).

It is necessary to take into account that capital market imperfections, or lack of access to credit and saving opportunities in formal financial systems, can lead to decisions to save through informal means. Studies such as those of Levenson and Besley (1996) for Taiwan, Kedir and Ibrahim (2011) for Ethiopia, and Carpenter and Jensen (2002) for Pakistan, explore the importance of informal financial systems as a significant source for accessing saving and credit opportunities in low-income countries.

Various studies evaluating the macroeconomic determinants of saving have revealed mixed results when assessing the life-cycle hypothesis of Modigliani. The study of Bebczuk et al. (2015) on saving in Latin America contends that the age of household heads has a positive, but decreasing, impact on saving. Levenson and Besley (1996) in their analysis of the rotating savings and credit associations (Roscas) in Taiwan show that participation in this informal system is higher among young people. Schclarek and Caggia (2015) show that, contrary to expectations, the relation between age and the saving rate in Chile is U shaped. Meanwhile, Castañeda (2001) explains that Colombian households respond more to current than future income. All these results demonstrate that macroeconomic theories on saving are inaccurate when data is analyzed at a microeconomic level.

Besides the literature studying the determinants of saving, there is another line of research that seeks to solve problems related to reduced saving levels, especially among low-income groups. A recent book edited by Cavallo and Serebrisky (2016) studies in detail the status of saving in Latin America and the Caribbean, suggesting that savings are low in the region and should be used more efficiently to achieve higher economic growth rates. The book examines the role played by the financial system in generating saving: how households, businesses, and governments can address problems and challenges by leveraging opportunities to achieve higher saving rates, and thereby promote development and well-being. Karlan et al. (2014) mention that low levels of saving could have significant implications for people's well-being, particularly regarding their consumption,

capacity to respond to shocks, and inability to make possibly profitable investments. They also identify five types of constraints that might be impeding the effective use of saving products and services by the poor, such as transaction costs, lack of trust and regulatory barriers, asymmetric information, social restrictions, and behavioral issues.

Likewise, Di Giannatale and Roa (2016) present an in-depth review of the literature on the obstacles to formal saving, from both the supply side (access to financial products) and the demand side (use and frequency of use of those products). The authors also discuss the determinants of formal saving from a theoretical and empirical point of view. To overcome all these obstacles, the literature proposes making rapid-impact interventions, such as encouraging *mental accounting*, which consists of defining a monthly expenditure plan where people commit to certain specific amounts per expenditure category. This creates a psychological cost for individuals to transfer money from one account, such as utilities expenses, to another, such as entertainment (see Shefrin and Thaler, 1992; Thaler, 1999; Salas, 2015). Mental accounting can be enhanced by peer pressure, which consists of informing a friend or family member of a spending plan so that person can both help to follow it and reduce the temptation (and increase the cost) of transferring money from one spending category to another (Kast et al., 2012). Furthermore, to encourage saving in the financial system, the literature suggests using word of mouth (social networks) to disseminate information about the advantages of saving in formal institutions, generating confidence in the system and contributing to its promotion (Newman et al., 2008).

3. DATA AND RESULTS

We analyze saving among households in urban and rural areas using the second round of the ELCA conducted in 2013, which includes data on income and expenditures, education, social capital, and composition of urban and rural households in Colombia. The urban sample contains information on 4,911 households, representing socioeconomic strata one to four (low and middle income) from five regions of the country (Bogotá, Central, Oriental, Atlántica, and Pacífica). The rural sample includes data on 4,351 households, representing

households from strata one and two in the Atlántica, Altiplano Cundi-Boyacense, Eje Cafetero, and Centro-Oriente regions.

Detailed data on household income and expenditures from the ELCA was employed to calculate saving rates, considering socioeconomic characteristics in order to identify variations in the saving habits of different urban and rural population groups. Saving rate calculations show that in 2013 the average saving rate of middle- and low-income households in urban areas was -1.6% and 3.2% in rural areas. These saving rates increase to 19.2% and 16.2%, respectively, when spending on durable goods, education, and health are excluded, suggesting households carry out some of their saving by purchasing such goods, which could be considered as investment[2]. Evaluating saving rates by income quintile, we observe that in both urban and rural areas they increase considerably with each quintile, implying a positive relation between household income and saving as suggested by the literature (see, for instance, Bosworth, et al., 1991; Butelmann and Gallego, 2000; Huggett and Ventura, 2000; Dynan et al., 2004).

In addition, by gender of the household head, we find that male-headed households have higher saving rates than those whose head is female. This difference is greater in rural areas, which would suggest less empowerment for women. These results are consistent with Bosworth et al. (1991), who find that households headed by single mothers have low saving rates. Bernasek and Shwiff (2001) also find significant differences between men and women's investment and saving decisions, and Ahmad and Asghar (2004) show that the gender employment gap between men and women influences the fact that saving rates vary by gender. Moreover, the results show that saving rates increase with the level of education of the household head in both urban and rural areas. It stands out that gains in savings as the level of education increases, are higher in rural areas, meaning it is recommendable to foster improvements in the education of the population located in those areas of the country. As set out in Lusardi

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[2] Household saving is defined as available income minus expenditure items, and the saving rate as household saving divided by available income. For a more detailed study of saving rates where different definitions of expenditure are considered, see Iregui et al. (2016). See also Melo et al. (2006).

(2008), a lack of saving skills can be associated with low levels of education and consequently to limited financial literacy.

Given the differences found in saving rates by area and socioeconomic characteristics, the factors affecting the likelihood of a person saving are explored below. We also examine the determinants of whether this saving is made formally or informally. To do this we employ logit models, using data for individuals, household heads and their partners: 7,738 for urban areas and 7,533 for rural ones.

3.1 Determinants of the Likelihood of Saving

This section analyzes the determinants of saving among low- and middle-income individuals using a sample of household heads and their partners for urban and rural areas. In general, the data indicates that a small percentage of people in the sample save: 18% in urban areas and 13% in rural ones (Figure 1).

Figure 1

DO YOU SAVE A PART OF YOUR INCOME REGULARLY?
Percentage of responses, second round year 2013

URBAN

RURAL

Do not report
1

Do not
receive
income
12

Yes
18

Not
69

Do not report
0.1

Do not
receive
income
20

Yes
13

Not
67
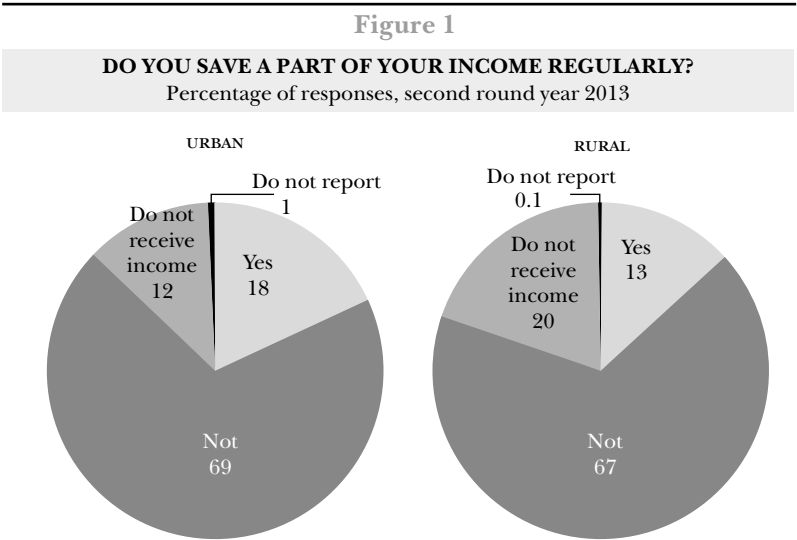
Source: ELCA.

To understand the determinants of people's saving behavior we estimate the following equation using logit models:[3]

$$1 \qquad\qquad Savings_i = \beta_0 + \beta_1 X_{1,i} + \beta_2 X_{2,i} + \upsilon_i,$$

where *Savings* is a binary variable that indicates whether individual *i* saves (1) or not (0). $X_{1,i}$ includes the characteristics of household *i* (e.g. income, size, region where it is located, and home ownership) and $X_{2,i}$ contains the characteristics of individual *i* (e.g. age, age squared, sex, education, marital status, and employment). Annex lists the definitions of those variables, as well as the descriptive statistics.

Table 1 shows the results of the estimations.[4] As can be seen, when individuals are classified by age group in the urban and rural samples, people between 15 and 47 years of age have a higher probability of saving than those who are over 58, the reference group. This result is consistent with the life-cycle theory (Modigliani, 1966) according to which a person saves during their most productive years and dissaves towards the end of their life.

Higher levels of education increase the likelihood of people saving in both areas. This could be because highly educated people tend to be more patient and consider the future (Bebczuk et al., 2015). The education results are consistent with Morisset and Revoredo (1995), who analyze a panel of 74 countries between 1960 and 1990, finding that education has a positive influence on saving.

As for income, in urban areas it can be seen that an increase in the income quintile raises the likelihood of saving, as compared to the lowest-income quintile. In rural areas, only individuals in the highest quintile have a greater probability of saving (6%) than those in quintile 1. In urban areas, the larger the household size the lower the probability of saving. To understand the effects of wealth on saving, a dichotomous variable was included in the analysis that indicates whether a household is a homeowner or not. We find that home ownership increases the likelihood of saving in urban and rural areas.

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[3] The estimations were performed using clustered errors at household level and included the corresponding expansion factors.

[4] The estimations were also carried out for the sample of employed individuals to establish whether saving depends on the type of employment a person has. These results are not presented here to save space, but are available upon request.

TABLE 1

DETERMINANTS OF THE LIKELIHOOD OF SAVING (LOGIT ESTIMATION)

Marginal effects[1]

Dependent Variable: One if the person saves and zero if not

Explanatory Variables	Urban		Rural	
	dy/dx	Standard Error	dy/dx	Standard Error
Age 15 to 25	0.1131	(0.0664)[c]	0.1136	(0.0393)[a]
Age 26 to 37	0.1354	(0.0367)[a]	0.0616	(0.0176)[a]
Age 38 to 47	0.0680	(0.0311)[b]	0.0522	(0.0152)[a]
Age 48 to 57	0.0317	(0.0286)	0.0138	(0.0143)
Sex (male = 1)	−0.0091	(0.0145)	0.0104	(0.0097)
Married (yes = 1)	−0.0216	(0.0292)	−0.0017	(0.0164)
Separated (yes = 1)	−0.0128	(0.0317)	0.0321	(0.0265)
Middle school/ high school (yes = 1)	0.0186	(0.0225)	0.0319	(0.0115)[a]
Technical/technological education (yes = 1)	0.0069	(0.0309)	0.0797	(0.0420)[c]
Tertiary education (yes = 1)	0.0744	(0.0366)[b]	0.1050	(0.0509)[b]

Labor market participation (yes=1)	0.1376	(0.0154)[a]	0.0911	(0.0096)[a]
Income quintile 2	0.0643	(0.0375)[c]	0.0215	(0.0158)
Income quintile 3	0.1090	(0.0365)[a]	0.0080	(0.0157)
Income quintile 4	0.1121	(0.0367)[a]	0.0089	(0.0161)
Income quintile 5	0.1705	(0.0468)[a]	0.0580	(0.0179)[a]
Household size	−0.0239	(0.0061)[a]	−0.0028	(0.0028)
Homeowner (yes=1)	0.0534	(0.0194)[a]	0.0207	(0.0092)[b]
Remittances from Colombia (yes=1)	−0.0068	(0.0256)	0.0212	(0.0107)[b]
Remittances from abroad (yes=1)	0.0033	(0.0331)	0.0230	(0.0314)
Government programs (yes=1)	0.0067	(0.0253)	−0.0171	(0.0110)
Insurance (yes=1)	0.0533	(0.0171)[a]	0.0298	(0.0102)[a]
Fixed regional effects	Yes	Yes	Yes	Yes
Number of observations	7,738		7,533	

Note: [1] Marginal effects were calculated at the mean for the continuous variable and at 1 for the dichotomous variables. [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.1$
Source: Authors' calculations.

This result is similar to that reported by Peltonen et al. (2009), and Butelmann and Gallego (2000), who find a positive relation between wealth and saving, specifically finding that home ownership encourages saving. According to Bebczuk et al. (2015), this result could be because a person who owns their home does not have to pay monthly rent, and therefore has a higher margin of income for saving.

Participation in the job market increases the likelihood of saving (14% in urban areas and 9% in rural ones). Meanwhile, receiving domestic remittances only raises the probability of saving in rural areas (2%). This responds to the fact that remittances are generally transferred from urban to rural areas. Such results are in line with Rodríguez-Raga and Riaño-Rodríguez (2016), who find that greater access to resources increases the probability of saving in Colombia. On the other hand, being a beneficiary of government programs is not important in saving decisions.[5] The latter suggests that such programs should focus more on promoting saving. Finally, having insurance or not was included as a proxy variable for risk aversion, which was positive and significant in the estimations.[6] This result suggests that people who are risk averse are more likely to save (5% in urban areas and 3% in rural ones).

3.2 Differences in the Likelihood of Formal and Informal Saving

This section presents the descriptive statistics and reports the results of the estimations for the determinants of formal and informal saving. Figure 2 illustrates how the majority of household heads and their partners save in cash (50% in urban areas and 82% in rural ones). Financial institutions do not appear to be very attractive for

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[5] The survey asks whether households have benefited from the following programs or aid in the prior 12 months: Families in action, programs for senior citizens, education programs offered by the *Servicio Nacional de Aprendizaje* (SENA), *Red Juntos-Unidos*, programs of the *Instituto Colombiano de Bienestar Familiar* (ICBF), natural disaster relief, and assistance for displaced persons.

[6] It would be interesting to include variables such as financial education, and risk and time preferences in this analysis, as done by Di Giannatale et al. (2015). Unfortunately, the ELCA does not contain these types of variables. It doescontain however, data on ownership of insurance policies. We therefore decided to add this variable to the estimation as a proxy variable for people's risk aversion.

Figure 2

WHERE DO YOU MAINLY SAVE ?
Percentage of responses, second round year 2013
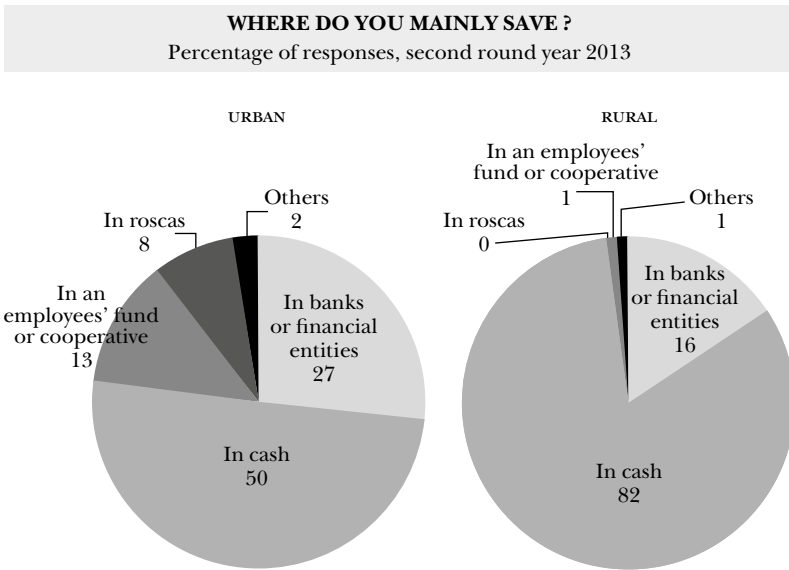
URBAN

RURAL

Source: ELCA.

savers, given that only 27% of urban individuals and 16% of rural ones report saving in such establishments.

In light of the small percentage of savers in banks or financial institutions, we investigate the reasons why people do not use those financial intermediaries. Their motives include supply and demand side aspects. Among the supply factors, which are related to access to financial products, the ELCA delves into aspects related to the costs and yields of products, as well as the paperwork required. On the demand side, the survey asks about barriers associated to a lack of trust in institutions, lack of knowledge regarding the procedures to access products, and lack of resources for saving.[7] Figure 3 presents the main reasons why individuals do not save in financial institutions. In urban areas, 32% of people argue they have very little money for saving, 19% report not saving because of high handling fees and commissions, 14% state that the yields are not good, and

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[7]   For further details on the barriers to saving, see Di Giannatale and Roa (2016).

REASONS FOR NOT SAVE IN THE FINANCIAL SYSTEM
Percentage of responses, second round year 2013
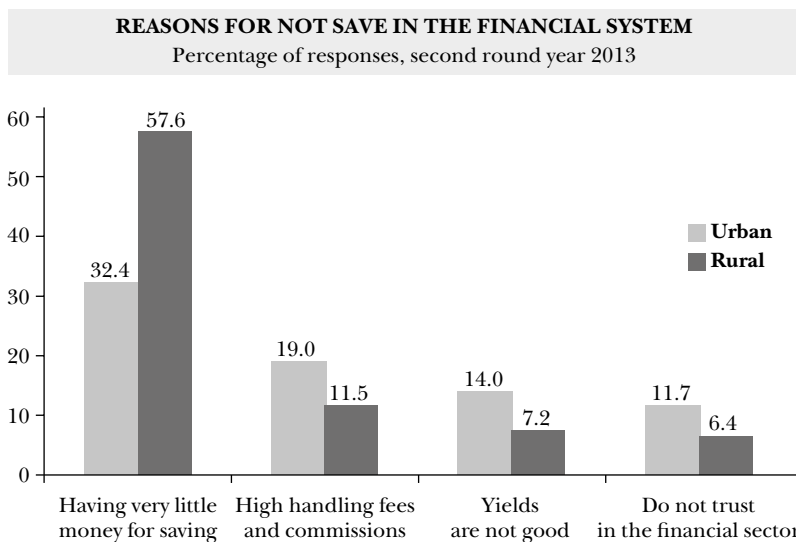
Source: ELCA.

12% say they do not trust the financial sector. In rural areas, 57% of people argue they do not have money to save, followed by 12% who say they do not save because handling fees are too high.

Finally, figure 4 shows that people from both areas mainly save for old age, education, and emergencies. Besides those categories, in urban areas, purchasing a home is one of the most important reasons, while in rural areas, health and paying debts are included among the most important reasons for saving.[8]

We now study the possible determinants of the likelihood that people save in a bank or employee fund (formal), or in cash or roscas (informal). We estimate the following equation for each type of saving:

$$2 \qquad Saves\_in_i = \alpha_0 + \alpha_1 X_{1,i} + \alpha_2 X_{2,i} + \alpha_3 X_{3,i} + \varepsilon_i,$$

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[8] It should be pointed out that people can report several reasons for saving in the survey.

Figure 4

PRINCIPAL REASON FOR SAVING
Percentage of responses, second round year 2013
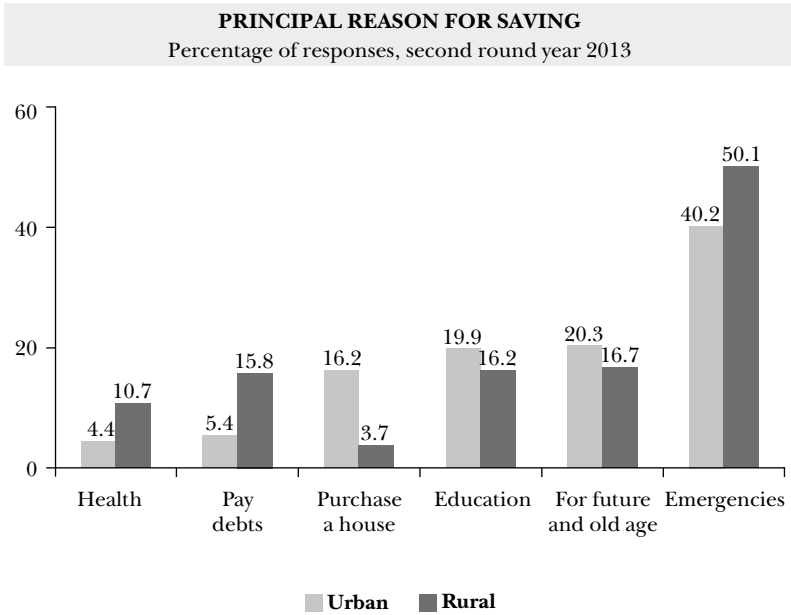
Source: ELCA.

where *Saves_in* is a binary variable that takes the value one if per-
son *i* saves in a bank, an employee fund, cash, or roscas, and zero
if not. $X_{1,i}$ y $X_{2,i}$ are defined as in equation 1 and $X_{3,i}$ includes the
reasons given for saving by person *i* (e.g. purchasing a home, pur-
chasing other assets, emergencies, or paying debts).

Table 2 shows the marginal effects of the estimations.[9] As can
be seen, in urban areas, people under 37 years of age are less likely
to save in banks than the reference group, while the 38 to 47 age
group are more likely to save in roscas. In rural areas, people over
the age of 58 are more likely to save in banks than other age groups,
while they are less likely to save in cash.

In urban areas, being male increases the probability of saving
in banks (6%) and decreases that of saving in roscas (5%), while in

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[9] The estimations were also performed for the sample of people in em-
ployment. For matters of space, these results are not presented here,
but are available upon request.

rural areas it increases the probability of saving in banks (5%) and decreases that of doing so in cash (6%). As for marital status, in urban areas being married or separated increases the probability of saving in employee funds, as compared to people who are single or widowed, and decreases the likelihood of saving in banks. Education is a variable highly correlated to saving, as analyzed in the previous section. In particular, education increases the probability of saving in financial institutions in both areas, but decreases the probability of saving in cash and in roscas. That is, education fosters formal saving and discourages informal saving.

In urban and rural areas, the highest income quintiles are more likely to save in a bank and less likely to do so in cash than quintile 1. Hence, higher income households are more likely to save in the formal sector than in the informal sector. As the size of household increases, the probability of saving in a bank declines. Meanwhile, homeowners have a higher probability of saving in banks in rural areas.

Household heads or partners in urban areas that report saving for old age do so mainly in employee funds. Moreover, those who save to purchase a home are more likely to do so in the formal sector and less likely to do so in cash. This might be because it represents a major investment for people and financial institutions can be safer. Meanwhile, those who save for emergencies prefer to do so in cash (this increases the probability by 11%), and to a lesser extend in roscas (this decreases the probability by 8%). This might be a result of the fact that roscas generally have specific aims and restrictions for using or withdrawing money. In rural areas, those who save to purchase a home are the most likely to do so in banks (37%), and the least likely to do so in cash (30%). On the other hand, saving for emergencies is done in cash (this increases the probability by 6%).

Remittances from abroad increase the likelihood of saving in banks by 13% in rural areas. The latter is an expected result given that international transfers are generally made through financial institutions. Finally, risk aversion increases the probability of saving in the formal sector, and decreases that of saving in cash in both urban and rural areas.

Table 2

DETERMINANTS OF THE LIKELIHOOD OF SAVING: WHERE DO YOU SAVE? (LOGIT ESTIMATION)

Marginal effects[1]

Dependent variable: one if a person saves in that way and zero if not

	Urban				Rural	
	Bank	*Fund*	*Cash*	*Roscas*	*Bank*	*Cash*
Age 15 to 25	−0.1560	0.0335	0.1492	0.0738	−0.1156	0.1102
	(0.0772)[b]	(0.1360)	(0.0956)	(0.0985)	(0.0165)[a]	(0.0409)[a]
Age 26 to 37	−0.1267	0.1033	0.0756	0.0671	−0.0747	0.0922
	(0.0724)[c]	(0.0928)	(0.0596)	(0.0524)	(0.0268)[a]	(0.0295)[a]
Age 38 to 47	0.0158	−0.0083	−0.0065	0.1072	−0.0315	0.0585
	(0.0748)	(0.0830)	(0.0552)	(0.0649)[c]	(0.0282)	(0.0321)[c]
Age 48 to 57	0.0439	0.0442	−0.0356	0.0326	−0.0502	0.0537
	(0.0689)	(0.0829)	(0.0537)	(0.0544)	(0.0263)[c]	(0.0296)[c]
Sex (male=1)	0.0635	0.0486	−0.0386	−0.0450	0.0449	−0.0629
	(0.0326)[c]	(0.0340)	(0.0354)	(0.0202)[b]	(0.0197)[b]	(0.0216)[a]
Married (yes=1)	−0.1176	0.0961	0.0226	0.0299	−0.0353	0.0253
	(0.0604)[c]	(0.0505)[c]	(0.0495)	(0.0344)	(0.0356)	(0.0362)
Separated (yes=1)	−0.2312	0.2645	0.0409	0.0435	−0.0046	0.0015
	(0.0457)[a]	(0.1199)[b]	(0.0670)	(0.0684)	(0.0504)	(0.0554)
Middle school/high school (yes=1)	0.0103	0.0398	−0.0250	−0.0303	−0.0007	−0.0263
	(0.0479)	(0.0586)	(0.0488)	(0.0309)	(0.0239)	(0.0284)

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Table 2 (cont.)

	Urban				Rural	
	Bank	Fund	Cash	Roscas	Bank	Cash
Technical/technological education (yes=1)	-0.0232 (0.0573)	0.1056 (0.0789)	-0.0589 (0.0549)	-0.0113 (0.0320)	-0.0622 (0.0441)	0.0499 (0.0485)
Tertiary education (yes=1)	0.1561 (0.0712)[b]	0.1181 (0.0766)	-0.2126 (0.0628)[a]	-0.1181 (0.0405)[a]	0.1447 (0.0815)[c]	-0.1784 (0.0888)[b]
Labor market participation (yes=1)	-0.0257 (0.0525)	0.0683 (0.0497)	-0.0716 (0.0563)	-0.0238 (0.0444)	-0.0075 (0.0334)	0.0003 (0.0352)
Income quintile 2	-0.0064 (0.0706)	0.0758 (0.1000)	0.0107 (0.0740)	-0.0270 (0.0427)	0.0067 (0.0382)	-0.0265 (0.0443)
Income quintile 3	0.0898 (0.0635)	0.0385 (0.0908)	-0.0517 (0.0652)	-0.0138 (0.0364)	0.0140 (0.0401)	-0.0380 (0.0476)
Income quintile 4	0.0779 (0.0681)	-0.0222 (0.0817)	0.0335 (0.0636)	-0.0285 (0.0365)	0.0603 (0.0442)	-0.0916 (0.0504)[c]
Income quintile 5	0.2065 (0.0834)[b]	0.0448 (0.0931)	-0.1480 (0.0741)[b]	-0.0053 (0.0447)	0.0750 (0.0381)[b]	-0.1028 (0.0432)[b]
Household size	-0.0381 (0.0136)[a]	0.0156 (0.0100)	0.0144 (0.0110)	-0.0032 (0.0069)	0.0063 (0.0053)	-0.0025 (0.0055)
Homeowner (yes=1)	0.0150 (0.0407)	0.0316 (0.0366)	-0.0323 (0.0389)	-0.0137 (0.0269)	0.0541 (0.0221)[b]	-0.0366 (0.0250)
Saves for the future and old age (yes=1)	0.0057 (0.0413)	0.0744 (0.0444)[c]	-0.0529 (0.0435)	-0.0069 (0.0306)	0.0282 (0.0350)	-0.0157 (0.0352)

Saves to pay children's or own education (yes=1)	0.0242 (0.0552)	0.0522 (0.0539)	-0.0157 (0.0429)	-0.0600 (0.0249)[b]	0.0448 (0.0314)	-0.0437 (0.0338)
Saves to purchase a home (yes=1)	0.1322 (0.0622)[b]	0.0766 (0.0626)	-0.1465 (0.0489)[a]	-0.0387 (0.0266)	0.3672 (0.1031)[a]	-0.3032 (0.0996)[a]
Saves to purchase other assets (yes=1)	-0.0783 (0.0817)	-0.1524 (0.0278)[a]	0.0521 (0.0676)	0.1187 (0.0596)[b]	0.0073 (0.0577)	0.0026 (0.0568)
Saves for emergencies (yes=1)	0.0086 (0.0387)	-0.0266 (0.0435)	0.1122 (0.0452)[b]	-0.0808 (0.0218)[a]	-0.0288 (0.0296)	0.0571 (0.0317)[c]
Saves to pay debts (yes=1)	-0.2559 (0.0584)[a]	-0.0802 (0.0702)	0.0008 (0.0820)	0.2130 (0.0909)[b]	-0.0298 (0.0288)	0.0570 (0.0298)[c]
Remittances from Colombia (yes=1)	-0.0701 (0.0536)	-0.0162 (0.0590)	0.0086 (0.0422)	0.0690 (0.0524)	-0.0131 (0.0271)	0.0058 (0.0292)
Remittances from abroad (yes=1)	0.0938 (0.0694)	-0.0723 (0.0642)	-0.0798 (0.0657)	0.0558 (0.0833)	0.1260 (0.0727)[c]	-0.1114 (0.0732)
Government programs (yes=1)	0.0160 (0.0547)	-0.0032 (0.0456)	0.0402 (0.0400)	-0.0499 (0.0235)[b]	-0.0062 (0.0214)	-0.0057 (0.0233)
Insurance (yes=1)	0.0844 (0.0393)[b]	0.0825 (0.0361)[b]	-0.2053 (0.0424)[a]	0.0457 (0.0204)[b]	0.0470 (0.0233)[b]	-0.0533 (0.0254)[b]
Fixed regional effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,373	1,373	1,373	1,373	983	983

Marginal effects were calculated at the mean for the continuous variable and at 1 for dichotomous variables. Robust standard errors in parenthesis. [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.1$
Source: authors' calculations.

6. CONCLUSIONS

This paper performs an empirical analysis of the saving behavior of middle and low-income individuals in urban and rural areas of Colombia using the second round of the ELCA conducted in 2013. To this end, we analyzed factors that affect the probability of saving of household heads or their partners, and assessed the possible determinants of the likelihood of a person saving in the formal or informal sector.

The results show that the likelihood of saving increases with the level of education, income, and home ownership. It is worth mentioning that education is of major importance, especially in rural areas where around 80% of individuals in the sample have five or less years of education. The results therefore show that people of all education levels in rural areas are more likely to save than those with primary education or less. Saving can be encouraged by running financial education campaigns with simple fast-impact behavioral interventions that encourage changes in the attitudes of low- and middle-income individuals towards spending their available income in a controlled and responsible manner. For instance, as mentioned, mental accounting could be complemented by the peer-pressure effect to help mitigate common behavioral biases among individuals when making financial decisions. We also observe how labor market participation increases the probability of saving in both areas. Thus, policies targeted at fostering formal employment and social security inclusion could enable households to increase their savings (Bebczuk et al., 2015).

An examination of the differences between formal and informal saving highlights that 50% of people in urban areas and 82% in rural ones save in cash. The estimations also show that education and income increase the likelihood of saving in banks and decreases that of saving in cash. One type of policy aimed at including families in the middle and low socioeconomic strata into the financial system could involve word of mouth to disseminate information within such communities and help to encourage formal saving (Newman et al., 2008). Another policy for promoting financial inclusion would be to reduce the financial costs families incur when saving.

Finally, targeted policies could be considered. For instance, given how the study reveals that being male increases the probability of saving in financial institutions, a policy designed to promote saving in

the banking system among women could lead to an overall increase in saving. Furthermore, the study demonstrates that the highest income quintiles save more in banks and that a better education also raises the likelihood of saving in such institutions. Hence, a policy to encourage saving that focuses on the poorest and least educated households could contribute to improving the living standard of such households.

ANNEX

Variables Used in the Estimations and Descriptive Statistics

Table A.1

DESCRIPTION OF VARIABLES	
Variables	*Description*
Endogenous Variables	
Saves	One if the person saves some of the income they receive; zero if they do not save.
Saves in the bank	One of the person saves in a bank or financial institution; zero if not.
Saves in a fund	One if the person saves in an employee fund; zero if not.
Saves in cash	One if the person saves in cash; zero if not.
Saves in a rosca	One if the person saves in roscas; zero if not.
Explanatory Variables	
Age 15 to 25	One if the person is aged between 15 and 25; zero if not.
Age 26 to 37	One if the person is aged between 26 and 37; zero if not.
Age 38 to 47	One if the person is aged between 38 and 47; zero if not.

Age 48 to 57	One if the person is aged between 48 and 57; zero if not.
Aged over 58	One if the person is aged over 58; zero if not.
Sex	One if the person is male; zero if not.
Married	One if the person is married or cohabiting; zero if not.
Separated	One if the person is separated; zero if not.
Widowed	One if the person is widowed; zero if not.
Single	One if the person is single; zero if not.
No education	One if the person has no formal education; zero if they do.
Primary education	One if the highest education attained by the household head is basic/primary level; zero if not.
Middle school/ high school	One if the highest education attained by the household head is middle /high school; zero if not.
Technical/ technological education	One if the highest education attained by the household head is technical with or without a degree, or technological with or without a degree; zero if not.
Higher education	One if the highest education attained by the household head is university with or without graduation, postgraduate degree with or without graduation; zero if not.
Household income	Total household income consisting of labor and non-labor income. An alternative definition was used for rural areas that also included other payments received by the household besides wages (food, housing or education subsidies, or food or transportation benefits, or family allowance) and net profits or fees generated by their activities.

Variables	Description
Household size	The number of people in the person's household.
Homeowner	One if the person's household is a homeowner (fully paid for or being paid for); zero if not.
Labor market participation	One if the person participated in the labor market; zero if they do not.
Saves for the future and old age	One if the person saves for the future and old age; zero if not.
Saves for education	One if the person saves to pay for their children's or own education; zero if not.
Saves to purchase a home	One if the person saves to purchase a home; zero if not.
Saves to purchase other assets	One if the person saves to purchase other assets; zero if not.
Saves for emergencies	One if the person saves for emergencies; zero if not.
Saves to pay debts	One if the person saves to pay debts; zero if not.
Remittances from Colombia	One if the person's household received support in money and/or in kind from family members or friends living in Colombia; zero if not.
Remittances from abroad	One if the person's household received support in money and/or in kind from family members or friends living abroad; zero if not.
Government programs	One if the person's household received or benefitted from the following programs or support: Families in action, programs for senior citizens, SENA education programs, *Red Juntos-Unidos,* ICBF programs, natural disaster relief, and assistance for displaced persons; zero if not.
Insurance	One if members of the household have some type of insurance; zero if not.

Table A.2

DESCRIPTIVE STATISTICS

Variables	Urban				Rural			
	Average	Standard deviation	Minimum	Maximum	Average	Standard deviation	Minimum	Maximum
Saves	0.181	0.385	0	1	0.131	0.337	0	1
Saves in the bank	0.267	0.442	0	1	0.158	0.365	0	1
Saves in a fund	0.126	0.332	0	1				
Saves in cash	0.503	0.500	0	1	0.816	0.387	0	1
Saves in a rosca	0.078	0.271	0	1				
Age	45	13	15	88	47	13	15	97
Age 15 to 25	0.050	0.215	0	1	0.036	0.186	0	1
Age 26 to 37	0.250	0.433	0	1	0.209	0.407	0	1
Age 38 to 47	0.266	0.442	0	1	0.270	0.444	0	1
Age 48 to 57	0.252	0.434	0	1	0.246	0.431	0	1
Aged over 58	0.168	0.374	0	0	0.228	0.419	0	1
Sex (male)	0.430	0.495	0	1	0.484	0.500	0	1
Married	0.791	0.406	0	1	0.870	0.336	0	1
Separated	0.117	0.321	0	1	0.052	0.222	0	1
Widowed	0.036	0.187	0	1	0.033	0.179	0	1

Single	0.056	0.230	0	1	0.045	0.206	0	1
No education	0.046	0.210	0	1	0.109	0.312	0	1
Primary education	0.309	0.462	0	1	0.658	0.474	0	1
Middle school/high school	0.433	0.496	0	1	0.207	0.405	0	1
Technical/technological education	0.117	0.321	0	1	0.015	0.122	0	1
Tertiary education	0.095	0.293	0	1	0.010	0.102	0	1
Household size	4	2	1	39	5	2	1	18
Homeowner	0.498	0.500	0	1	0.615	0.487	0	1
Labor market participation	0.712	0.453	0	1	0.660	0.474	0	1
Saves for the future	0.203	0.402	0	1	0.167	0.373	0	1
Saves for education	0.199	0.399	0	1	0.162	0.368	0	1
Saves to purchase a home	0.162	0.368	0	1	0.037	0.189	0	1
Saves to purchase other assets	0.047	0.213	0	1	0.034	0.181	0	1
Saves for emergencies	0.402	0.490	0	1	0.501	0.500	0	1
Saves to pay debts	0.054	0.225	0	1	0.158	0.365	0	1
Remittances from Colombia	0.204	0.403	0	1	0.276	0.447	0	1
Remittances from abroad	0.039	0.195	0	1	0.024	0.153	0	1
Government programs	0.368	0.482	0	1	0.612	0.487	0	1
Insurance	0.565	0.496	0	1	0.377	0.485	0	1

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Formal and Informal Household Credit in Colombia

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Abstract

This paper provides evidence on the determinants of household credit, formal and informal, in both urban and rural areas in Colombia. We also study the factors that affect the likelihood that a household is in arrears. Results show that the probability that a household has credit is positively related to marital status (married), education, income, household size, home ownership, and labor market participation. Estimates indicate that income and education are positively correlated with the probability of having a formal loan, and negatively related to the likelihood of having informal credit. Finally, household income, credit usage, and unexpected events increase the probability of credit default.

Keywords: household debt, formal credit, informal credit, credit default, Colombia.

JEL classification: C25, G21, D12, R22.

1. INTRODUCTION

Access to credit enables households to use resources to meet their consumption requirements, purchase a home, or make profitable investments, which can contribute to an accumulation of assets and a reduction in poverty. Moreover, credit can play an important role in rural sector development. According to Jia et al. (2015), access to credit enables farmers to take greater risks in more profitable projects instead of investing in less risky, but probably inefficient ones. Thus, as pointed out by Ibrahim et al.(2007), understanding the factors that determine households' access to credit is important for designing policies aimed at reducing poverty, especially in low-income countries. However, such efforts have been hindered by the absence of household-level data.

Households can also face credit constraints, due to institutional factors as well as household-specific characteristics (for example low income, few assets) that might not allow them to smooth their consumption, make profitable investments, or cope with shocks that could destabilize the household. As a consequence, households need to turn to other sources of funds to meet their credit requirements. Hence, the coexistence of formal and informal credit markets, which is widespread in emerging countries.

In Colombia, household credit obtained from the formal sector has been increasing as a proportion of gross domestic product (GDP), rising from 9% in 2005 to 20% in 2015. Nevertheless, this percentage is low when compared to other countries. According to total credit statistics from the Bank for International Settlements, in 2014 average total household debt as a percentage of GDP was 72% in advanced economies and 31% in emerging ones. Furthermore, concerning some other Latin American countries, Colombia's percentage is lower than that of Brazil (25%) and Chile (38%), but higher than those of Argentina (6%) and Mexico (15%).

According to the Financial Capabilities Survey in Andean Countries (Mejía et al., 2015), rates of financial product holdings among households in Colombia are very low, with a general lack of knowledge about the characteristics of such products. There are also significant differences among population segments, such as between rural and urban areas, between women and men, and among age groups. Education and income are the two most important factors explaining such differences.

This paper aims to provide empirical evidence on factors that affect the likelihood of households having credit in urban or rural areas using data for middle- and low-income households in Colombia obtained from the Colombian Longitudinal Survey of the University of the Andes (ELCA). Since households can have credit simultaneously from the formal as well as the informal sector, the paper also investigates the possible factors determining whether a household has a loan, taking into account the origin of such resources. Moreover, it analyzes the probable determinants of the likelihood of households being in arrears given that a deterioration in the portfolio could affect the stability of the financial system and households' standards of living.

The results do not generally display any significant differences between urban and rural areas. The likelihood of a household having a loan is positively and significantly related to the marital status of the household head (married), education, income, household size, labor market participation, home ownership, and shocks faced by the household. In particular, households use formal credit to set up a business and finance both productive and investment activities. Meanwhile, they use formal and informal loans to pay debts. In urban areas, households use both sources of funds to purchase clothes or food, whereas in rural areas these requirements are mostly met with informal credit. Finally, the results show that income, credit usage, and unexpected events mainly explain the likelihood of being in arrears.

The paper is divided into five sections, including this introduction. Section 2 reviews domestic and international literature. Section 3 describes data employed in the paper and provides some descriptive statistics. Section 4 discusses the empirical strategy of the study and presents the results of the estimations. Section 5 gives the main conclusions.

2. REVIEW OF THE LITERATURE

The theoretical framework for household borrowing decisions dates back to the life cycle theory (for example Ando and Modigliani, 1963; Modigliani, 1966) and the permanent income hypothesis (Friedman, 1957). As mentioned by Vandone (2009), the standard theory is based on the reasoning that consumers seek to improve their

standard of living by smoothing consumption at different times in their lives. Households make their borrowing decisions while taking into account their wealth, available income, and expectations regarding future income. In these models, therefore, credit supply and demand are determined by sociodemographic, economic, and institutional factors. They also assume households do not face constraints in getting credit, an aspect that has been considered in other related studies.[1]

Households' participation in the credit market, as well as the constraints they face, have been the subject of extensive empirical study in international literature with an emphasis on developing countries.[2] The formal and informal rural credit market in Vietnam, for instance, has been analyzed by Barslund and Tarp (2008), who find that formal credit demand mainly depends on land ownership, whereas informal credit is negatively associated with age and education, and positively associated with a bad credit history and the number of dependents. Meanwhile, Nguyen (2007) and Duy et al. (2012) study the determinants of formal credit in rural areas of Vietnam, finding that among the most important factors are family size, the household head's work in the agricultural sector or community involvement, marital status (married), distance to the market center, a household's capital endowments, and the region where they are located.

Also, Vaessen (2001) finds that the likelihood of access to rural credit in Northern Nicaragua is positively related to formal education, family size, non-agricultural activities, and access to networks of information. For the case of Egypt, Mohieldin and Wright (2000) study the determinants of formal and informal credit in four villages of the Kalyoubbiya province. In these villages, the people that work in agriculture and own land (loan guarantee) are more likely to get a loan, while larger families are more inclined to have formal credit, although this effect declines as family size increases.

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1   For further details on pioneering literature about credit rationing, see for instance Baltensperger (1978), Stiglitz and Weiss (1981), and Jaffee and Stiglitz (1990).

2   For a detailed review of the literature, see for instance Vandone (2009), Pastrapa and Apostolopoulos (2015), and the references mentioned therein.

As for urban areas of developing countries, Doan and Tuyen (2015) find that for peripheral urban areas of Ho Chi Minh City (Vietnam), household size, phone ownership (as a proxy for wealth), labor income, and households' dwelling location have a positive impact, while age and marital status (married) have a negative effect on the likelihood of taking part in the credit market. For Ethiopia, Ibrahim et al. (2007) analyze the determinants of credit constraints and the amount borrowed by urban households. The authors find that households' resources, number of dependents, and geographic location are the most important factors.

In the case of developed countries, Crook (2001) investigates the determinants of debt requested by households in the United States. The results show that a household demands less debt when the head of household is aged over 55 and is relatively risk averse. Moreover, a household demands more debt when its income is higher, when it owns its own home, when the family size is larger, and the head of the household is working. Del Rio and Young (2006) examine the determinants of household participation in the unsecured debt market in the United Kingdom (UK). They find that the main determinants of the decision to participate in the credit market are the age of the borrower, their income, education, job status, and the amount borrowed (in the case of mortgages).

Meanwhile, Magri (2007) analyzes the determinants of Italian households' participation in the debt market. The author shows that the age of the household head increases the probability of requesting a loan up to a certain threshold. Moreover, household income increases the likelihood of having credit, while it reduces credit rationing. For Portugal, Costa and Farinha (2012) find that the probability of households having debt increases with income levels and real wealth, and decreases with their level of financial wealth. In addition, households with children are more likely to have mortgages, whereas larger households have a higher probability of having other debts. Age also has a negative impact on debt market participation.

The literature on household indebtedness has also studied the probability of households defaulting on their loans. For instance, Bridges and Disney (2004) analyze arrears on debt among low-income households in the UK, while Holló and Papp (2007) study the main factors affecting households' credit risk in Hungary, and Alfaro and Gallardo (2012) examine debt default behavior of households in Chile.

For the case of Colombia, literature that studies households' access to credit is very scarce.[3] Recently, with the higher availability of data, this topic has begun to be studied given the impact household indebtedness could have on the economy's financial stability.[4] For instance, Murcia (2007) studies the determinants of credit access for Colombian households (credit cards and mortgage loans), using data from the 2003 standard of living survey. The author finds that variables such as income, wealth, geographic location, access to social security, education, and age affect the probability of using such financial services. Furthermore, González and León (2007) employ data from financial accounts provided by the Banco de la República and individuals' income tax statements to examine the main variables influencing household borrowing decisions during the period 1993-2004. The authors find that collateral, carried debt, and financial burden are the principal drivers of household indebtedness.

Besides, Cano et al. (2015) use the 2012 Financial Capabilities Survey to empirically assess the determinants of access to financial products from the demand side. In the particular case of credit, the authors find that the variables making a positive contribution to credit are education, marital status (married), the economic variables index, the liquidity requirements index, the intertemporal preferences index, and the number of establishments per 10,000 inhabitants.

Using the ELCA, Cadena and Quintero (2015) present a description of the evolution of Colombian households' credit between 2010 and 2013, as well as a socioeconomic characterization of such households in rural and urban areas. Meanwhile, Rodríguez-Raga and Riaño-Rodríguez (2016), using the first round of the ELCA (2010), study the determinants of households' access to formal financial products, including saving, credit, and insurance. Concerning credit, these authors find that the probability of having credit increases with the age of the household head, the holding of fixed asset, and the location of the home.

The literature on debt default and overindebtedness among Colombian households is scarce. One exception is Gutiérrez et al.

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[3] As mentioned in Murcia (2007), most papers on credit in Colombia have addressed the matter from the supply side, mainly focusing on the study of credit constraints.

[4] For a review of the literature on the relation between financial stability and financial inclusion see Roa (2016) and the references therein.

(2012), who use the 2010 survey on household financial burdens and education for Bogota to analyze conditions of indebtedness and the determinants of the probabilities of household default and overindebtedness. The authors find that income, employment, and the household head's age have an adverse effect on the probability of default. On the other hand, debt levels and the refinancing variable increase the likelihood of default.

3. DESCRIPTIVE DATA AND STATISTICS

An analysis of the likelihood of having credit was performed for urban as well as rural areas using the second round of the ELCA conducted in 2013. The survey constitutes an important source for a study of household access to credit because it includes data on the sources, usage, and conditions of loans obtained by such households (Cadena and Quintero, 2015).

In particular, we used data on the heads of 4,911 households in urban areas and 4,351 households in rural areas. Most of the household heads are men, 63% in urban areas and 80% in rural ones. The age of household heads varies between 17 and 88 years in urban areas and between 19 and 97 in rural ones. The urban survey is representative for strata 1 to 4 in Colombia and five of its geographic regions: Bogotá, Central, Oriental, Atlántica, and Pacífica. The rural survey is representative of small farmers in four microregions: Atlántica Media, Altiplano Cundi-Boyacense, Eje Cafetero, and Centro-Oriente.

Concerning the relevant variables, 59% of urban households reported having at least one loan. As mentioned previously, formal and informal credit markets exist alongside one another in Colombia. A household can, therefore, access both credit sources and have more than one loan with each of them.[5] Thus, 72.5% of urban household credit corresponds to loans granted by formal institutions, 23.9% to the informal sector, and 3.6% to unidentified sources. In addition, 49% of rural households reported having at least one loan, while 65% of these households' loans were obtained from formal

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[5] For instance, 53% of households in urban areas that reported having credit had only one loan, while around 10% had four or more. In rural areas, 58% of households that reported having credit had only one loan and close to 6% had four or more.

Table 1

DISTRIBUTION OF HOUSEHOLD CREDIT SOURCES
Percent

	Urban area	Rural area
Have credit (percentage of households)		
Yes	59	49
No	41	51
Who they borrow from (percentage of loans)		
Formal sector	72.5	65.0
Banks or financial entities	46.8	52.0
Employee funds or cooperatives	7.5	3.8
Department stores or supermarkets	15.9	6.4
Family compensation funds	0.7	0.0
Unions or associations	0.2	1.9
Employer	0.5	0.4
Government education loan (Icetex)	0.9	0.4
Informal sector	23.9	32.0
Family members	4.1	5.8
Friends	5.5	8.9
Moneylenders	9.3	3.3
Storekeepers	3.9	12.2
Catalog shopping	0.9	0.8
Pawnshops or trading houses	0.2	0.9
Other sources	3.6	3.0

Note: A household can have different types of credit at the same time. To calculate the values presented in this table all the loans reported by households were taken into account. These values, therefore, show formal and informal loans as a percentage of total loans.
Source: Authors own calculations based on the ELCA.

institutions, 32% from informal ones and 3% from unspecified sources (Table 1). Although banks are the main credit source for households, it is important to highlight that only 13% of households requesting credit from such institutions obtain it. On the supply side, the most important reasons for rejection reported by households are poor credit rating, insufficient income, and inadequate guarantees. On the other hand, some main demand-side reasons for why households do not request loans from the financial system are the need for "too many requirements and a lot of paperwork," behavioral biases such as fears of not being able to pay a loan and lose the guarantee, as well as the belief that even if they requested a loan it would not be approved. For these reasons, households seek alternative sources of financing.

With respect to usage, among urban households the main purpose of credit is to purchase furniture, home appliances, and other assets (20%); buy clothes or food (17%); pay debts (16%); set up or invest in a business (13%); make home improvements (9%); and purchase a home (7%). In the case of rural households, it is important to emphasize that 36% of loans are used for investing in agriculture, livestock, and farm buildings, while 17% are for purchasing clothes or food, 13% for furniture, appliances, and other assets, and 9% for paying debts.[6]

4. EMPIRICAL STRATEGY AND RESULTS

In this section, we attempt to identify factors affecting the likelihood of a household having credit. We also perform estimations that take into account formal and informal sources of credit. This analysis is important given that in developing countries like Colombia the coexistence of formal and informal credit markets is widespread. Households might face constraints for accessing formal credit due to their inherent characteristics and institutional factors. These households, therefore, need to turn to other credit sources to meet their borrowing requirements. According to Mohieldin and Wright (2000), the coexistence of formal and informal credit markets can be explained by two opposing views. On the one hand, regulations

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[6] These percentages were calculated taking into account the usage of all household loans. For further details, see Iregui et al. (2016).

limiting interest rates lead to the creation of an alternative market (informal) where interest rates are not controlled. On the other, different costs associated with contract detection, monitoring, and compliance, cause credit market fragmentation. The literature has also found that there are significant differences in credit usage depending on its origin. For instance, loans from the formal sector are mainly used for investment and business activities, whereas informal credit is used to satisfy household consumption.[7]

Households that are in arrears and their determinants have not been widely studied in Colombia. Household overindebtedness could become a problem for economic authorities given its impact on financial stability stemming from a deterioration in the portfolio. It is therefore interesting, given the data included in the surveys employed, to analyze the possible determinants of the likelihood that middle- and low-income households are in arrears with at least one of their loans, be they formal or informal.

4.1 Determinants of the Probability of a Household Having Credit

To analyze the factors that might determine whether a household has at least one loan, be it with the formal or informal sector, logit models were estimated.[8] The estimation equations for urban and rural households are written as follows:

1
$$Credit_i = \alpha_0 + \alpha_1 X_{1,i} + \alpha_2 X_{2,i} + \alpha_3 X_{3,i} + \varepsilon_i,$$

2
$$Formal\_credit_i = \delta_0 + \delta_1 X_{1,i} + \delta_2 X_{2,i} + \delta_3 X_{3,i} + \delta_4 X_{4,i} + \mu_i,$$

3
$$Informal\_credit_i = \beta_0 + \beta_1 X_{1,i} + \beta_2 X_{2,i} + \beta_3 X_{3,i} + \beta_4 X_{4,i} + \upsilon_i,$$

where *Credit, Formal_credit,* and *Informal_credit* are binary variables that take the value One if household i has at least one loan, one formal or one informal loan, and 0 if it does not. $X_{1,i}$ contains the

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[7] See for instance Zeller (1994) for the case of Madagascar, Mohieldin and Wright (2000) for Egypt, and Jia et al. (2015) for rural areas of China.

[8] The estimation included the corresponding expansion factors.

characteristics of household i (income, whether the household saves or not, whether it benefits from a government transfer program, size, region where it is located, or home ownership), $X_{2,i}$ includes the characteristics of household head i (age, age squared, sex, education, marital status, and employment), $X_{3,i}$ contains some shocks that have been able to destabilize the household, and $X_{4,i}$ corresponds to the main credit usage of household i (for example paying debts, purchasing clothes or food, setting up or investing in a business, education, acquiring a home, and purchasing an automobile, among others). Annex contains the definitions of these variables.

With respect to formal lenders, the survey allows for identifying whether these are banks or financial entities, employee funds or cooperatives, department stores, supermarkets, unions or associations, or government bodies granting education loans. Informal credit sources include friends, money lenders, family members (from other households), storekeepers, catalog purchases, and pawnshops or trading houses.

Table 2 shows the marginal effects of the estimations carried out using logit models.[9] The results show that the likelihood of a household having at least one loan decreases as the age of the household head increases, although in a nonlinear manner.[10] In particular, a 10% increase in the age of the household head reduces the probability of having a loan by close to 12% in urban areas and 18% in rural ones. This suggests that the older the head, the lower the likelihood of being in debt; this could be due to the fact that with increasing age these households are covering their needs (e.g., acquiring a home, children's education) with higher income, or become averse to indebtedness. When separate estimations are performed for formal and informal credit, in contrast to the case of informal credit, the results show that the probability of having formal credit increases with the age of the household head. This might be due to the requirements demanded by financial institutions (for example, credit history, guarantees, and stable employment).

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[9] The estimations were also performed for the sample of household heads in employment in order to establish whether the probability of having credit depended on the type of employment of the individual. In addition, estimations were carried out for each formal and informal source of credit. The results are not presented here to save space, but are available upon request.

[10] The marginal effect of age refers to the impact of age and age squared.

Table 2

PROBABILITY OF HAVING AT LEAST ONE LOAN: LOGIT ESTIMATION
Marginal effects[1]

Dependent variable one if the household has at least one loan; zero if not

	Urban area			Rural area		
	Total credit	Formal credit	Informal credit	Total credit	Formal credit	Informal credit
Log of age	-0.1161 (0.0582)[b]	0.0658 (0.0328)[b]	-0.1199 (0.0429)[a]	-0.1789 (0.0376)[a]	0.0803 (0.0367)[b]	-0.0704 (0.0418)[c]
Sex (male=1)	-0.0118 (0.0322)	0.0132 (0.0258)	-0.0044 (0.0303)	0.0204 (0.0281)	-0.0219 (0.0282)	-0.0105 (0.0307)
Married (yes=1)	0.1304 (0.0422)[a]	0.0376 (0.0371)	-0.0579 (0.0498)	0.0978 (0.0289)[a]	0.0558 (0.0331)[c]	-0.0210 (0.0336)
Separated (yes=1)	0.0478 (0.0437)	0.0405 (0.0309)	-0.0315 (0.0493)	0.0294 (0.0378)	-0.0787 (0.0403)[c]	0.0919 (0.0450)[b]
Middle school/high school (yes=1)	0.0318 (0.0258)	0.0243 (0.0174)	-0.0389 (0.0237)	0.0128 (0.0228)	-0.0046 (0.0200)	-0.0361 (0.0224)
Technical/ technological education (yes=1)	0.0061 (0.0519)	0.0407 (0.0284)	-0.0446 (0.0365)	0.1049 (0.0792)	0.0841 (0.0580)	-0.0508 (0.0548)
Tertiary education (yes=1)	-0.0032 (0.0460)	0.1300 (0.0212)[a]	-0.1733 (0.0329)[a]	0.2098 (0.0935)[b]	-0.0009 (0.0721)	-0.0808 (0.0626)

Income quintile 2	0.1079	0.0496	−0.0657	0.0515	0.0019	0.0483
	(0.0290)[a]	(0.0191)[a]	(0.0269)[b]	(0.0259)[b]	(0.0284)	(0.0324)
Income quintile 3	0.1015	0.1017	−0.1173	0.0746	0.0152	0.0431
	(0.0317)[a]	(0.0168)[a]	(0.0251)[a]	(0.0267)[a]	(0.0266)	(0.0314)
Income quintile 4	0.2280	0.1253	−0.1495	0.1298	0.0356	0.0056
	(0.0301)[a]	(0.0205)[a]	(0.0306)[a]	(0.0270)[a]	(0.0263)	(0.0307)
Income quintile 5	0.3072	0.1709	−0.2325	0.2622	0.0782	−0.0305
	(0.0318)[a]	(0.0192)[a]	(0.0272)[a]	(0.0251)[a]	(0.0271)[a]	(0.0291)
Saves (yes=1)	0.0113	0.0456	−0.0733	0.0326	0.0330	−0.0172
	(0.0305)	(0.0188)[b]	(0.0276)[a]	(0.0234)	(0.0216)	(0.0236)
Government transfers (yes=1)	0.0640	−0.0040	−0.0088	−0.0083	−0.0152	0.0190
	(0.0292)[b]	(0.0195)	(0.0244)	(0.0197)	(0.0177)	(0.0202)
Household size	−0.0260	−0.0091	0.0061	0.0093	0.0062	−0.0078
	(0.0060)[a]	(0.0042)[b]	(0.0054)	(0.0050)[c]	(0.0043)	(0.0053)
Homeowner (yes=1)	0.0895	0.0217	−0.0368	0.0551	0.0023	−0.0314
	(0.0257)[a]	(0.0189)	(0.0251)	(0.0189)[a]	(0.0176)	(0.0210)
Labor market participatipn (yes=1)	0.0633	−0.0273	0.0359	0.0485	−0.0042	0.0254
	(0.0334)[c]	(0.0221)	(0.0276)	(0.0278)[c]	(0.0300)	(0.0327)
Other shocks (yes=1)	0.0681	−0.0038	0.0493	0.0081	0.0032	−0.0107
	(0.0237)[a]	(0.0169)	(0.0238)[b]	(0.0194)	(0.0172)	(0.0204)
Accident shock (yes=1)	−0.0001	−0.0247	0.0279	0.0012	0.0186	0.0226
	(0.0251)	(0.0175)	(0.0219)	(0.0192)	(0.0186)	(0.0204)

	Urban area			Rural area		
	Total credit	Formal credit	Informal credit	Total credit	Formal credit	Informal credit
Separation shock (yes=1)	0.0163 (0.0369)	−0.0157 (0.0268)	0.0678 (0.0458)			0.0178 (0.0301)
Employment shock (yes=1)	0.0505 (0.0258)[b]	−0.0034 (0.0183)	−0.0011 (0.0244)			
Family member intake shock (yes=1)	0.0062 (0.0379)	−0.0019 (0.0233)	0.0157 (0.0283)	0.0911 (0.0285)[a]	−0.0306 (0.0254)	
Move away shock (yes=1)	−0.0095 (0.0326)	−0.0122 (0.0303)	0.0116 (0.0347)			
Disaster shock (yes=1)	0.0859 (0.0267)[a]	0.0019 (0.0220)	0.0126 (0.0280)	0.0136 (0.0211)	−0.0301 (0.0192)	0.0272 (0.0217)
Plague shock (yes=1)				0.1295 (0.0194)[a]	0.0073 (0.0182)	−0.0035 (0.0203)
Loss of animals shock (yes=1)				0.0620 (0.0226)[a]	−0.0351 (0.0211)[c]	0.0502 (0.0231)[b]
Usage pay debts (yes=1)		0.0514 (0.0169)[a]	0.1805 (0.0258)[a]		0.1867 (0.0218)[a]	0.1622 (0.0296)[a]
Usage clothes/food (yes=1)		0.0416 (0.0173)[b]	0.1551 (0.0275)[a]		−0.1190 (0.0245)[a]	0.6058 (0.0243)[a]

Usage business (yes=1)	0.1378 (0.0164)ᵃ	0.0120 (0.0284)		0.2673 (0.0246)ᵃ	-0.0622 (0.0327)ᶜ
Usage education (yes=1)	-0.0262 (0.0356)	0.2354 (0.0553)ᵃ		0.0951 (0.0345)ᵃ	0.1346 (0.0470)ᵃ
Usage purchasing a home (yes=1)	0.1583 (0.0151)ᵃ	-0.0907 (0.0372)ᵇ		0.1678 (0.0372)ᵃ	0.0942 (0.0503)ᶜ
Usage other assets (yes=1)	0.1495 (0.0162)ᵃ	-0.0310 (0.0234)		0.1438 (0.0207)ᵃ	0.0730 (0.0275)ᵃ
Usage home improvements (yes=1)	0.1293 (0.0159)ᵃ	0.1355 (0.0396)ᵃ		0.2482 (0.0227)ᵃ	0.0095 (0.0309)
Usage automobile (yes=1)	0.0980 (0.0304)ᵃ	-0.0287 (0.0462)			
Usage farming investment (yes=1)				0.4782 (0.0188)ᵃ	-0.1181 (0.0241)ᵃ
Region fixed effects	Yes	Yes	Yes	Yes	Yes
Number of observations	4,720	2,756	4,300	2,127	2,127

Notes: [1] Marginal effects were calculated at the means for the continuous variable and at one for dichotomous variables. ᵃ $p < 0.01$, ᵇ $p < 0.05$, ᶜ $p < 0.1$

Source: Authors own calculations.

The likelihood of having at least one loan is higher in both urban and rural areas for married individuals as compared to the reference group (single/widowers). It is to be expected that these individuals need more credit to meet the requirements of their families.[11] Meanwhile, household heads in rural areas that are separated are less likely to borrow from formal sources and more likely to do so from informal ones.

As for education, in rural areas, having a tertiary education increases the probability of having credit by 21% compared to households where the head has only a basic or lower level of education. In urban areas, having a tertiary education is associated with a higher probability of a household having formal credit (13%) and a lower probability of having informal credit (17%). Other studies have also found a positive relation between formal credit and education. For instance, Magri (2007) finds that household heads with higher levels of education might have less difficulty gathering and assessing the information necessary to apply for a loan. Moreover, Chen and Chivakul (2008), and Swain (2007) point out that higher human capital increases a household's capacity to generate future income, facilitating access to credit.

Concerning household income, according to the literature the relation between current income and debt is ambiguous (Magri, 2007). For instance, Chen and Chivakul (2008), Del Rio and Young (2006), and Swain (2007) find that as current income increases, the likelihood of debt declines. Pastrapa and Apostolopoulos (2015), and Sorokina (2013) show that income does not affect the probability of having credit, while Crook (2001) finds that middle- and low-income households demand more credit when their income increases. Along the same lines, our results indicate that as income rises the probability of having at least one loan also increases, both for the sample of households in urban areas and that for households in rural areas. This result could be explained by the fact that the marginal utility of consumption is very high for low- and middle-incomes, meaning an increase in income might be reflected in increased spending, and therefore in a greater demand for credit (Magri, 2007; Del Rio and Young, 2006). When formal and informal credit are analyzed separately, we find that income increases the probability of having

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[11] Del Rio and Young (2006) found a similar result for the United Kingdom.

formal credit in both urban and rural areas, and reduces the probability of having informal credit.

In urban areas, we also find households that save have a higher probability (4%) of having formal credit, given that savings can be used as a guarantee. These same households also have a lower probability of having informal credit (7%). Meanwhile, households in urban areas receiving government transfers (Families in Action program) are 6% more likely to have credit than those not receiving such transfers. Beneficiaries of this type of program probably have more information on access to credit because one of the requirements for participating in them is having a bank account. As for household size, we find that the probability of having credit decreases in urban areas. This could be a result of the fact that more individuals contribute to the family economy in such households, thereby reducing their credit requirements.

A dichotomous variable was included as a proxy for wealth that indicates whether a household is a homeowner or not. The latter asset can also be used as a guarantee, meaning a positive relation should be expected between this variable and the probability of having credit.[12] Our results suggest households that own a home are around 9% more likely to have credit than those that do not, in urban areas (6% in rural areas).

A positive relation is also expected between the work status of the household head and having at least one loan, given that individuals in employment might be less uncertain about their future income. The results show that a household head who participates in the labor market is around 6% more likely to have at least one loan than a head that does not, in urban areas (5% in rural areas).

As for shocks that could destabilize a household, the results show that in urban areas the household head becoming unemployed, natural disasters, and other shocks (for example, the death of a household head, spouse, or another family member; robbery, fire, or destruction of household assets) increase the probability of having credit. Meanwhile, in rural areas, plagues, loss of livestock, and the arrival or intake of another family member increase this probability.

The choice of credit source (formal or informal) could depend on the use given to the loan. A dichotomous variable was constructed

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[12] See for instance Chen and Chivakul (2008), and Mohieldin and Wright (2000).

for each usage that takes the value One if the household has at least one loan for such use and 0 if it does not. The results show that households use formal as well as informal credit to pay debts. In particular, in the sample of households in urban areas, if the credit is used to pay debts, the likelihood of having a formal loan is 5% higher than if the credit was for other purposes, while that of an informal loan is 18% higher. In rural areas, this probability is around 17% higher for both types of credit.

Households in urban areas also use both types of credit sources to purchase clothes or food. Thus, for such households the probability of having formal credit is 4% higher than if the resources were allocated to other uses, while that of having informal credit is 16% higher. In rural areas, informal loans are mostly used for meeting household consumption requirements. The probability of obtaining informal credit for clothes or food is 61% higher than for other purposes, while the probability of obtaining formal credit is 12% lower.[13] It is important to highlight the role of storekeepers as a credit source for financing the consumption requirements of clothes or food.

As would be expected, households turn more to formal loans, especially with banks or financial institutions, when setting up a business. The results suggest that the probability of having a formal loan is 14% higher in urban areas and 27% higher in rural ones, compared to other uses. With respect to credit used for purchasing a home, in both urban and rural areas, the likelihood of having formal credit is 16% higher than for other uses. Households also make home improvements using credit. In particular, the probability of financing these renovations with formal credit is 16% higher in urban areas and 23% higher in rural ones. As for purchasing furniture, home appliances, and other assets, the likelihood of having at least one formal loan is 15% higher in urban areas, whereas both credit sources are used in rural areas. In the case of formal credit, this probability is 14% higher than that for other purposes, while that of having informal credit is 7% higher. The results also indicate that if the household credit is for purchasing an automobile, it is 10% more likely to be financed with formal credit in urban areas.[14]

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[13] Jia et al. (2015) find that, in rural areas of China, informal loans are mainly used to satisfy the consumption requirements of farmers.

[14] Using credit to purchase an automobile is only considered in the urban sample given that only 1% of households had credit for this item in the rural sample.

Formal credit is frequently used in rural areas for financing business and investment activities. For instance, 88% of loans used for investing in agriculture, livestock, and farm buildings was granted by banks or financial institutions. The estimates indicate that the probability of those households having formal credit for such items is 48% higher, while for informal loans the probability is 12% lower.

4.2 Probability of a Household Being in Arrears

In this section, we examine whether socioeconomic variables, credit usage, and different shocks that affected households could have some impact on the probability of debt default. The estimation equation is written as follows:

$$\boxed{4} \qquad Arrears_i = \gamma_0 + \gamma_1 X_{1,i} + \gamma_2 X_{2,i} + \gamma_3 X_{3,i} + \gamma_4 X_{4,i} + \eta_i,$$

where *Arrears* is a binary variable that takes the value One if household i is not up to date with payments of at least one of its loans and 0 if it is up to date with all loans. $X_{1,i}$, $X_{2,i}$, $X_{3,i}$ and $X_{4,i}$ are defined as in Equations 2 and 3. Equation 4 is also estimated separately for formal and informal credit.

As can be seen in Table 3, in general terms the results demonstrate that the sociodemographic characteristics of the household head do not significantly explain the probability of being in arrears. The variables that mostly explain these results are income and credit usage. In particular, the likelihood of being in arrears decreases with the age of the household head for formal credit in urban areas and for informal credit in rural areas.[15] If the household head is married, in rural areas the likelihood of being in arrears is lower than for individuals who are single/widowers, which might be because the household head receives economic support from their spouse. In the same areas, the likelihood of being in arrears is lower (6%) for household heads that have middle or high school education than for those with basic or lower level of education. For informal loans, this likelihood is 5% lower.

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[15] Estimates were also carried out disaggregating age into the following ranges: 17-27, 28-37, 38-47, 48-57 and over 58. The estimations are not shown here, but are available upon request.

As for income, the probability of being in arrears decreases for the highest quintiles in both areas. For instance, in urban areas, the likelihood of being in arrears with a formal loan is 7% lower in quintile 5 than in quintile 1 (reference quintile), and in rural areas, this likelihood is 4% lower. Meanwhile, this probability rises for formal loans in both areas as household size increases. However, this is not the case for homeowners, whose probability of being in arrears decreases in both rural and urban areas.

With respect to shocks that destabilized the household, in urban areas the household head becoming unemployed as well as other events (for example the death of the household head, spouse, or other family member; a spouse or other household member becoming unemployed; robbery, fire, or destruction of household assets, among others) increase the likelihood of being in arrears given that such shocks have a direct impact on household income. On the other hand, the arrival or intake of a family member, and the occurrence of a natural disaster (flooding, avalanches, collapses, river overflows or landslides, storms, tremors, or earthquakes) increase the probability of being in arrears by 5% and 9% respectively.

Finally, when considering credit usage, we find that the likelihood of being in arrears in both areas is generally higher if the loans are used to pay debts (10% in urban areas and 14% in rural ones), to purchase clothes or food (15% in urban areas and 24% in rural ones), to set up businesses (17% in urban areas and 9% in rural), for other assets (14% in urban and 6% in rural) and to purchase a home (close to 36% in both areas), as compared to other uses. Nevertheless, for purchasing a home, the probability of being in arrears is 5% lower in urban areas if the loan was obtained from informal sources. On the contrary, the likelihood of being in arrears is higher if credit is used for education and home improvements than if the resources are used for other purposes. In rural areas, this probability is higher if the credit is used for agricultural investments and is obtained from formal sources.

Table 3

PROBABILITY OF A HOUSEHOLD BEING IN ARREARS: LOGIT ESTIMATION
Marginal effects[1]

Dependent variable: One if the household is in arrears with at least one loan; zero if it is up to date on all loans

	Total arrears	Formal arrears	Informal arrears	Rural area Total arrears	Formal arrears	Informal arrears
Log of age	0.0258	−0.0611	−0.0052	−0.0665	0.0479	−0.0847
	(0.0669)	(0.0302)[b]	(0.0214)	(0.0445)	(0.0328)	(0.0329)[a]
Sex (male=1)	0.0184	−0.0038	0.0150	0.0088	0.0152	0.0089
	(0.0359)	(0.0204)	(0.0150)	(0.0320)	(0.0190)	(0.0272)
Married (yes=1)	0.0245	−0.0426	0.0057	−0.0722	−0.0184	−0.0580
	(0.0465)	(0.0263)	(0.0188)	(0.0404)[c]	(0.0262)	(0.0336)[c]
Separated (yes=1)	0.0389	0.0064	0.0172	0.0003	−0.0085	0.0163
	(0.0447)	(0.0233)	(0.0225)	(0.0466)	(0.0280)	(0.0377)
Middle school/high school (yes=1)	−0.0322	0.0215	−0.0071	−0.0616	−0.0089	−0.0491
	(0.0287)	(0.0174)	(0.0121)	(0.0231)[a]	(0.0163)	(0.0188)[a]
Technical / technological education (yes=1)	0.0091	0.0453	0.0185	−0.0168	0.0394	0.0000
	(0.0425)	(0.0303)	(0.0208)	(0.0567)	(0.0572)	(0.0508)
Tertiary education (yes=1)	0.0800	0.0400	−0.0415	0.0574	0.1079	−0.0568
	(0.0595)	(0.0288)	(0.0138)[a]	(0.0867)	(0.0789)	(0.0628)

	Urban area			Rural area		
	Total arrears	Formal arrears	Informal arrears	Total arrears	Formal arrears	Informal arrears
Income quintile 2	−0.0830 (0.0280)[a]	−0.0215 (0.0179)	−0.0322 (0.0106)[a]	0.0281 (0.0341)	0.0084 (0.0227)	0.0283 (0.0285)
Income quintile 3	−0.0376 (0.0330)	0.0029 (0.0208)	−0.0152 (0.0130)	−0.0061 (0.0322)	−0.0180 (0.0192)	0.0272 (0.0285)
Income quintile 4	−0.1198 (0.0308)[a]	−0.0071 (0.0193)	−0.0518 (0.0125)[a]	0.0326 (0.0366)	0.0222 (0.0257)	0.0030 (0.0279)
Income quintile 5	−0.1332 (0.0327)[a]	−0.0663 (0.0185)[a]	−0.0781 (0.0121)[a]	−0.0153 (0.0322)	−0.0402 (0.0179)[b]	0.0137 (0.0278)
Government transfers (yes = 1)	0.0162 (0.0310)	−0.0058 (0.0168)	0.0035 (0.0124)	−0.0085 (0.0217)	−0.0088 (0.0145)	0.0015 (0.0178)
Household size	0.0128 (0.0074)[c]	0.0143 (0.0033)[a]	0.0025 (0.0024)	0.0079 (0.0054)	0.0082 (0.0032)[b]	−0.0004 (0.0042)
Homeowner (yes = 1)	−0.0498 (0.0265)[c]	−0.0377 (0.0149)[b]	−0.0066 (0.0112)	−0.0453 (0.0221)[b]	−0.0180 (0.0164)	−0.0421 (0.0175)[b]
Labor market participation (yes = 1)	−0.0140 (0.0396)	−0.0439 (0.0239)[c]	0.0155 (0.0118)	0.0446 (0.0284)	0.0199 (0.0173)	0.0284 (0.0236)
Other shock (yes = 1)	0.0904 (0.0314)[a]	0.0505 (0.0149)[a]	0.0543 (0.0160)[a]	0.0226 (0.0213)	0.0230 (0.0155)	−0.0049 (0.0167)

Accident shock (yes=1)	-0.0103 (0.0270)	0.0008 (0.0137)	0.0215 (0.0115)[c]	-0.0005 (0.0210)	-0.0219 (0.0129)[c]	0.0157 (0.0176)
Separation shock (yes=1)	0.0439 (0.0474)	0.0216 (0.0300)	0.0120 (0.0209)			
Employment shock (yes=1)	0.0537 (0.0366)	0.0565 (0.0209)[a]	0.0234 (0.0140)[c]			
Family member intake shock (yes=1)	-0.0602 (0.0280)[b]	-0.0099 (0.0174)	-0.0181 (0.0131)	0.0520 (0.0301)[c]	-0.0006 (0.0192)	0.0430 (0.0243)[c]
Move away shock (yes=1)	0.0311 (0.0355)	0.0405 (0.0252)	-0.0119 (0.0149)			
Disasters shock (yes=1)	0.0223 (0.0441)	0.0114 (0.0202)	0.0345 (0.0190)[c]	0.0892 (0.0253)[a]	0.0328 (0.0180)[c]	0.0717 (0.0198)[a]
Plague shock (yes=1)				0.0153 (0.0223)	0.0145 (0.0156)	0.0051 (0.0182)
Animal loss shock (yes=1)				0.0129 (0.0260)	-0.0035 (0.0183)	0.0105 (0.0197)
Usage pay debts (yes=1)	0.1023 (0.0331)[a]	0.0790 (0.0192)[a]	0.0723 (0.0141)[a]	0.1353 (0.0353)[a]	0.1170 (0.0318)[a]	0.0587 (0.0298)[b]
Usage clothes/food (yes=1)	0.1480 (0.0380)[a]	0.0440 (0.0166)[a]	0.0976 (0.0196)[a]	0.2418 (0.0303)[a]	0.0064 (0.0205)	0.2500 (0.0273)[a]
Usage business (yes=1)	0.2017 (0.0329)[a]	0.1673 (0.0271)[a]	0.0225 (0.0156)	0.0085 (0.0384)	0.0919 (0.0372)[b]	-0.0316 (0.0319)

	Urban area			Rural area		
	Total arrears	*Formal arrears*	*Informal arrears*	*Total arrears*	*Formal arrears*	*Informal arrears*
Usage education (yes=1)	0.0450 (0.0508)	0.0613 (0.0289)[b]	0.0676 (0.0304)[b]	0.0227 (0.0507)	0.0535 (0.0436)	-0.0320 (0.0385)
Usage purchasing a home (yes=1)	0.3697 (0.0635)[a]	0.0415 (0.0293)	-0.0540 (0.0095)[a]	0.3613 (0.0628)[a]	0.1007 (0.0637)	0.0202 (0.0598)
Usage other assets (yes=1)	0.1420 (0.0448)[a]	0.0559 (0.0169)[a]	0.0023 (0.0117)	0.0561 (0.0268)[b]	0.0679 (0.0239)[a]	0.0332 (0.0225)
Usage home improvements (yes=1)	0.1508 (0.0602)[b]	0.0707 (0.0296)[b]	0.0648 (0.0281)[b]	-0.0166 (0.0408)	0.0147 (0.0370)	-0.0027 (0.0342)
Usage automobile (yes=1)	-0.0879 (0.0416)[b]	0.0501 (0.0378)	0.0049 (0.0327)			
Usage farming investments (yes=1)				0.0406 (0.0247)	0.1030 (0.0214)[a]	-0.0317 (0.0193)
Regional fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	2,756	2,756	2,756	2,127	2,127	2,127

Notes: [1] Marginal effects were calculated at the means for the continuous variable and at one for dichotomous variables. [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$
Sources: Authors own calculations.

5. FINAL REMARKS

This paper studies two important topics concerning households' financial behavior. First, the determinants of formal and informal indebtedness, and second, the likelihood of them being in arrears. The coexistence of formal and informal credit markets is a widespread phenomenon in Colombia. Hence, understanding the factors that affect the probability of a household having credit, depending on the origin of the resources, is of significant interest for a developing country such as Colombia.

The evidence presented in this paper highlights the importance of increasing the participation of formal credit among the sources of financing used by households to reduce the risks and costs associated with some informal credit sources. This process should be accompanied by appropriate regulation, as well as greater financial education to prevent overindebtedness among households, considering the risks this might have on the stability of the financial system. The high share of credit used for clothes or food could reflect problems of low incomes for meeting households' basic needs, meaning public policies oriented toward creating and formalizing employment might be necessary.

The results demonstrate how the probability of having formal credit increases with the age of the household head, education and income, which is the opposite to what occurs with informal credit. The results show that young people, low-income individuals, and those with low levels of education are less likely to have access to credit, especially formal credit. These individuals face credit constraints which marginalize them and prevent them from developing their business potential, generating poverty traps. Hence, public policies aimed at creating and formalizing employment are needed. Some strategies could include investing in education and technical training. In Colombia, a randomized trial of the Youth in Action program, which provides classes and training to thousands of unemployed youngsters (Attanasio et al., 2011) showed that, ten years after the intervention, participants had a greater probability of working in the formal sector and having higher earnings. This type of initiative could, therefore, help loosen credit constraints and reduce inequality.

The factors most explaining arrears are income and credit usage. In this direction, public policies could be envisaged that are

geared toward improving the management of household finances and responsible use of money, such as preparing a spending plan that identifies sources of income, and defines expenses and debts so a household can be aware of its budget and stick to it. Messages (reminders) reminding individuals of commitments, spending limits, and payment dates also help them to be more responsible with their finances (Karlan et al., 2014).

Finally, it would be important to consider behavioral factors that might affect arrears on debt. In particular, the literature has shown how common behavioral biases such as problems of self-control, present-bias, limited attention problems (people *forget* to set aside money for expenditure needs) impede individuals from being up to date with their payment obligations (Karlan et al., 2014).

ANNEX

Description of Variables Used in the Estimations

DESCRIPTION OF VARIABLES	
Variables	*Description*
Endogenous Variables	
Loans	One if the household has at least one loan; zero if it does not have any
Formal credit	One if the household has at least one loan with banks or financial entities, employee funds or cooperatives, department stores, supermarkets or Codensa, family compensation funds, unions or associations, employer or Icetex; zero if it does not.
Informal credit	One if the household has at least one loan with family members (from other households), friends, money lenders, storekeepers, catalog shopping, pawn shop or trading house, and other informal sources; zero if it does not.
Arrears	One if the household is in arrears with at least one of its loans; zero if it is up to date with all its loan payments.

Explicative Variables

Age	The age of the household head in years at the time of the survey.
Sex	One if the household head is male; zero if not.
Married	One if the household head is married or cohabiting; zero if not.
Separated	One if the household head is separated; zero if not.
Widower	One if the household head is a widower; zero if not.
Single	One if the household head is single; zero if not.
No education	One if the household head has not completed primary/basic education; zero if they have.
Primary	One if the highest level of education completed by the household head is basic/primary; zero if not.
High school/ middle school	One if the highest level of education completed by the household head is high school/middle; zero if not.
Technical/ technological education	One if the highest level of education completed by the household head is technical, with or without a degree, or technological, with or without a degree; zero if not.
Tertiary education	One if the highest level of education completed by the household head is university, with or without a degree, postgraduate degree, with or without a degree; zero if not.
Household income	Total household income consists of labor and non-labor income. An alternative definition was used for the rural sector that also includes additional payments other than salary received by the household (food, housing, education, subsidies, food and transport vouchers, or family allowance) and net profits or fees generated by their activities.
Household size	The number of individuals in the household
Homeowner	One if the household is a homeowner (fully paid for or being paid for); zero if not.
Labor participation	One if the household head participates in the labor marker; zero if they do not.
Usage debts	One if credit is used for paying debts; zero if not.
Usage clothes/ food	One if credit is used for purchasing clothes or food; zero if not.
Usage business	One if credit is used for investing in a business; zero if not.

Variables	Description
Usage education	One if credit is used for their own or their children's education; zero if not.
Usage purchasing a home	One if credit is for purchasing a home; zero if not.
Usage other assets	One if credit is used for purchasing other assets, furniture or home appliances; zero if not.
Usage home improvements	One if credit is for home improvements; zero if not.
Usage automobile	One if credit is for purchasing an automobile; zero if not.
Usage farming investments	One if credit is for investing in agriculture, livestock or farm buildings; zero if not.
Shock accident	One if a household member suffered an accident or illness that prevented them performing day-to-day tasks; zero if not.
Shock separation	One if the spouses were separated; zero if not.
Shock leaving	One if the household had to leave its habitual place of residence; zero if not.
Shock employment	One if the household head became unemployed; zero if not.
Shock family member intake	One if a family member arrived or was taken in by the household; zero if not.
Shock plagues	One if the household suffered plagues or crop failures; zero if not.
Shock loss of animals	One if the household suffered loss or death of animals; zero if not.
Shock disasters	One if the household suffered flooding, avalanches, land collapse, river overflows or landslides, storms, tremors, or earthquakes; zero if not.
Shock others	One if the household experienced death of the household head, spouse or another family member; a spouse or another household member becoming unemployed; bankruptcy or closure of family businesses; loss or reduction of remittances; loss of farms, lots or plots of land; robbery, fire or destruction of household assets, or were victims of violent crimes. Rural areas also included whether the household had to move away from its habitual place of residence, if the household head became unemployed, and if the spouses separated; zero if not.
Government transfers	One if the household is a beneficiary of the families in action program; zero if not.

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Factors Affecting Ownership of Financial Products in Colombia

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Abstract

This paper explores the variables determining why, despite being aware a financial product exists, individuals decide not to include them in their portfolio of products and services. The results for Colombia from the Financial Capabilities Survey in Andean Countries conducted by CAF-Development Bank of Latin America were employed to estimate the dependence between the level of awareness and ownership of financial products, and variables related to respondents' sociodemographic characteristics, such as households' financial skills. It also attempts to measure the level or strength of association between said variables. We use a two-factor contingency table methodology, complemented by loglinear regression models, following that proposed by Agresti (2007). The results show that not having a financial product, despite knowing it exists, is related to low levels of education, income, and not budgeting, among other factors.

Keywords: financial inclusion, financial stability, awareness and ownership of financial products

JEL classification: D10, G20, O10.

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1. INTRODUCTION

Financial inclusion is a topic of major interest among public and private institutions, international organizations, and multilateral bodies. According to the World Bank (2014), close to 50 countries have established objectives for financial inclusion, and the World Bank Group, together with a coalition of partners, have made commitments to promote it, setting a principal goal of achieving universal access for adults to the financial system by 2020.

At the international level, one of the agencies most recognized for its work on financial inclusion topics is the Alliance for Financial Inclusion (AFI) created in 2008. The main objective of the AFI is to encourage the interaction and exchange of knowledge among its member countries, with the purpose of making financial services more accessible to individuals excluded from the system. In 2016, the alliance consisted of members from over 90 countries and institutions, including the United Nations, the Bill and Melinda Gates Foundation, and the German Federal Ministry for Economic Cooperation and Development, among others.

The importance of this topic on the global agenda stems from recognition of the positive implications financial inclusion and financial development have for economic growth and productivity (King and Levine, 1993; Levine and Zervos, 1998; Songul, 2011; and Sahay et al., 2015), poverty reduction (Burgess and Pande, 2005), economic inequality (Beck et al., 2007), and the labor market situation (Bruhn and Love, 2014). Moreover, this growing interest has increased as a consequence of the 2007-2008 international financial crisis because it highlighted the importance of the relation between the level of financial inclusion and financial stability (Sahay et al., 2015; Han and Melecky, 2013; Mehrotra and Yetman, 2015).

In the last ten years, the Colombian government has also been committed to promoting financial inclusion in the country. To this end, in 2006 it set up the Programa de Banca de las Oportunidades (Bank of Opportunities Program) and authorized creation of correspondent banks that allowed for increasing the coverage and ownership of financial products among the population. This policy was hailed as a success by government authorities, given that as of 2014 most Colombian towns had at least one point of access and around six million people were using the financial system, surpassing the government's 2010-2014 Development Plan goal.

Based on this policy balance, the government modified its approach at the end of 2014, establishing new guidelines promoting the use of financial and transactional products, financing to small and midsize firms (SMEs) and to the agricultural sector, and improving financial education among the population (Salamanca, 2014). This objective encompasses various regulatory initiatives by the government, including the creation of the Intersectoral Commission for Economic and Financial Education (Decree 457 of 2014),[1] the definition of low amount consumer credit (Decree 2654 of 2014), [2] the authorization of insurance company correspondents (Decree 34 of 2015),[3] the creation and regulation of companies specializing in electronic deposits and payments (Law 1735 of 2014 and Decree 1491 of 2015),[4] and the inclusion of property guarantees as admissible collateral (Decree 466 of 2016).[5]

In addition, the Intersectoral Commission for Financial Inclusion was set up[6] (Decree 2338 of 2015) to coordinate the policies and efforts of public and private institutions and foster financial inclusion in the country. This government effort was highlighted in the Global Microscope 2015, where Colombia is ranked second among a sample of 55 nations when measuring the most enabling regulatory and institutional environment for financial inclusion.

The international and domestic importance of this topic has made it necessary to obtain more specific measures on levels of financial

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[1] See *Diario Oficial*, year CXLIX, No. 49083, March 5, 2014, <http://www.suin-juriscol.gov.co/viewDocument.asp?id=1104597>.

[2] See *Diario Oficial*, year CL, No. 49368, December 17, 2014, <http://www.suin-juriscol.gov.co/viewDocument.asp?id=1477104>.

[3] See *Diario Oficial*, year CL, No. 49.394, January 14 de 2014, <http://www.suin-juriscol.gov.co/viewDocument.asp?id=30019717>.

[4] See Law núm. 1735, October 21, 2014, <http://wp.presidencia.gov.co/sitios/normativa/leyes/Documents/LEY%201735%20DEL%2021%20DE%20OCTUBRE%20DE%202014.pdf>, and *Diario Oficial*, CL, No. 49572, July 13, 2015, <http://www.suin-juriscol.gov.co/viewDocument.asp?id=30019957>.

[5] See *Diario Oficial*, year CLI, No. 49.818, March 17, 2016, <http://www.suin-juriscol.gov.co/viewDocument.asp?id=30023903>.

[6] The commission will consist of the Ministry of Finance and Public Credit and that of Agriculture and Rural Development, the financial superintendent and the director of the Financial Regulation and Financial Studies Unit, as well as the governors of the Banco de la República and the director of the National Planning Department as special guests.

inclusion among the population. Two approaches stand out for this purpose: one (supply) that considers financial institution data, and another (demand) constructed from household surveys (Roa, 2015). In the case of Colombia, financial institution data finds that 76.3% of adults have at least one financial product, while only 38.4% of people mention having an account at a financial institution, according to a survey of individuals conducted by the World Bank.

The difference between both approaches underlines the need for analyzing not just supply factors, but also those of demand when assessing ownership of formal financial products. The results for Colombia show that supply-side constraints are small: 95% of individuals stated having access to at least one point of contact to the financial system, according to the Demand Survey of Banca de las Oportunidades (BO) and the Financial Superintendency of Colombia (Superintendencia Financiera de Colombia, SFC), while there are also financial products available through simplified procedures whose only requirement is to present an identification document in order to acquire them. This demonstrates that some of the supply barriers mentioned by Karlan et al. (2014), such as regulatory ones or those associated to the costs of having the opportunity to access the financial system, are not significant in explaining the determinants of financial product ownership in Colombia.

Hence, the fact that an individual in Colombia does not have any financial instrument in their portfolio is more associated to sociodemographic characteristics, awareness, and financial attitudes and behaviors that condition their preferences and financial decisions. This is consistent with that found by Bebczuk (2008), who contends that low levels of financial inclusion in Latin America and the Caribbean are mainly associated with demand factors. Furthermore, people may decide not to have financial products for reasons of confidence or social emulation, despite how useful they might be. Karlan et al. (2014) and Roa (2013) have found that other factors such as cognitive capacity and psychological aspects have a significant influence on people's financial behavior, given that they limit their ability to process and interpret the information available.

As shown in the literature review section of this paper, various exercises have been performed in Colombia to measure the influence of sociodemographic factors on financial product ownership. However, these tasks have suffered from limited demand-side data, specially concerning the variable that measure financial attitudes

and behaviors, as well as awareness regarding the supply of said products. The efforts of the OECD in preparing a questionnaire that is comparable across countries (and applied to Andean countries through the CAF) stand out in contributing to this type of research and addressing data limitations.

One of the most important results of the abovementioned survey for Colombia is that 96% of those surveyed are aware of at least one financial product, but only 44.2% mention owning at least one. This difference is the main motivation for this work, which consists of determining the demand factors explaining why individuals decide not to own a financial product, despite knowing it exists. The methodology employed for this objective is that of using contingency tables to determine the dependency of the fact of being aware of, but not owning a financial product with all the possible explicative variables, as well as loglinear estimates for determining the level of association between such variables.

In line with findings for other emerging economies regarding the factors limiting financial inclusion, we find that not owning a financial product in Colombia despite being aware of it is related to low levels of education and income, a vulnerable status in the labor market, not budgeting, and not being directly responsible for money management in the household. The paper is divided into six sections including this introduction. Section 2 reviews the literature. The third section presents the data, while Section 4 describes the methodology used. The paper then gives the most important results and ends with some concluding remarks.

2. LITERATURE REVIEW

Literature on this topic has generally focused on determining the variables that affect the likelihood of usage or access to financial products or services, where the most outstanding factors have been education, income, and age, among others. Several works have also underlined the importance of financial education, behavioral variables, and financial attitudes, as well as psychological aspects.

In the United States, Grimes et al. (2010) employ data from the National Financial Services Survey to show that people with a professional education, are homeowners, have taken a course in economics, business, or finance at college and have knowledge of economic

matters[7] are more likely to be banked, while being young and having a low income make this less likely. For Canada, Simpson and Buckland (2009) show that financial exclusion is related to the levels of income, wealth, education (formal and financial), age, and being a homeowner or not.

Using the Financial Access Survey for Kenya and Uganda, Johnson and Niño-Zarazúa (2009) find that having a job or a main source of income is the most influential variable in access to or exclusion from the financial system in those countries. The authors show that age is also an important variable, although its influence depends on the country. The individuals most likely to be excluded in Kenya are aged between 18 and 24, while in Uganda they are over 45.

In the case of Latin America and the Caribbean, García et al. (2013), based on data from the Global Financial Index Database, demonstrate that having at least one account in the financial system is positively related to income, education, being male, being between 25 and 64 years old, and living in urban areas. Meanwhile, Tuesta et al. (2015) contend that in Argentina the probability of having an account,[8] a credit card, or a debit card increases with education, income, and age, although the effects on the latter variable are degressive. For Mexico, Djankov (2008) finds that bankarization among households is explained by wealth, education, and other unobservable characteristics. In the case of Bolivia, Altunbaş et al. (2010) show that having a university degree or being a civil servant increases the possibility of obtaining a loan from a formal financial intermediary, while being a woman or indigenous reduces it.

For Colombia, the recent works of Rodríguez-Raga and Riaño-Rodríguez (2016), and Gómez et al. (2016) stand out. These authors estimate the determinants of access to and demand for saving and credit products in Colombia, using discrete choice models. In the former paper, the authors employ information from the Colombian Longitudinal Survey (ELCA), while in the latter they take data from the Demand Survey of Banca de las Oportunidades.

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[7] This variable is constructed from the percentage of correct answers to questions on economics themes. The latter includes concepts such as unemployment rate, inflation, deficit, and central bank functions, among others.

[8] The account may be at a financial institution, cooperative, microfinance company, or post office.

Meanwhile, Rodríguez-Raga and Riaño-Rodríguez (2016) find that the likelihood of having access to saving products in the formal financial system is greater for those who have higher levels of income and education, formal employment, their own home, and access to public services or some type of government assistance program. They also show that access to credit is related to home ownership, living in urban areas, and being older. Similarly, Gómez et al. (2016) demonstrate that the probability of demand for savings accounts is greater among individuals with higher levels of education and income, who are beneficiaries of some type of government program, and have formal employment, confidence in the financial system, and at least one insurance policy. In the case of demand for loans, these authors show that the probability is higher among individuals over the age of 46, and who have formal employment and confidence in the financial system.

In addition, Cano et al. (2013), based on the Financial Capabilities Survey of the World Bank and the Banco de la República, calculate the determinants of access to a basket of financial products, assuming that the more products a household has, the more likely it is to use them effectively. Through multiple correspondence analysis, the authors find that access to different baskets of financial products is associated to variables such as sex, levels of income and wealth, schooling, and level of financial education, household stability, and distance between dwellings and financial branches, as well as the assessment of the future in financial decisions and attitudes.[9]

The work of Murcia (2007) finds the determinants of access to mortgage credit and credit cards for Colombian households, based on data from the Quality of Life Survey of the National Administrative Department of Statistics (DANE). Using a probit model, the author determines that the likelihood of having access to credit depends on income or wealth, years in education, and geographic location. The sex of the household head was found to be significant in the case of mortgage credit, but not in that of credit cards.

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[9] According to this paper, households' financial attitudes are related to their capacity to learn from the money management mistakes of others, trying to save money for the future or for emergencies and doing so regularly, making long-term plans, and obtaining information for making financial decisions.

Finally, Meza et al. (2008) show that when people assess the benefits and risks of owning financial products, the most important variable is their personal experience or those of their friends. Moreover, Martin (2007) finds that people's financial behaviors, such as acquiring financial saving products, establishing a budget, and paying obligations on time, mainly depend on their degree of risk aversion, capacity to tackle problems, and financial literacy. On the latter points, Roa (2013) highlights how it is essential to consider that the acquisition and usage of financial data is influenced by the psychological traits of individuals, such as cognitive biases, confidence and conformity, and bounded rationality, among others.

3. DATA DESCRIPTION

This section of the paper presents a description of the data used for estimating the factors influencing ownership of financial products in Colombia. The principal source of our dataset is the Financial Capabilities Survey in Andean Countries (Bolivia, Colombia, Ecuador, and Peru) developed by the Organization for Economic Cooperation and Development (OECD) and funded and sponsored by the CAF-Development Bank of Latin America through the Asociación Solidaridad Países Emergentes. The survey was prepared with the aim of performing a diagnosis to identify the knowledge, skills, attitudes, and behaviors of individuals in different countries relative to some financial topics and various aspects of financial education, such as budgeting, money management, short- and long-term financial planning, and choosing financial products.

The questionnaire was designed in 2011 by the International Network on Financial Education of the OECD to be used in face-to-face or telephone interviews and consists of practical questions taken from existing financial education surveys. Thus, the survey is made up of different modules containing questions related to specific themes divided as follows: location, general information on the household, the household economy, financial products, behaviors and attitudes to money, evaluation of concepts, education and employment data, and general information about the respondent.

Given the objective of performing an analysis of the determinants of financial product ownership in Colombia, we only employ results of the survey for that country, which was conducted towards the end

of 2013 among a sample of 1,261 individuals over the age of 18 from all socioeconomic levels. The sample is nationally representative and covers 23 areas of the country, including Bogotá.

Given that some answers were initially consolidated in different ways (for example, a multiple-choice question could be assigned to just one or several variables depending on the number of options it contained), variables needing some type of treatment were transformed to make them easier to handle for the estimations. Some additional count or summary variables were also created (such as the number of financial products known, and the number of correct answers in the concept assessment module, among others).

3.1 Descriptive Statistics of the Survey

In general terms, the individuals surveyed mostly belong to mid-size and large urban areas. The majority of respondents are also women (53.5%) and aged 18 to 29 (27.0%). A summary of some of the most important sociodemographic variables in the study is presented in Annex 1.

As for awareness of financial products, 54.3% of those surveyed are familiar with between three to eight financial products. With regard to financial product ownership, 79% mention owning just one or none. From these results therefore raises interest in finding the factors that determine why respondents, even though they are aware of financial products, do not own them. This question was used as the basis to create variable Y (awareness and ownership condition) that we want to explain as a multinomial variable that takes the value 1 if the individual is aware of at least one financial product, but does not own any (AandNo), 2 if the individual is aware of at least one product and owns at least one (AandO) and 3 if the individual is not aware of any financial products (and therefore does not own any, NA). The latter is explained by the way in which the survey was conducted, given that if respondents state not knowing any financial product they do not answer the following questions in the ownership and usage modules. Upon analyzing the distribution of variable Y, we find that 44.3% of the data takes the value 1 (aware of and do not own), 51.4% take the value 2 (aware of and own), while the remaining 4.3% belongs to category 3 (not aware of).

4. METHODOLOGY

Based on the findings in the second section of this paper, the methodology most commonly used when attempting to determine factors associated to a behavior or individual situation (ownership or usage of financial products) is that related to probit and logit models. Nevertheless, when all the explicative variables are categorical, as is the case with the data employed in this work, it is useful to employ contingency tables to perform tests of independence, and loglinear models to determine the degree of association between the variables considered, in accordance with that proposed by Agresti (2007).

4.1 Contingency Table Analysis

Contingency table analysis, besides performing exploratory analysis, estimates joint distributions of variables of interest and performs measures of association that describe the dependence between two random binomial or multinomial variables. This paper uses basic two-way contingency tables $(I^* J)$, where it is assumed that each n_{ij} in table x represents the number of subjects that have the following characteristics $(Y=i, Z=j)$, and n_{i+}, n_{+j} are the marginal totals of rows and columns, respectively:

	Z=1	Z=2	Total
Y=1	n_{11}	n_{12}	n_{1+}
Y=2	n_{21}	n_{22}	n_{2+}
Total	n_{+1}	n_{+2}	n_{++}

Assuming that the observations result from a random sampling process, table $x = (n_{11}, n_{12}, n_{21}, n_{22})$ will have a multinomial distribution with a vector parameter:

$$\pi = (\pi_{11}, \pi_{12}, \pi_{21}, \pi_{22}) = \{\pi_{ij}\}, \qquad \text{[1]}$$

where $\pi_{ij} = P(Y = i, Z = j)$ corresponds to the probability of an individual randomly selected from the population of interest belonging

to cell (i, j)-*th* of the contingency table. Annex 2 shows an example of a contingency table analysis application.

After performing the exploratory analysis procedure for the data, the hypothesis we wish to assess is the independence between the explicative and dependent variables. These tests were performed for all the variables of the survey in order to study the possible influence of all the dimensions measured in the survey: sociodemographic characteristics, household economy data, behaviors and attitudes to money, and concept assessments.

4.2 Estimation Method

The variable to explain in this paper is defined as multinomial, in which the response of each individual is independent and the probability for the three categories is the same. Hence, the number of possible categories is denoted as c with their respective probabilities $\{\pi_1, \pi_2, \ldots \pi_c\}$, where $\Sigma_j \pi_j = 1$. For n independent observations, where $\Sigma_j n_j = n$, the likelihood that n_1 falls into category 1, n_2 into category 2, ..., n_c into category c is equal to

<div style="text-align:right">2</div>

$$P\left(n_1, n_2, \ldots, n_c\right) = \left(\frac{n!}{n_1! n_2! \ldots n_c!}\right) \pi_1^{n_1} \pi_2^{n_2} \ldots \pi_c^{n_c}.$$

In practice, the parameter values of the distribution are unknown. In this case, the parameter of the multinomial distribution we want to estimate corresponds to the probability value of each category: π_j. The estimation method most used for these estimations is that of maximum likelihood, which guarantees optimal properties for the estimators, and uses the likelihood function as an input defined as the probability of observed data according to the parameter. In the multinomial case, the likelihood function is written as:

<div style="text-align:right">3</div>

$$L\left(\pi_1, \pi_2, \ldots \pi_c\right) = C\pi_1^{n_1} \pi_2^{n_2} \ldots \pi_c^{n_c} = C\prod_{j=1}^{c} \pi_j^{n_j} = C\left(\pi_j\right)^{\sum_{j=1}^{c} n_j},$$

where C is a constant equal to $\left(\dfrac{n!}{n_1! n_2! \ldots n_c!}\right)$.

The objective with this function is therefore to find the scenario that maximizes the probability of the event that has occurred. Most of the times this methodology is employed, a transformation of the likelihood function is carried out in order to make it easier to calculate the points at which said function is maximized. Hence, the log-likelihood function is denoted as:

$$l\left(\pi_1, \pi_2, \ldots \pi_c\right) = \left(\sum_{j=1}^{c} n_j\right) \ln \pi_j.$$

Deriving 4 with respect to π_j and setting equal to zero gives the estimated parameter as:[10]

$$\hat{\pi}_j = \frac{n_j}{n}.$$

Similar to what occurs in the multinomial distribution, for observed data we find that $\hat{\pi}_{ij} = n_{ij}/n$, which corresponds to the joint probability for both variables Y and Z, and becomes the parameter of interest for the estimations.

After finding the explicative variables that are dependent on the variable of interest, and defining the assumed distribution of the latter, the next step is to estimate by survey modules the effects of the explicative variables on the behavior of the variable of interest. The explicative variables employed were selected from the stepwise models of each group. This was carried out considering the high degree of multicollinearity among the variables, and with the aim of seeking the best adjustment of the variables chosen per topic. The estimation is made by using generalized linear models, specifically through the use of loglinear regressions that quantify the level of association and interaction between two categorical variables (explicative and dependent). This level of association is constructed based on odds ratios resulting from estimating the expected values of the contingency table cells.

Given that there is no linear relation between the dependent variable and the explicative ones, as takes place in linear regression

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[10] For further details see Agresti (2007), p. 21.

models, the results of the estimations do not exhibit the direct effects of any variable on that, but model expected frequencies $\hat{\mu}_{ij}$ instead.

The structure of the model is defined depending on whether it is based on the independence assumption or not, in the former case the model is written as follows:

<div style="display:flex; align-items:center;">
6
</div>

$$\mu_{ij} = n\pi_{i+}\pi_{+j}.$$

Taking the natural log on both sides of 6:

7

$$\log(\mu_{ij}) = \log(n) + \log(\pi_{i+}) + \log(\pi_{+j}),$$

8

$$\log(\mu_{ij}) = \lambda + \lambda_i^A + \lambda_j^B.$$

In the no independence case, the representation would be:

9

$$\log(\mu_{ij}) = \lambda + \lambda_i^A + \lambda_j^B + \lambda_{ij}^{AB},$$

where A and B denote the two categorical variables; λ represents the general effect of expected frequencies; λ_i^B represents the principal effect of variable A; λ_j^B represents the principal effect of variable B; and λ_{ij}^{AB} represents the interaction or association between the variables and indicates there is no independence between them.

By modelling expected frequencies, we obtain the parameters that allow for constructing odds ratios that will show the levels of association between the categorical variables being compared. Specifically, the interaction term λ_{ij}^{AB} will allow this measure to be constructed. Thus, by taking

10

$$exp^{\lambda_{ij}^{AB}}$$

we obtain the odds ratio between the explicative variable and the variable of interest. Annex 4 shows the estimation results, in which values λ_{ij}^{AB} (estimate) are found for each regression and their associated $exp^{\lambda_{ij}^{AB}}$ (exp. [coefficients]).

5. RESULTS

This section presents some of the results obtained from the tests of independence between the variable of interest and all possible explicative variables, as well as levels of association between them. Annex 3 of this paper provides a list of the explicative variables for which a test of independence was conducted with respect to variable *Y*, together with the corresponding results.

First, mosaic plots (Figure 1) are presented that show the strength of dependence, if it exists, between two categorical variables. The Y axis of the plots represents the variable of interest in the model (1 if the individual is aware of at least one financial product but does not own any, 2 if the individual is aware of at least one product and owns at least one, and 3 if the individual is not aware of any financial product). The X axis shows the variable found to be relevant for analysis and its different categories. Blue indicates that there is a higher number of frequencies in that category than the model expected, while red means that the number of frequencies in that category is smaller than the model anticipated.

Hence, in the first case studied we find that there are more individuals who do not save and who are aware of but do not own financial products than anticipated by the model. Likewise, we find that there are fewer individuals than expected by the model who did not mention the no saving option (option 2 of variable X) and that are aware of but do not own at least one financial product.

As can be seen, marital status and age do not appear to exhibit dependence with the variable of interest, given that the figures show the test of independence is not significant. This is reflected by grey in most of the figure. On the contrary, having a budget or being responsible for making the financial decisions of the household do seem to be related to the decision on whether to own a financial product or not when an individual is aware of it.

Thus, education, employment status and income exhibit some level of dependence with awareness and ownership of financial products. The tests of independence results show that there is a larger number of people than anticipated by the model with between primary and incomplete high school education, individuals dedicated to household tasks, and with a monthly income of under 400,000 Colombian pesos (COP) who are aware of, but do not own financial products. Meanwhile, the tests show that there is a smaller number

Figure 1

RESULTS OF THE TESTS

DOES NOT SAVE

Pearson
residuals:

VARIABLE: SAVE_NO

• Does not save

  1. Yes
  2. No

$p-$value$=$
$< 2.22e^{-16}$

MARITAL STATUS

Pearson
residuals:

VARIABLE: MARITAL_STATUS

• Marital status

  1. Married
  2. Single
  3. Separated
  4. In union
  5. Widowed

$p-$value$=$
0.0026708

AGE

Pearson
residuals:

VARIABLE: AGE

• Age

  1. Between 18 and 29 years
  2. Between 30 and 39 years
  3. Between 40 and 49 years
  4. Between 50 and 59 years
  5. Between 60 and 69 years
  6. Over 70 years

$p-$value$=$
$3.2743e^{-07}$

Figure 1 (cont.)

RESULTS OF THE TESTS

BUDGET

VARIABLE: BUDGET

• ¿Does your family have a budget?

1. Yes
2. No

p−value = 4.0278e^{−15}

RESPONSIBLE FOR DECISIONS

VARIABLE: RESP_DECI

• Responsible for money management decisions in the household

1. You
2. You and your partner
3. You and another family member
4. Your partner
5. Other family member
6. Other non-family member
7. None

p−value = < 2.22e^{−16}

EDUCATION LEVEL

VARIABLE: EDUCATION_LEVEL

• Highest level of education reached

1. No education
2. Preschool
3. Primary school incomplete
4. Primary school complete
5. High school incomplete
6. High school complete
7. Technical incomplete
8. Technical complete
9. University incomplete
10. University complete
11. Master's degree/PhD

p−value = < 2.22e^{−16}

EMPLOYMENT STATUS

VARIABLE: EMPLOYMENT_STAT

• Current employment status

1. Self employed
2. Own business
3. Employee
4. Part-time employee
5. Student
6. Housework
7. Retired
8. Unemployed
9. Unable to work
10. Rentier

INCOME

VARIABLE: INCOME

• Monthly income range

1. Less than 189,000 COP
2. Between 189,000 COP
3. Between 189,000 COP
   and 378,000 COP
4. Between 756,000 COP
   and 1,512,000 COP
5. Between 1,512,000 COP
   and 3,024,000 COP
6. Between 3,024,000 COP
   and 6,048,000 COP
7. Over 6,048,000 COP

of people than expected by the model with levels of education above university and with income between COP 800,000 and COP 3 million who are aware of, but do not own financial products.

After having found the dependence relations between explicative variables and the variable of interest, we proceeded to perform estimations with those that were significant within each section of questions. Annex 4 of this paper shows the regressions performed, as well as the transformations of λ_{ij}^{AB} coefficients that allow odds ratios to be constructed. It should be mentioned that each model estimation produces validity test results indicating whether the model is properly adjusted. Although these results are not included in Annex 4, they prove the models are properly adjusted. Below are the most outstanding results on the determinants of why a Colombian who is

aware financial products exist decides not to own any, as well as the contribution in terms of the likelihood of the occurrence.

In line with that highlighted in Figure 1, being aware of a financial product but not owning any is related to low levels of education among the respondents, being more frequent among those who did not complete high school education. That is, those without education or with just preschool, incomplete and complete primary school, and incomplete high school education. After complete high school education, a positive contribution is observed on the probability of being aware of and owning financial products. Said probability is 5.0% and 4.2% in the case of completed high school and incomplete technical education respectively, and continues to be positive and much larger for the following levels of education (complete technical, incomplete and complete university, postgraduate), being 15.1% on average. This relation might be attributable to the fact that education provides the individuals with the tools and knowledge necessary to understand the benefits associated with the acquisition of financial products.

On the other hand, the condition of being aware of and not owning any financial products is related to not budgeting and not being directly responsible for money management in the household. Hence, it can be seen how the probability of being aware of and owning financial products among those who do not budget is 0.45 times that of those who do. Said probability among respondents who delegate money management in the household to their partner or another person is 0.5 times that of those who manage it directly. The aforementioned factors reflect the importance of financial behavior when assessing the likelihood of owning a product. In light of this, and considering that the assessment of concepts such as inflation and compound interest were not significant variables, it is essential that education programs implemented in Colombia place emphasis on households' economic behavior. The latter is backed by recommendations made by the World Bank (2013) for improving financial capacities in Colombia, based on the results of the national survey on financial behaviors, attitudes, and literacy.

Meanwhile, not owning financial products despite being aware of them is related to the lowest sociodemographic strata, being amongst the two lowest income ranges, and being unemployed, unable to work, or dedicated to housework. With respect to socioeconomic strata, it can be seen that belonging to strata 4, 5, and 6 increases the

likelihood of being aware of and possessing financial products by 2.9 percentage points (pp), 2.8 pp and 5.1 pp, in that order. In contrast to that expected, this probability is positive for stratas 2 and 3, although its average level is just 1.6%. As for employment status, it is worth mentioning that being a business owner and having at least one employee increases the probability by 2.3 pp of being aware of and owning financial products, while being a full-time employee does so by 2.5 pp. This result is consistent with several of the works mentioned in Section 2, which demonstrate the importance of job security and stability as a determinant of financial inclusion.

Finally, it should be highlighted that, with respect to the marital status of respondents, being widowed is the only variable that affects ownership of a product, while sex and age do not appear to have a significant relation with nonownership, despite being aware. Nevertheless, analyzing the estimated probabilities of being aware of and owning at least one financial product, we find that being a woman and over the age of 60 decreases said likelihood. This might be explained by the fact that a significant proportion of women in Colombia have no income of their own to allow and encourage them to demand financial products.

6. CONCLUSIONS

Identification of the factors that influence the ownership of financial products in any economy has been considered highly important given the positive effects such behavior has on financial stability and, thereby, on economic growth and development. There is ample international recognition regarding the importance of performing studies that measure not only levels of usage and access to financial products, but also determinants related to the decision to access the financial system or remain outside it. With this objective in mind, we used the results of the Financial Capabilities Survey in Colombia, conducted in 2013, to find the factors explaining why even when individuals are aware of financial products they do not own them.

This topic is of great interest for the country because the results of the survey show 44.2% of respondents who mention being aware of at least one financial product do not own any. It is important to mention that this behavior might be associated with supply and demand determinants, but since every town in Colombia has at least

Figure 2

**DISTRIBUTION OF THE VARIABLE OF INTEREST
AND EXPLICATIVE VARIABLES (FRECUENCY)**

LEVEL OF EDUCATION

■ **Awares and does not own** ■ **Awares and owns** ▪ **Does not aware**

BUDGETING

■ **Awares and does not own** ■ **Awares and owns** ▪ **Does not aware**

STRATA

■ **Awares and does not own** ■ **Awares and owns** ▪ **Does not aware**

EMPLOYMENT STATUS

Legend:
- Awares and does not own
- Awares and owns
- Does not aware

RESPONSIBLE FOR FINANCIAL DECISIONS

Legend:
- Awares and does not own
- Awares and owns
- Does not aware

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Figure 2 (cont.)

**DISTRIBUTION OF THE VARIABLE OF INTEREST
AND EXPLICATIVE VARIABLES (FRECUENCY)**

INCOME

■ Awares and does not own   ■ Awares and owns   ■ Does not aware

MARITAL STATUS

■ Awares and does not own   ■ Awares and owns   ■ Does not aware
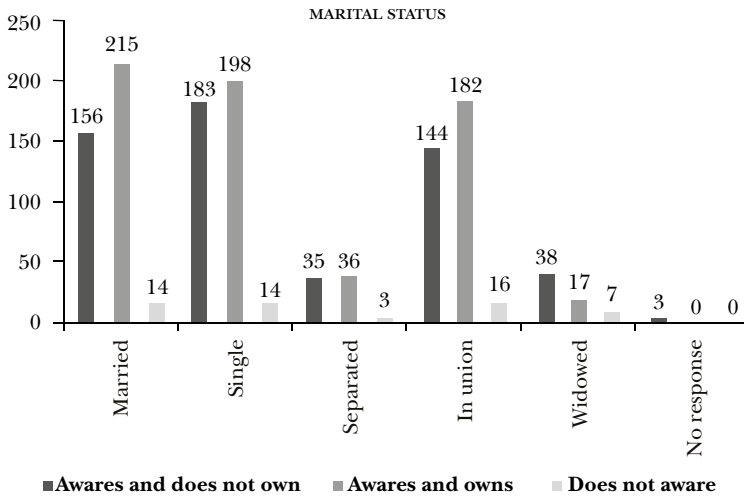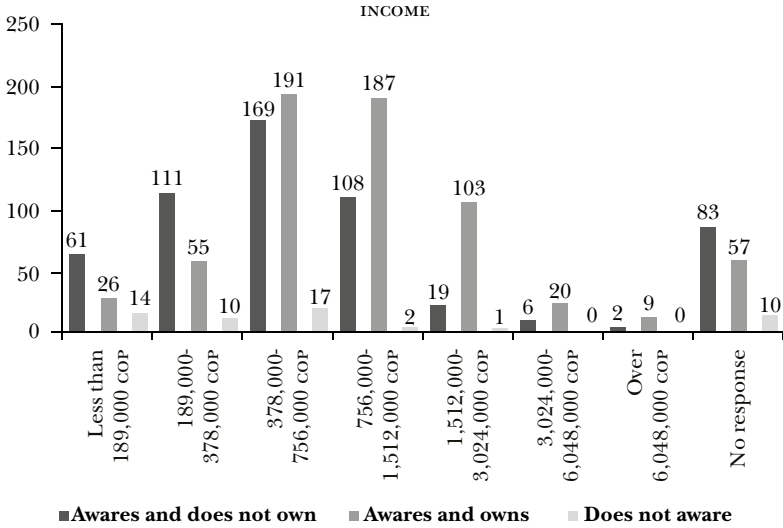
Source: Financial Capabilities Survey-CAF; own calculations.

one access point and there are simplified financial products available, it is assumed the factors explaining nonownership of financial products are related to individuals' sociodemographic characteristics, and their preferences, attitudes, and behaviors.

The estimation methodology that uses contingency tables and loglinear models is an appropriate approach given the nature of the variables it uses, all of which are categorical. This type of model enables dependence relations to be established between the variable of interest and different covariables associated to household sociodemographic themes, attitudes, and financial behaviors, among others.

In particular, we find that individuals with higher than secondary education (high school) are more likely to be aware of and own a financial product than those without education. This confirms the outcomes found by various research papers, underlining how education continues to be important for promoting financial inclusion.

In addition, being in low income ranges and not having a stable source of income is related to nonownership of financial products, which highlights the importance of continuing to make progress in efforts to foster formal employment. In contrast, a high socioeconomic stratum increases the probability of being aware of and possessing financial products. Furthermore, the variables of sex and age do not appear to have a significant relation with the fact of not having any financial product when being aware of at least one.

With respect to some financial behaviors, such as not budgeting and not being responsible for household decisions, we find that this type of individual is more reluctant to have financial products when they are aware of them. It is therefore not only important to promote secondary education, but also financial education programs that place emphasis on the household economy, which has been shown to be one of the main conditioning factors for improving financial capacities in Colombia.

The results of this study support those found in the research work mentioned in Section 2 of this paper, given that they not only underline the importance of sociodemographic variables such as income and education, but also those associated to financial behaviors. In the same way, this paper represents a step towards understanding why Colombians decide not to own financial products despite being aware of them. Going forward, and with more available information, it will be possible to delve deeper into the significance of variables associated to individuals' biases and preferences. The promotion of

these studies continues being of particular interest to the country because they can help establish the factors that should be regarded as important for elaborating policies that encourage ownership of financial products in Colombia, and thereby increase levels of financial inclusion and all the benefits this implies for financial stability and economic growth. Finally, it is important to emphasize that policies implemented to improve levels of financial inclusion should be comprehensive, and strive to address aspects of both supply and demand.

ANNEX

Annex 1

Figure A.1

PRINCIPAL DESCRIPTIVE STATISTICS OF THE SURVEY

AREA

	Rural	Small urban	Midsize urban	Large urban
	260	258	348	395

SEX

	Male	Female
	586	675

LEVEL OF EDUCATION

No education	Preschool	Primary incomplete	Primary complete	High school incomplete	High school complete	Technical incomplete	Technical complete	University incomplete	University complete	Master's degree/PhD	No response
24	15	138	157	186	382	39	141	60	105	11	3

300
250
200
150
100
50
0

178 — Bogota
283 — Caribbean
279 — Central
197 — Eastern
224 — Pacific
100 — South-eastern

AGE

400
350
300
250
200
150
100
50
0

341 — 18 - 29
275 — 30 - 39
242 — 40 - 49
341 — 50 - 59
127 — 60 - 69
67 — Over 70

MARITAL STATUS

450
400
350
300
250
200
150
100
50
0

385 — Married
385 — Single
74 — Separated
342 — In union
62 — Widowed
3 — No response

AWARENESS

Number of products known

OWNERSHIP

Number of products owned

AWARENESS AND OWNERSHIP

Source: Financial Capabilities Survey-CAF; own calculations.

Annex 2

One application of contingency table analysis illustrated by Agresti (2007) classifies individuals according to sex and opinions on life after death:

	BELIEF IN AFTERLIFE		
Sex	*Yes*	*No*	*Total*
Women	$n_{11} = 509$	$n_{12} = 116$	$n_{1+} = 625$
Men	$n_{21} = 398$	$n_{22} = 104$	$n_{2+} = 502$
Total	$n_{+1} = 907$	$n_{+2} = 220$	$n_{++} = 1127$

It can be seen that out of all the women, 509 said they believed in life after death and 116 said they did not. Based on these initial results the question of interest would be whether sex has any relation with belief in afterlife or not, whether it is more likely that a determined sex says they believe, or whether, on the contrary, sex does not have any relation with this belief.

Annex 3. Tests of Independence

Segment	No	Img_credit_line	Yes
Sex	No	Img_pension_fund	No
Question_division	No	Img_friends	Yes
Question_inflation	No	Img_collective_funds	Yes
Question_interest	No	Img_informal_moneylender	No
Question_simple_interest	No	Img_personal_loan	No
Question_compound_interest	No	Img_credit_cared	No
Question_investment_loss_relation	No	Img_sales	No
Question_inflation_cost_living	No	Img_other	Yes
Question_investment_diversification	Yes	Img_no_answer	Yes
Question_deposit_insurance	No	Img_not_applicable	No
Save_home	Yes	Area	No

Save_chains	No	Region	No
Save_investment	Yes	Marital_status	No
Save_family	No	Under_18	Yes
Save_acccounts	No	Over_18	Yes
Save_fixed_term_deposits	No	Responsible_decisiones	No
Save_frequent_accounts	No	Budget	No
Save_property	Yes	Carefully_consider_when_buying	No
Save_no	No	Live_day_to_day	No
Save_no_answer	Yes	Spend_today	No
Ps_families_in_action	No	Pay_on_time	No
Ps_united_network	Yes	Risk_for_investing	No
Ps_opportunities_bank	Yes	Monitor_financial_topics	No
Ps_agricultural_program	Yes	Financial_goals	No
Ps_agricultural_safe_income	Yes	Money_to_spend	No
Ps_incora	Yes	Income_minus_expenses	No
Ps_lands_adaptation	Yes	Time_income_cover_expenses	No
Ps_productive_alliances	Yes	Cellphone_payments	No
Ps_pademer	Yes	Education_level	No
Ps_rural_women	No	Employment_status	No
Ps_rura_youths	Yes	Stable_income	No
Ps_credit_investment_mechanism	Yes	Income	No
Ps_price_subsidies	Yes	Age	No
Ps_productive_training	Yes	Strata	No
Ps_housing_subsidies	Yes	Budget_specific_plan	No
Ps_other	Yes	Budget_comply_frequently	No
Ps_none	No	Product_choice	No
Ps_not-know	Yes	Deposit_insurance_amount	No
Ps_no_answer	Yes	Professional_fees_receipt	No
Img_pawn	No	Employment_benefits	No
Img_extra_work	Yes	#products_known	No
Img_overdraft	Yes	#method_of_saving	No
Img_mortgage	Yes	#social_programs	No
Img_employer_loan	Yes	#products_owned	No
Img_arrears	Yes	#products_choice	No
Img_reduce_expenses	Yes	#informal_sources	No
Img_save	No	#methods_cover_expenses	Yes
Img_ask_for_credit	No	#correct_answers	No

Annex 4. Regression Results

Explicative variable			Estimation	exp (coefficients)
Sex	CyT	Female	$(0.33)^{b}$	0.72
Inflation question	CyT	No	$(0.58)^{a}$	0.56
Simple interest question	CyT	No	$(1.26)^{a}$	0.28
Investment-loss question	NC	False	1.46^{a}	4.29
Savings in current or saving accounts	CyT	No	$(2.47)^{a}$	0.08
Savings in fixed-term deposits	CyT	No	$(4.10)^{a}$	0.02
Savings by making deposits	CyT	No	$(2.44)^{a}$	0.02
Does not save	CyT	No	1.27^{a}	3.55
Uses savings when income is less than expenditures	CyT	No	$(1.02)^{a}$	0.36
Asks for credit when income is less than expenditures	CyT	No	0.51^{c}	1.67
Uses pension fund when income is less than expenditures	CyT	No	$(1.57)^{a}$	0.21
Uses credit when income is less than expenditures	CyT	No	$(1.22)^{b}$	0.29
Region	CyT	Caribbean	$(1.03)^{a}$	0.36
		Central	$(0.88)^{a}$	0.42
		East	$(0.49)^{c}$	0.61
		Pacific	$(0.92)^{a}$	0.40
		South-East	$(0.82)^{b}$	0.44
Marital status	CyT	Single	$(0.24)^{d}$	0.79
		Widowed	$(1.13)^{a}$	0.32

Responsible for household decisions	CyT	You and your partner	0.27 [d]	1.31
		Your partner	(0.66)[b]	0.52
		Other family member	(0.60)[a]	0.55
Budget	CyT	No	(0.78)[a]	0.46
	NC	No	0.76[c]	2.14
Level of education	CyT	High school complete	1.62[b]	5.04
		Technical incomplete	1.44[c]	4.21
		Technical complete	2.55[a]	12.85
		University incomplete	2.75[a]	15.67
		University complete	2.82[a]	16.80
	NC	High school complete	(1.78)[c]	0.17
Employment status	CyT	Own business	0.84[b]	2.31
		Employed	0.91[a]	2.48
		Home	(1.02)[a]	0.36
		Unemployed	(0.78)[b]	0.46
		Unable to work	(1.29)[c]	0.27
Income	CyT	From 378,001 cop to 756,000 cop	0.98[a]	2.65
		From 756,001 cop to 1,512,000 cop	1.40[a]	4.06
		From 1,512,001 cop to 3,024,000 cop	2.54[a]	12.72

Explicative variable			Estimation	exp (coefficients)
		From 3,024,001 COP to 6,048,000 COP	2.06[a]	7.82
		More than 6,048,000	2.36[b]	10.56
	NC	From 189,001 COP to 378,000 COP	(0.94)[c]	0.39
		From 378,001 COP to 756,000 COP	(0.82)[c]	0.44
		From 756,001 COP to 1,512,000 COP	(2.52)[b]	0.08
Strata	CyT	2	0.27[c]	1.31
		3	0.58[a]	1.78
		4	1.06[a]	2.89
		5	1.01[c]	2.76
		6	1.63[c]	5.12
Comply with their budget	CyT	Sometimes	0.78[c]	2.18
		Never	0.75[a]	2.11
Receives employment benefits	CyT	No	(1.38)[a]	0.25
Number of social programs	CyT	1	(0.52)[a]	0.59
Age	CyT	60-69	(0.53)[c]	0.59
		Over 70	(0.82)[b]	0.44
	NC	Over 70	1.60[a]	4.94

Note: levels of significance, [a] 0.001, [b] 0.01, [c] 0.05 and [d] 0.1, respectively.

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The Role of Cognitive Characteristics, Personality Traits, and Financial Literacy in Financial Decision Making

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Abstract

The aim of this study is to analyze the relation between cognitive characteristics, personality traits, and financial literacy in savings and credit financial decision making, as well as participation in the formal financial sector. Our analysis is based on the Financial Capabilities Survey, which was applied in four countries of the Andean region: Bolivia, Colombia, Ecuador, and Peru. The empirical analysis shows the importance of numerical abilities and personality traits associated with conscientiousness on the tendency to save and participate in formal financial markets. The results of our instrumental variable analysis demonstrate that the role of financial literacy may be greater in more complex decisions or decisions that require more information, such as involving the use of credit, than for simpler decisions such as holding a basic savings account.

Keywords: savings, credit, personality traits, cognitivie characteristics, financial literacy .

JEL classification: A20, D12, D14, G11, I20, J26.

1. INTRODUCTION

In recent decades, a variety of literature has appeared that looks at the determinants of financial decisions beyond those discussed in neoclassical theory. First, several studies have shown the importance of cognitive characteristics in explaining socioeconomic behaviors. Cognitive skills are identified with abstract thought and are defined as the rate at which people learn or their ability to reason. They are usually measured by an intelligence test, such as the test for the *IQ*. The effect of cognitive abilities and the ability to explain social outcomes such as educational achievement, crime, and health are well understood and documented (Heckman and Kautz, 2012; Almlund et al., 2011; Borghans et al., 2008; Roberts et al., 2007).

In the last decade, a series of studies have also appeared to show how higher levels of cognitive abilities positively affect financial habits: fewer financial errors are made, the probability of defaulting on payments is less, a greater diversity of financial instruments is used, and more sophisticated financial instruments are acquired, among other outcomes (Cole and Shastry, 2009; McArdle et al., 2009; Christelis et al., 2010; Grinblatt et al., 2011; Agarwal and Mazumder, 2013). It can be deduced from this work that numerical skills in particular are closely related to healthy financial decision making.

More recently, some studies have analyzed the role of personality traits in socioeconomic behaviors (Borghans et al., 2011; Almlund et al., 2011; Heckman and Kautz, 2013). The main conclusion of these studies is that personality traits could have the same or greater potential than cognitive characteristics in the prediction of socioeconomic results, and that they are also more malleable throughout the life cycle.

A group of pioneering papers has begun to analyze the role of personality traits in financial decisions. In general, these papers have found that the personality trait of conscientiousness is strongly related to saving for retirement, timely repayment of credit, and avoidance of financial problems (McCarthy, 2011; Kaufmann, 2012; Jamshidinavid et al., 2012; Klinger et al., 2013a,b; Di Giannatale et al., 2015; Kausel et al., 2016). In particular, a tendency to plan and self control are the traits that best predict these financial habits.

Much of the work that measures the effect of cognitive factors and personality traits on financial decisions addresses the possible relations both have with economic preferences. Regarding cognitive

characteristics, these could influence and determine intertemporal preferences and risk, as well as distinct cognitive biases associated with financial decisions (Frederick, 2005; Burks et al., 2009; Oechssler et al., 2009; Dohmen et al., 2010;Benjamin et al., 2013). On the side of personality traits, personality traits and preferences would seem to be complementary when it comes to explaining financial behaviors (Almlund et al., 2011; Becker et al., 2012; Heckman and Kautz, 2013).

Financial literacy is another element that has recently been considered as a determinant of financial decisions (Lusardi and Mitchell, 2014). The financial literacy literature shows a positive correlation between financial education and healthy financial decisions, such as saving for retirement, and avoiding indebtedness, among other outcomes (Lusardi and Mitchell, 2014). However, the direction of causality has not yet been resolved in many cases. Several papers explore the possible endogeneity between financial literacy and financial decisions per se. Different instruments have been used to try to resolve this problem (Lusardi and Mitchell, 2009; Bucher-Koenen and Lusardi, 2011; Van Rooij et al., 2011; Behrman et al., 2012; Klapper et al., 2012). The aforementioned works show that financial literacy matters, and that its effect is greater than that found in prior empirical analysis.

Building on the above discussion, the objective of this paper is to analyze the potential effects of cognitive characteristics, personality traits, and financial literacy in financial decisions. To our knowledge, this joint analysis of the different determinants and their potential relations and effects has not been carried out before. Previous work, as mentioned above, has focused on analyzing the determinants considered in our study separately, and has not always considered the possible relations between them.

We use the Financial Capabilities Survey in Andean Countries performed in Peru, Bolivia, Colombia, and Ecuador by CAF- Development Bank of Latin America (Mejía and Rodríguez, 2015) to meet our objective. The survey identifies the knowledge, skills, attitudes, and behaviors of individuals in relation to savings and credit, both formal and informal. Based on the survey results, we developed different indicators of financial literacy, cognitive characteristics, and personality traits.

This chapter is organized as follows. Section 2 presents the unit of analysis and the empirical methodology. Section 3 presents the

sample's descriptive statistics. Section 4 shows the theoretical model and the econometric analysis results of the lineal probability model. The results of the instrumental variable method used for the problem of endogeneity in financial literacy are in Section 5. Finally, we discuss our conclusions in the final section.

2. UNIT OF ANALYSIS AND METHODOLOGY

Our unit of analysis is based on the Financial Capabilities Survey (FCS)[1] administered in Bolivia, Colombia, Ecuador, and Peru, during the last quarter of 2013 to a representative sample of people over the age of 18. The questionnaire was created following the methodology developed by the Organization for Economic Co-operation and Development and the International Network of Financial Education (Atkinson and Messy, 2012; OECD-INFE, 2015). Specifically, the survey had a total of 33 questions that provided information about the socioeconomic characteristics of households, household economics, holding financial products, savings behaviors and attitudes, credit holdings, and the evaluation of financial concepts.

The empirical methodology of our study consisted of elaborating, based on the FCS, indicators that would operationally allow the measurement of concepts involved in the research, such as personality traits, cognitive characteristics, temporal and risk preferences, financial knowledge, and sociodemographic characteristics. The indicators are presented and discussed in the following section.

2.1 Financial Literacy and Cognitive Abilities

The FCS contains a broad set of financial literacy questions. Specifically, it poses eight questions related to knowledge of interest and compound interest, inflation and the value of money over time, risk and profitability, and risk diversification.

In order to make the results of the survey comparable with global evidence, we constructed a financial literacy indicator based on a set of standard questions. Specifically, Lusardi and Mitchell (2008, 2011a, 2011b) have designed a reduced set of four standard questions–also collected from the FCS–on the concepts of: *1)* inflation;

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[1]   For details of the survey, see Mejía and Rodríguez (2016).

2) interest or numerical skills; *3)* compound interest; and *4)* risk diversification, respectively. The authors define financial knowledge or financial literacy to be when the person answers at least three of the four questions correctly.

The results of the previous questions in Bolivia, Colombia, Ecuador and Peru show that the population of these countries has a low level of financial knowledge. Less than one-third of the population was able to answer at least three of the four questions correctly (Table 3 in Annex 1). However, the results at the question level are heterogeneous.

On average, respondents answer relatively well to questions of inflation and risk diversification. This result contrasts with studies in developed economies where the questions with the highest proportion of correct answers are simple and compound interest rates, while questions related to risk diversification receive the least correct answers.

This may be due to the experience of the respondents in the countries we studied. For example, experience with inflation (in the 1980s and 1990s) and economic crises. This result could also be due to the fact that, in reality, the interest rate question measures numerical abilities: it is the only one that explicitly requires a calculation. Following Lusardi and Mitchell, for this reason we suppose in our study that this question is a measurement of numerical ability,[2] not financial literacy.[3] Therefore, financial literacy will be defined in our study according to whether the person answers at least two of the three remaining questions correctly, and the interest rate question is our measure of cognition.

As mentioned in the first section, a large group of studies have shown how numerical skills are, within the different measures of cognition, the most strongly related to financial behaviors and decisions. Banks and Oldfield (2007) affirm that individuals with greater numerical abilities perhaps have more expertise in complex decision making, such as decisions related to finances. In addition, they

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[2] There is a question involving simple division in the survey. It was correctly answered by a majority of those who took the survey. Due to its simplicity, it was not considered a measure of numerical ability.

[3] Although it is true that this question could be a measure of financial literacy, based on empirical evidence offered by Lusardi (2016) this question is considered an indicator of numerical ability.

appear to be more patient, so they are more likely to have saved and invested in the past. Therefore, individuals with greater numerical skills can more easily make the calculations necessary to determine which financial decision is the most favorable.

In this work, as with the most recent literature, we also consider a more sophisticated financial literacy indicator known as PRIDIT. This is adapted to the measurement of financial literacy by Behrman et al. (2012), which is built in two stages. For elaborating this, we take into account the six questions of financial knowledge that the survey poses (these are shown in Table 15, Annex 3).

In the first stage, weighted scores are given based on the relative difficulty of the questions. Incorrect answers are penalized and the penalty is greater if a large percentage of those surveyed answered the question correctly. The penalty is lower if the question was answered incorrectly by a majority of the sample surveyed. For example, in our study, question three was answered correctly by a small percentage of people, so this question is considered difficult (see Table 15, Annex 3). In the second stage the principal component of weighted questions in the first stage is considered in order to take into account the correlation between the questions, and with that, measure how informative each question is. But this is not the sole weighting criterion at this stage. The questions tend to be more important on average, *ceteris paribus*, if the ratio of correct answers is close to a mean, not almost zero or nearly one. The intuition behind this is simple: the effort here is to avoid the extremes. That is, the questions that are answered by the majority of the sample correctly or those that are not.

2.2 Personality Traits

Personality traits are defined as "relatively long-lasting patterns of thinking, feelings, and behaviors that reflect the tendency to respond in certain ways under certain circumstances," (Roberts, 2009). Psychologists have also developed a relatively accepted taxonomy of personality characteristics known as the *big five*: openness to new experiences, conscientiousness, extraversion, agreeableness, and neuroticism or emotional instability (Borghans et al., 2008; Almlund et al., 2011).

The FCS contains several questions that allow you to extract information about some traits associated with conscientiousness, which

is one of the big five. In particular, the following subcharacteristics associated with conscientiousness can be evaluated from the survey questions: *1)* propensity to plan or establish long-term goals; *2)* perseverance; and *3)* scrupulosity This information is shown in Table 1.

Table 1

SURVEY QUESTIONS RELATED TO CONSCIENTIOUSNESS

Survey questions	*Subcharacteristics of conscientiousness*
a) Does your family have a budget? [Yes; No; I do not know]	Preference for long-term goals or a tendency to plan ahead
b) Does your family use this budget to accurately guide spending or as a plan for spending generally? [Precisely; In general; I do not know]	Scrupulousness
c) Does your family follow this plan for using money? [Precisely; In general; I do not know]	Perseverance or effort to succeed
d) Sometimes people find that their income does not cover their expenses. Has this happened to you in the last 12 months? [Yes; No; I do not know]	Preference for long-term goals or a tendency to plan ahead, perseverance
e) Before purchasing something, do you carefully consider if you can afford it? [Totally agree; Totally disagree (five categories)]	Scrupulousness
f) I pay my bills on time [Totally agree; Totally disagree (five categories)]	Perseverance
g) I have long-term financial goals and I strive to achieve them [Totally agree; Totally disagree (five categories)]	Preference for long-term goals or a tendency to plan ahead, perseverance

Based on the above questions, we created a conscientiousness index. This index ranges from zero to one, where higher scores imply greater conscientiousness. As for the methodology for calculating the index, for convenience it was decided to calculate it based on an average weight, assigning the same weight to the values of each of the prevous mentioned questions since they measure subcharacteristics that are distinct from a person's conscientiousness. To corroborate this, following Klapper et al. (2012) and Garber and Koyama (2016), a principal component analysis was performed to construct a conscientiousness index that compiled the highest correlation between these questions. We did not find a strong correlation between the questions, which is consistent with the fact that they measure different traits of conscientiousness.

Given that the questions we considered for developing the indicator have the same written structure and words used successfully in other contexts (Caprara et al., 1993; Barbaranelli et al., 2003; Lord, 2007; De Mel et al., 2008; Kaufmann, 2012; Heckman, 2012; Soto and John, 2016), we think they are a good measure of the personality traits that we were seeking to measure in our study (John et al., 1994).

Table 2

SURVEY QUESTIONS RELATED TO THE PREFERENCES

	Category scale (five options)	
Valuation criteria	*Total agreement*	*Total disagreement*
Risk preferences		
I am willing to risk some of my own money when I invest	Likes risk/Neutral towards risk	Risk averse
Time preferences		
I live for today and do not worry about tomorrow	Short term	Long term
I prefer to spend money rather than save for the future	Short term	Long term
Money is meant to be spent	Short term	Long term

2.3 Time and Risk Preferences

Regarding risk and time preferences, we used the questions in the FCS listed in Table 2.

Based on the previous valuation, two binary variables were defined that reflect risk aversion and time preferences. The aversion to risk variable takes the value of one if the person responded one or two (averse to risk), and zero otherwise (likes risk/risk neutral). For its part, the time preference variable takes the value of one if the accumulated score of the questions is less than or equal to six(prefers the long term), and zero on the contrary (prefers the short term).

2.4 Sociodemographic Variables

The survey allowed us to consider the following sociodemographic variables: age, sex, income stability, income stratum, schooling, marital status, and employment status. Except for the age variable, all variables are categorical or binary. The variable income stability takes the value of one if the person, considering all sources of their household income, reports that it is regular and stable, or zero if the opposite is the case. The variable income stratum is a categorical variable that takes the value one, two, and three for the low strata (monthly income less than or equal to 400 USD), medium strata (401 USD-1,600 USD), and high strata (more than 1,600 USD)[4] respectively. The variables schooling, marital status, and employment status are categorical variables that show the maximum level of study achieved, the civil status of the person, and the person's employment status respectively.

2.5 Financial Decision Making

Based on the information from the survey, we created the following five dichotomous variables related to savings and credit decisions, which will function as dependent variables in our econometric analysis:

- · V1. Holding some type of formal savings instrument. Takes a

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[4] Given that in each country the original income strata were reported in local currency, we expressed the income frontiers of each stratum in US dollars, based on the nominal exchange rate at the end of November 2014, a date close to that of deadlines for survey applications.

value of one if the respondent reports having at least one formal savings instrument; zero if not.

- V2. Saved in the last year: Takes a value of one if savings have occurred in the last 12 months in a formal manner (savings bank, current account, term deposit, or other mechanism specific to the country), or an informal manner (livestock, rotating savings and credit groups, cash kept at home); otherwise, a value of zero.

- V3. Formal savings over the past 12 months: Takes a value of one if the respondent has saved over the past 12 months in some formal way; zero if them have not, but instead has saved using an informal method (saving money at home, or with a group of people, among others)

- V4. Informal savings over the past 12 months: Takes a value of one if the respondent has saved over the past 12 months in some informal way (saving money at home, in sequences, or with a group of people, among others); or zero if them have not saved or saved using a formal method.

- V5. Holding formal credit products: Takes a value of one if the person has some type of credit (consumer credit, housing credit, credit card, microcredit, or other instrument specific to the country); otherwise, a value of zero.

Table 3 in Annex 1 presents the breakdown of financial decision variables at the country level. First, in terms of the possession of a formal savings instrument, on average 44.8% have some instruments, with Ecuador reaching a figure of 67. 2 per cent.

Second, the data also shows that in the sample countries more than 50% of the population saved in the last 12 months under some modality, and that the population of these countries uses both formal and informal methods to save. The savings were especially high in Bolivia, where, as in Peru, the percentages of both formal and informal savings are similar. However, there are significant differences between the population that saved using any type of instrument in relation to those that saved using a formal instrument.

Regarding the holding of some form of credit product, formal or informal, it is striking that on average, for the whole sample, the rate is lower than that of a savings product: 24.2%. In the case of

informal credit, this percentage is very similar (22.1%), with formal credit being very low (2.1%). These results contrast with the informal credit figures recorded in the Global Findex World Bank database (Demirgüç-Kunt et al., 2015), where in Latin America and the Caribbean 13.5% sought to borrow from friends and relatives and 39.5% requested a loan.

We believe that the reported low level of possession of informal credit may be related to a measurement error in the question. In this question, the only modality of informal credit was with individuals who lend money for a living, whereas respondents might be familiar with other types of informal credits that are either not recognized in this modality (family, friends, and employers, for example), or have another name. That is why, within the large percentage of people who reported not using a credit instrument, we think it includes persons who use informal means of credit.

3. DESCRIPTIVE STATISTICS

This section performs a disaggregated analysis of the data to identify relations from financial decisions and financial literacy with socioeconomic, personality and cognitive characteristics, and preferences at the country level. There follows a presentation and discussion of the main patterns. For financial literacy, the figure of two correct answers over three was used. We present some patterns found in the data (tables 4 and 5, Annex 1) as a first approximation of the possible relation between financial decisions and the remaining variables.

First, in Table 4 we show the average score, as well as the 25th, 50th, and 75th percentiles on the conscientiousness index for the variable groups (V1-V5). The percentiles show a symetric distribution. Consistent with the other works that were mentioned in the introduction, we found that those that save or use formal savings or credit instruments have conscientiousness levels that are significantly higher than those that do not. The difference is 0.06, 0.06, 0.07, 0.01, and 0.06 points for the variables V1, V2, V3, V4 and V5, respectively. The mean difference test confirms that these are significant for all financial decisions.

In Table 5, we present the affirmative financial decisions: holding of a formal savings instrument, formal or informal savings, only formal savings, only informal savings, and holding of formal credit

holdings disaggregated by financial literacy, numerical abilities, preferences, and socioeconomic characteristics. In line with the literature, those with higher levels of numerical skills tend to save more and participate in the formal financial sector, through both credit and savings. Nevertheless, it is striking that in the case of informal savings, no significant differences are observed when individuals are financially literate or have numerical skills. We believe that this could be due to the fact that in these countries successive financial crises have generated distrust in the formal sector, and as such the use of formal and informal methods coexist harmoniously.

In relative terms, people with financial literacy, higher educational attainment, income level, and stability, such as more stable work situations, save more and have greater participation in the formal financial sector. Finally, in terms of age, we can see that in the case of savings there is no defined pattern, while for credit–as with financial literacy–there is an inverted U-shape. This result is in line with the life-cycle models that show people become indebted during adulthood, compared to youth or old age.

4. ECONOMETRIC ANALYSIS

Our empirical model is based on Roy's theoretical model of comparative advantage (1951). This model was initially used by Heckman et al. (2006) to introduce the effect of personality traits on results in the employment market and social behavior. In our analysis we extend the model to explain the financial savings and credit decisions discussed in section 2.5.

In order to identify the potential influence of personality traits, cognition, and financial literacy on financial decision-making, we first estimate a linear probability model by ordinary least squares (OLS)[5]:

| 1 | $$Y_i = \beta_0 + \beta_1 COG_i + \beta_2 DIL_i + \beta_3 AF_i + X_i'\theta + u_i, \ .$$ |

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[5] Models were weighted using countries' sampling weights and aggregated by the population over the age of 18 in each country, with clustered standard errors in urban and rural areas within regions or departments, in order to mitigate potential selection bias due to the designs of the surveys.

Where Y_i represents a binary financial decision variable, COG_i is the binary variable of cognition or numerical abilities, DIL_i is the conscientiousness indicator, AF_i is an indicator of financial literacy (alternatively the binary variable or PRIDIT indicator), while X_i' is a vector of the control variables: sex, age, education, marital status, income category, unemployment, income stability, and nd country-specific dummies; and u_i is the stochastic residual that captures the omitted variables and follows a binomial distribution.

Roy's model assumes that cognitive and noncognitive characteristics, preferences, and financial literacy are mutually independent. Cunha et al., (2010) and Cunha and Heckman (2006) have specified more robust economic models in which the factors are nonlinear and inseparable. Although this type of modeling might be more accurate, the assumption of linearity in the parameters and separability considerably simplifies the analysis. However, for future research we hope to explore the supposed independence between cognitive and noncognitive characteristics.

Table 6 in Annex 2 reports the regression results of the linear probability model[6] for the possession of at least one formal savings instrument. The magnitude of R^2 is at levels higher than other works in related literature (Lusardi and Mitchell, 2014). Column 1 shows the regression without considering the control variables X_i'. In that case, financial literacy, measured as having had two of the three financial literacy questions correctly answered, the cognitive and conscientiousness variables are significant. Also, higher values of these variables imply a greater tendency to have at least one formal savings instrument. The same result is obtained if financial literacy is measured by the PRIDIT indicator (column 3). Nevertheless, the measures of financial literacy become nonsignificant when introducing control variables in both models.

As for the sociodemographic variables (columns 2 and 4), being an employed man with higher, stable income, a higher educational level, and residing in Bolivia, Colombia, or Ecuador related to Peru increases the probability of having at least one savings instrument, while being a woman or being unemployed reduces it. Column 5 includes all controls except the financial literacy variable.

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6   The same econometric exercise presented below was performed considering logit models and testing. The significance and effect of the variables do not change when using these models (Wooldridge, 2010).

The explanatory power of the model does not change, nor does the significance of the distinct variables.

It should be noted that temporary preferences and risk aversion are not significant in any of the regressions. In our introduction, we discuss the possible relation between cognitive and preference variables, going in the direction of causality from the first to the second. This possible relation could be a factor that eliminates or reduces the significance of preferences in our econometric exercise.

Table 7 in Annex 2 reports the results of the regression of the linear probabilistic model for the decision to have saved in some form, formal and/or informal, during the last twelve months. The results are similar to the previous regression with two important caveats. In the first place, the variable of financial literacy is not significant both with and without controls. Only in the case where this variable is measured by the PRIDIT indicator it is significant, but with the opposite sign expected. Second, sex is no longer significant, but age becomes significant at certain levels. In other words, the older the individual, the higher their likelihood of having saved in the last twelve months.

Table 8 in Annex 2 shows the regression for the decision to have saved using at least one formal instrument in the last twelve months. Again, conscientiousness and numerical skills are positively related to formal savings. As far as financial literacy is concerned, neither of the two measures used proved to be significant. In the first regression, sex again becomes significant–but not age–which is consistent with using a formal savings instrument.

Table 9 in Annex 2 shows the regression of the linear probabilistic model for the decision to save informally in the last twelve months. It is notable that in this financial decision case, being diligent is significant, while having superior numerical skills is not. As for financial literacy, it is only significant when measured with PRIDIT with the expected sign, both with controls and without them. Consistent with the literature, being female and having lower level of education is related to informal saving. However, it is striking that having a stable income is positively related to informal savings, and with a higher coefficient than that of formal savings. The explanation, according to our intuition, is that a stable income increases total savings, both formal and informal. In the case of Bolivia and Ecuador, participation in the informal sector is greater when compared with Peru.

From the empirical analysis of the four savings decisions, we can deduce the importance of cognitive abilities and personality traits when explaining the tendency to save, and the use of the formal sector to do so. These results are consistent with the studies that were discussed in our introduction, which emphasize the role of numerical skills and conscientiousness, and their subcharacteristics, in financial decision making. The same is true of sociodemographic variables, which play an important role when explaining savings decisions, and we see the expected results. For example, in line with the literature (Lusardi and Mitchell, 2008), in the case of sex, being a man seems to be relevant in explaining participation in the formal versus informal sector. Having a stable income plays a similar role.

Regarding financial literacy, results with respect to its significance are inconclusive. As we explain later, our intuition tells us this result could be due to the possible endogeneity of this variable in terms of saving decisions.

In relation to the decision to have a formal credit instrument (Table 10, Annex 2), we again observe that personality characteristics and cognitive abilities are significant, both with and without controls. In the case of financial literacy, we observe that–even including controls–this variable is significant. However, in the case of the PRIDIT indicator, financial literacy become nonsignificant when controls are included.

As for control variables, both tables show that having a higher and stable income, higher levels of education, and being a male increase the probability of using credit, while age is positive and significant regarding level, but negative and significant when squared, which is consistent with life-cycle and permanent income models.

From this analysis, we conclude that financial literacy plays a minor role, or no role at all, in whether an individual holds formal savings products or has saved during the previous twelve months. It does, however, have a significant effect on saving informally and borrowing through formal instruments. In line with the literature, what might be happening is that in the case of more complex decisions or those requiring more information–such as using credit or having stock holdings–the role of financial literacy could be greater, while in simpler decisions such as holding basic savings accounts or bonds, the role of financial literacy could be minor or nonexistent (Christelis et al., 2010, Van Rooij et al., 2011).

However, it is important not to ignore the fact that financial literacy's lack of significance may be due to the problem of endogeneity. This may be stronger in the case of savings than in the case of credit, in the degree to which the savings considered in the survey are short-term and credit instruments are medium- or long-term. In the case of savings, being short-term instruments, the process of financial learning may be behind the problem of endogeneity.

Alternatively, financial literacy's lack of significance may be due to the fact that it is strongly related to education and cognitive skills (Delavande et al., 2008, McArdle et al., 2009, Lusardi and Mitchell, 2014). If this is the case, education and cognition may be reflecting the effect of financial literacy, and introducing the latter might imply over-controlling the estimation (McArdle et al., 2009; Gerardi et al., 2013).

5. ECONOMETRIC ANALYSIS: INSTRUMENTAL VARIABLE ANALYSIS

As indicated at the end of the previous section, there is a possibility that there is an endogeneity problem between financial literacy indicators and those regarding financial decisions. This problem leads that the OLS linear probability estimators obtained could be incoherent and biased due to the presence of a non-zero correlation between financial literacy and the regression error term. In order to tackle the endogeneity issue head on, we followed an instrumented feasible generalized method of moments (GMM-IV), which is based on a two-step estimation (Baum et al., 2007).

In order to check the validity of the set of instruments considered, we rely on a set of statistical tests. First, to test whether the instruments are robust in the first stage, the following is used: the F-test of excluded instruments, the weak identification test of Kleibergen-Paap LM, and the F-test for Kleibergen-Paap weak instruments with Stock and Yogo (2005) critical values. Second, to verify that the instruments are independent of the error term in the second stage, the Hansen J overidentification test is used.

Regarding the composition of the vector of instruments for estimating financial literacy, there is extensive literature that considers several types of variables used as instruments for financial literacy (Lusardi and Mitchell, 2009; Van Rooij et al., 2011; Bucher-Koenen

and Lusardi, 2011; Klapper et al., 2012; Behrman et al., 2012). In most cases, the appropriate instruments can not be identified a priori. Therefore, we start from a set of possible candidates that could predict financial literacy, but that could not be related to the endogenous variables under study. Taking into account the literature that has addressed the problem of endogeneity with several instruments (Lusardi and Mitchell, 2014), we took *number of universities by region* as an instrument. With this instrument we tried to account for exposure to financial information or to peers/colleagues with higher financial knowledge (Klapper et al., 2012). Following the same line of thought, the following questions of the FCS, related to an individual's exposure to sophisticated financial information, were included as instruments: *1)* if the individual is aware of the concept of deposit insurance funds; *2)* if the individual has heard about mutual funds or investments in the stock markets; and *3)* if the individual has heard about any insurance products at all. In the countries under consideration, the majority of the population is simply not aware of these concepts. It may be that people are exposed to these concepts when looking for savings or other banking products, such as when financial entities seize the opportunity to offer investment funds or insurance products.

As an additional instrument, we consider the number of banking crises during the life of the person, based on Reinhart and Rogoff (2009). This instrument was chosen due to the fact that, in questions of financial literacy, unlike what is observed in developed countries, questions related to concepts of inflation and risk diversification are the ones that had the least number of incorrect responses or *I do not know* answers. This leads us to think that perhaps the experiences of financial crises in these countries may have provoked people to learn about these economic concepts. Additionally, it can be argued that crises lead to uncertainty, which affects economic activity and unemployment, and has direct effects on the dependent variables. Finally, a variable was included as an instrument that proved to be of little significance in explaining financial decisions: aversion to risk.

For the estimation we followed the GMM-IV approach, by taking the PRIDIT as a proxy indicator of financial literacy, because its continuous nature makes for easy handling and interpretation of the

results.[7] At the same time, we took into account the specific survey design of each country in the estimation.

The results of the first stage of the GMM-IV model are presented in Table 11 in Annex 2. Similar to the financial decision regressions in the previous section, many of the control variables included in equation 1, such as cognition, conscientiousness, schooling, and income stability, are significant. This is an indication of the financial literacy variable's endogeneity problem. Equally, the six candidate instruments included were individually significant and, together, they are good tools for predicting financial literacy. First, the F test statistic of excluded instruments is equal to 7.89 (value $p = 0.0000$). Secondly, the subidentification Kleibergen-Paap statistic χ^2 is equal to 50.53 (value $p = 0.0000$) thus rejecting the null hypothesis that the model is subidentified. Finally, the statistic F of the Kleinergen-Paap weak instrument contrast is equal to 8.80, indicating a relative maximum bias of between 10% and 20% regarding the IV (instrumental variable) calculation with respect to the OLS calculation, in accordance with the critical values tabulated by Stock and Yogo (2005).

The results of the second stage are presented in Table 12 (Annex 2). At this stage we verified that the instruments are independent of the error term using the Hansen J overidentification test. The results indicate that the instruments used are independent of the second stage error term for cases involving estimates of dependent variables V2 (savings in the last 12 months), V3 (only formal savings in the last 12 months), V4 (only informal savings in the last 12 months), and V5 (use of credit instruments), which together with the fulfillment of the condition of being sufficiently strong instruments, evaluated in the first stage, make them valid instruments for the GMM-IV model calculation.

The results of the GMM-IV estimates show that the coefficients of conscientiousness variables remain positive and significant for the calculation of the five dependent variables considered (V2-V5), whereas the coefficients of the cognition variable are positive and significant, except in cases of savings using formal or informal mechanisms (Table 12, Annex 2).

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7   In case of using the binary indicator of financial literacy, there is no clear consensus as to what is the appropriate methodology to solve the problem of endogeneity.

On the other hand, the financial literacy coefficient is significantly negative only for the regression of informal savings, and positive for the holding of formal credit instruments. These results can be interpreted respectively as: a) a higher level of financial literacy reduces the probability of using informal saving mechanisms, which helps to overcome barriers of financial self-exclusion (Roa, 2013); and b) a higher level of financial literacy increases the probability of using formal financial instruments, which is associated mainly with the medium- and long-term.

Another aspect worth highlighting about the results obtained in the second stage of the GMM-VI model is that the magnitudes of the financial literacy coefficients on decisions to save only informally and to have formal credit instruments, are higher in absolute value then the coefficients obtained through the respective linear probability models, which is consistent with the empirical evidence in which both methodologies have been used (Lusardi and Mitchell, 2014).

As for the other sociodemographic controls included in the calculation, the coefficients generally maintain the magnitudes resulting from the OLS linear probability model regressions, both in their significance and in their sign. Specifically, the sex differences are no longer significant for the probability of having a formal savings instrument, whereas, for this same dependent variable, squared age becomes negative and significant. On the other hand, stability of income is not significant to estimate the probability of saving in the last twelve months through formal mechanisms.

Finally, the same estimate exercise using IV variables at the country level was repeated (tables 13 and 14, Annex 2). [8] The results suggest that the instruments are weak for the cases of Colombia, Peru, and Ecuador, while for Bolivia they are adequate. For the last country, in line with the aggregate model, financial literacy matters for formal savings, informal savings, and using credit decisions.

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[8] It is important to note that the instruments *number of universities* and *cumulative banking crises* do not have sufficient variability at country level. In this sense, the instrumental analysis was carried out with the remaining instruments. The results of Peru, Colombia, and Ecuador are not reported since they do not pass the minimum model specification requirements. Those results may be requested from the authors.

6. CONCLUSIONS

The objective of this study has been to analyze the importance of cognitive characteristics, personality traits, and financial literacy in savings and credit decisions, through formal and/or informal mechanisms. The results of our empirical analysis show that the numerical skills and three traits associated with the conscientiousness variable–propensity to plan, perseverance, and scrupulosity–are relevant in explaining the tendency to save and participate in formal financial markets. The same occurs with stable income and higher levels of education. Consistent with the literature, being female and having a lower level of education is related to informal savings and credit. As might be expected from what is shown by life-cycle theories, using credit has a non-lineal relation with age.

It should be noted that, while a propensity to save through informal mechanisms positively depends on conscientiousness and income, it is not related to cognition. As has been shown in other surveys (Global Findex, Demirguc-Kunt et al., 2015), this result might be linked to the fact that in the surveyed countries, formal and informal savings mechanisms coexist harmoniously across all socioeconomic levels.

In relation to financial literacy, we used an instrumental variable (IV) analysis to tackle the possible endogeneity of this variable. The results using instrumenal variable (IV) analysis for the distinct savings decisions show that the financial literacy coefficient is only significant and negative for the informal savings regression, which suggests that a higher level of financial literacy lowers the probability of using informal, short-term savings mechanisms. For formal credit, financial literacy is significant with a positive coefficient, or, in other words, it increases the probability of having formal financial instruments, whose decision is associated mainly to the medium and long term. Consistent with the literature discussed in this work, for more complex products such as investment funds or medium- and long-term credit, financial literacy is relevant compared to simpler products such as a deposit or a bond.

Our results suggest that fostering numerical skills, especially in early years, could be key to acquiring healthy financial behavior. These skills become fixed between the ages of six and eight (Hopkins and Bracht, 1975; Schuerger and Witt, 1989).

Secondly, we can draw conclusions about the importance of conscientiousness in financial decisions. This result is of great relevance when designing education or financial-inclusion programs that seek to promote or establish healthy financial behaviors for different segments of the population, beyond sex or age. Specifically, the use of empirical methodologies to measure personality traits would serve to identify those individuals who due to their personality traits are more prone to fall behind with payments, avoid saving, or participate in the informal financial sector. In the future, we hope to explore not only the role of conscientiousness and its sub-characteristics in financial decision making, but also analyze the effect of the big five personality traits. In that sense, it would also be desirable to have a more complete survey instrument that would allow the development of stronger indicators for other variables, such as preferences or other cognitive characteristics dimensions.

Last but not least, our research shows the relevant role of financial literacy programs to encourage participation in the formal financial sector. It also underlines the importance of this variable in more complex financial decisions. We hope that these results enrich the understanding of the underlying processes and determinants of financial decision-making in developing economies.

ANNEX

Annex 1. Descriptive Statistics

<p align="center">Table 3</p>

PROFILES OF FINANCIAL DECISION VARIABLES BY COUNTRY
In percentages

	Peru	Bolivia	Colombia	Ecuador	Total
V1. One if has some type of savings instrument; zero ifhas no type of savings instrument					
0	72.3	58.0	60.9	32.8	59.1
1	27.7	42.0	39.1	67.2	40.9
V2. One is has saved in the last 12 months in some way; zero if has not saved/not asnwered					
0	48.8	29.3	41.5	43.8	42.6
1	51.2	70.8	58.5	56.3	57.4
V3. One if has saved in the last 12 months in an informal way; zero if has not saved or has used an informal savings method					
0	80.2	64.8	78.6	82.9	78.3
1	19.8	35.3	21.4	17.1	21.7
V4. One if has saved in the last 12 months in at least one informal way; zero if has not saved or has used an informal savings method					
0	68.6	70.4	62.9	92.8	64.3
1	31.4	29.6	37.1	7.2	35.7
V5. One if has some type of formal credit; zero if does not have credit or has informal credit					
0	77.5	71.4	73.2	92.8	76.8
1	22.5	28.6	26.8	7.2	23.2
Total	100	100	100	100	100

Note: The observations are weighted by the weights at the country level (in the cases of Bolivia and Ecuador they are not necessary), and for the total they are multiplied in turn by the proportion of the population older than 18 years of age in each country with respect to the same population for the four countries.

Table 4

CONSCIENTIOUSNESS AND FINANCIAL DECISIONS
Due conscientiousness characteristics scoring

	P(25)	P(50)	P(75)	Average	Difference (0) and (1)
V1. One if has some type of savings instrument; zero if has no type of savings instrument					
0	0.63	0.69	0.80	0.71	−0.06[c]
1	0.69	0.78	0.87	0.77	
V2. One if has saved in the last 12 in some way; zero if not saved/not answered					
0	0.60	0.69	0.80	0.70	−0.06[c]
1	0.68	0.76	0.86	0.76	
V3. One if has saved in the last 12 months in an informal way; zero if has not saved or has used an informal savings method					
0	0.63	0.70	0.81	0.72	−0.07[c]
1	0.70	0.81	0.88	0.79	
V4. One if has saved in the last 12 months in at least one informal way; zero if has not saved or has used an informal savings method					
0	0.63	0.72	0.83	0.73	−0.01[c]
1	0.66	0.75	0.84	0.74	
V5. One if has some type of formal credit; zero if does not have credit or has informal credit					
0	0.63	0.70	0.82	0.72	−0.06[c]
1	0.69	0.79	0.87	0.78	

Note: The observations are weighted by the weights at the country level (in the cases of Bolivia and Ecuador they are not necessary), and for the *total* they are multiplied in turn by the proportion of the population older than 18 years of each country with respect to the same population for the four countries. Average differences test. [a] $p<0.05$, [b] $p<0.01$, [c] $p<0.001$.

Table 5

AFFIRMATIVE FINANCIAL DECISIONS, FINANCIAL KNOWLEDGE AND SOCIODEMOGRAPHIC CHARACTERISTICS

Percentages

	V1. Holding savings (1)	*V2. Saved formally and/or informally (1)*	*V3. Saved formally (1)*	*V4. Saved informally (1)*	*V5. Possession of formal credit (1)*
A. Financial knowledge (2/3)					
No	33.8	53.2	18. 3	35.0	17.4
Yes	47.1	61. 1	24.7	36.4	28.2
B. Numerical abilities					
No	36.3	55.0	19.5	35.6	20.9
Yes	63.6	69.2	32.6	36.5	34.1
C. Risk preferences					
Risk loving or neutral	38.5	50.6	18.5	32.1	20.5
Risk averse	41.6	59.4	22.6	36.8	23.9
D. Time preferences					
Prefers the short term more	36.7	51.8	16.9	34.9	18.5
Prefers the long term more	42.5	59.6	23.5	36.1	24.9
E. Age groups					
18-29	44.3	66.8	24.0	42.8	20.5
30-39	47.0	58.9	22.6	36.3	28.1
40-49	38.8	57.7	22.8	35.0	23.8
50-59	36.6	48.5	20.9	27.7	24.5
60-69	31.9	45.0	14.1	30.9	20.8
>70	26.6	38.3	14.5	23.8	12.8
F. Sex					
Men	45.9	58.8	26.3	32.5	26.3
Women	36.3	56.1	17.4	38.7	20.2
G. Country					
Peru	35.0	54.2	24.5	29.8	27.8
Bolivia	42.0	70.8	35.3	35.5	28.6
Colombia	35.8	56.3	19.5	36.8	24.8
Ecuador	67.2	56.3	17.1	39.2	7.2

	V1	V2	V3	V4	V5.
H. Marital Status					
Married	45.3	57.1	24.5	32.6	27.0
Single	41.7	58.9	22.7	36.2	19.7
Separated/divorced	42.5	51.9	17.0	35.0	23.8
Domestic partnership	36.4	59.0	19.0	40.0	23.6
Widow/widower	25.2	46.3	13.2	33.0	14.6
No response	23.6	75.0	33.7	41.3	9.8
I. Work status					
I work for myself and have no employees	34.1	55.9	19.5	36.4	24.9
I own a business of my own and have a least one employee	62.0	76.7	38.6	38.1	39.2
I work full-time as an employee	65.9	65.9	32.8	33.1	34.1
I work part-time as an employee	49.0	67.6	29.5	38.1	22.5
I am a student	39.4	67.2	23.4	43.8	16.6
I dedicate my time to homemaking and the family	22.8	46.5	9.3	37.2	9.6
I am retired (receive a pension)	52.9	54.5	32.8	21.7	34.5
I am unemployed	25.5	42.3	7.8	34.5	12.4
I am not working because of disability, or prolonged illness	12.6	28.1	1.0	27.1	8.1
I live off of investments, interest and/or dividends (I am a person of independent means)	32.7	62.5	31.4	31.1	38.3
Other	30.5	46.7	14.5	32.2	16.2
No response	16.4	34.0	5.7	28.3	11.8

Table 5 (cont.)

	V1	V2	V3	V4	V5.
J. Stable income					
Yes	47.3	64.5	26.6	37.9	28.5
No	29.6	45.0	12.9	32.1	13.5
Do not know	28.9	42.9	12.8	30.0	16.3
No response	29.2	44.9	16.7	28.3	18.3
K.Education level					
Secondary education not completed or less	23.6	46.0	11.5	34.5	13.7
Completed secondary education	39.7	57.2	18.4	38.8	22.3
Technical education not completed	37.5	66.5	21.2	45.2	25.3
Technical education	60.1	69.4	33.6	35.8	34.3
University education not completed	64.3	72.9	34.5	38.4	29.2
University-level education	72.7	73.9	46.9	26.9	43.7
Post graduate	94.7	90.8	71.9	18.9	65.8
L. Income stratum					
Vulnerable class, moderate poverty and extreme poverty (up to 400 USD monthly)	30.9	50.9	15.1	35.8	15.8
Middle class (between 401 USD and 1,600 USD)	58.5	70.8	32.1	38.7	32.7
High income (1,600 USD and above)	67.0	78.0	49.5	28.5	52.3

Note: Understood as affirmative financial decisions for the first group of people (1) composed of the variables (V1-V5) who decided to save, save using a formal instrument, save using an informal instrument or obtain formal credit. The observations are weighted by the weights at the country level (in the cases of Bolivia and Ecuador they are not necessary), and for the total they are multiplied in turn by the proportion of the population older than 18 years of age in each country with respect to the same population for the four countries.

Annex 2. Regressions

Table 6

OLS REGRESSIONS: POSSESSION OF FORMAL SAVINGS INSTRUMENTS (V1)

	1	2	3	4	5
Financial knowledge (2/3)	0.0474[c] (0.0175)	−0.0135 (0.0171)			
Conscientiousness index	0.814[c] (0.0658)	0.497[c] (0.0705)	0.806[c] (0.0662)	0.490[c] (0.0706)	0.493[c] (0.0702)
Numerical abilities	0.232[c] (0.0217)	0.119[c] (0.0220)	0.246[c] (0.0205)	0.113[c] (0.0212)	0.114[c] (0.0212)
Women		−0.0450[c] (0.0161)		−0.0440[c] (0.0161)	−0.0444[c] (0.0161)
Stable income		0.0512[c] (0.0175)		0.0505[c] (0.0175)	0.0511[c] (0.0174)
Age		−0.0000771 (0.00307)		−0.000391 (0.00307)	−0.000253 (0.00307)
Age^2		−0.00000715 (0.0000331)		−0.00000388 (0.0000331)	−0.00000531 (0.0000332)
Completed secondary education		0.0932[c] (0.0210)		0.0912[c] (0.0210)	0.0922[c] (0.0210)
Technical education not completed		0.0986[a] (0.0528)		0.0980[a] (0.0529)	0.0982[a] (0.0529)
Technical education		0.288[c] (0.0333)		0.285[c] (0.0334)	0.287[c] (0.0333)
University education not completed		0.217[c] (0.0339)		0.214[c] (0.0339)	0.215[c] (0.0338)
University-level education		0.325[c] (0.0324)		0.322[c] (0.0326)	0.324[c] (0.0325)
Post graduate		0.492[c] (0.0427)		0.486[c] (0.0420)	0.488[c] (0.0420)

	1	2	3	4	5
Married		0.0225		0.0224	0.0225
		(0.0199)		(0.0199)	(0.0199)
Single		−0.00242		−0.00162	−0.00209
		(0.0223)		(0.0223)	(0.0223)
Separated/ divorced		0.0252		0.0255	0.0252
		(0.0364)		(0.0363)	(0.0364)
Unemployed		−0.0674[b]		−0.0686[b]	−0.0679[b]
		(0.0342)		(0.0342)	(0.0342)
Middle class (between 401 USD and 1,600 USD)		0.125[c]		0.124[c]	0.125[c]
		(0.0198)		(0.0198)	(0.0198)
High income (1,600 USD and above)		0.139[b]		0.137[b]	0.138[b]
		(0.0583)		(0.0584)	(0.0584)
Bolivia		0.0790[c]		0.0782[c]	0.0784[c]
		(0.0196)		(0.0196)	(0.0196)
Colombia		0.0443[b]		0.0415[b]	0.0434[b]
		(0.0190)		(0.0191)	(0.0190)
Ecuador		0.343[c]		0.341[c]	0.342[c]
		(0.0189)		(0.0189)	(0.0188)
PRIDIT			0.0220[c]	0.00476	
			(0.00648)	(0.00641)	
Constant	−0.254[c]	−0.161[a]	−0.227[c]	−0.154[a]	−0.161[a]
	(0.0467)	(0.0850)	(0.0477)	(0.0857)	(0.0851)
Observations	4,871	4,411	4,871	4,411	4,411
R²	0.0899	0.238	0.0906	0.238	0.238
Controls	No	Yes	No	Yes	Yes

Note: PRIDIT is a financial literacy index calculated in two stages (see Table 15, Annex 3). Squared minimums weighted by country-wide sample weights (in the case of Bolivia and Ecuador they are not necessary), and by the proportion of the population over 18 years of age in each country with respect to the same population for the four countries and standard errors adjusted for 131 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$.

Table 7

OLS REGRESSIONS: 12-MONTH SAVINGS – FORMAL/INFORMAL (V2)

	1	2	3	4	5
Financial knowledge (2/3)	0.0190 (0.0182)	−0.00979 (0.0185)			
Conscientious-ness index	0.907[c] (0.0652)	0.637[c] (0.0726)	0.924[c] (0.0656)	0.645[c] (0.0726)	0.634[c] (0.0724)
Numerical abilities	0.111[c] (0.0210)	0.0542[b] (0.0215)	0.121[c] (0.0196)	0.0541[c] (0.0204)	0.0505[b] (0.0203)
Women		−0.00213 (0.0174)		−0.00322 (0.0174)	−0.00169 (0.0174)
Stable income		0.0915[c] (0.0194)		0.0935[c] (0.0194)	0.0914[c] (0.0194)
Age		−0.00690[b] (0.00329)		−0.00651[b] (0.00329)	−0.00703[b] (0.00329)
Age^2		0.0000254 (0.0000358)		0.0000214 (0.0000358)	0.0000268 (0.0000358)
Completed secondary education		0.0292 (0.0228)		0.0322 (0.0228)	0.0284 (0.0228)
Technical education not completed		0.0951[a] (0.0528)		0.0959[a] (0.0525)	0.0949[a] (0.0528)
Technical education		0.0863[c] (0.0330)		0.0899[c] (0.0329)	0.0852[c] (0.0329)
University education not completed		0.0670[b] (0.0318)		0.0723[b] (0.0317)	0.0657[b] (0.0316)
University-level education		0.0906[c] (0.0324)		0.0969[c] (0.0324)	0.0893[c] (0.0325)
Post graduate		0.185[c] (0.0637)		0.190[c] (0.0638)	0.182[c] (0.0636)

	1	2	3	4	5
Married		−0.0254		−0.0250	−0.0254
		(0.0224)		(0.0224)	(0.0224)
Single		−0.0536[b]		−0.0551[b]	−0.0534[b]
		(0.0235)		(0.0235)	(0.0235)
Separated/ divorced		−0.0286		−0.0295	−0.0286
		(0.0400)		(0.0400)	(0.0400)
Unemployed		−0.0955[b]		−0.0934[b]	−0.0958[b]
		(0.0414)		(0.0415)	(0.0414)
Middle class (between 401 USD and 1,600 USD)		0.106[c]		0.107[c]	0.106[c]
		(0.0198)		(0.0198)	(0.0198)
High income (1,600 USD and above)		0.149[c]		0.153[c]	0.149[c]
		(0.0518)		(0.0517)	(0.0515)
Bolivia		0.121[c]		0.122[c]	0.121[c]
		(0.0200)		(0.0201)	(0.0200)
Colombia		−0.00222		0.00439	−0.00281
		(0.0205)		(0.0205)	(0.0204)
Ecuador		−0.0104		−0.00719	−0.0112
		(0.0200)		(0.0200)	(0.0200)
PRIDIT			−0.00601	−0.0179[c]	
			(0.00694)	(0.00692)	
Constant	−0.122[b]	0.232[b]	−0.126[c]	0.208[b]	0.232[b]
	(0.0480)	(0.0908)	(0.0489)	(0.0913)	(0.0908)
Observations	4,871	4,411	4,871	4,411	4,411
R^2	0.0648	0.132	0.0647	0.133	0.132
Controls	No	Yes	No	Yes	Yes

Note: PRIDIT is a financial literacy index calculated in two stages (see Table 15, Annex 3). Squared minimums weighted by country-wide sample weights (in the case of Bolivia and Ecuador they are not necessary), and by the proportion of the population over 18 years of age in each country with respect to the same population for the four countries and standard errors adjusted for 131 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$.

Table 8

	1	2	3	4	5
OLS REGRESSIONS: FORMAL SAVINGS 12 MONTHS (V3)					
Financial knowledge (2/3)	0.0122 (0.0144)	−0.0189 (0.0146)			
Conscientiousness index	0.722[c] (0.0563)	0.480[c] (0.0589)	0.718[c] (0.0563)	0.476[c] (0.0589)	0.474[c] (0.0587)
Numerical abilities	0.109[c] (0.0199)	0.0412[b] (0.0204)	0.112[c] (0.0189)	0.0346[a] (0.0197)	0.0342[a] (0.0197)
Women		−0.0594[c] (0.0138)		−0.0588[c] (0.0138)	−0.0586[c] (0.0138)
Stable income		0.0281[b] (0.0142)		0.0282[b] (0.0141)	0.0279[b] (0.0141)
Age		−0.00219 (0.00266)		−0.00236 (0.00268)	−0.00243 (0.00268)
Age^2		0.0000178 (0.0000285)		0.0000197 (0.0000287)	0.0000204 (0.0000287)
Completed secondary education		0.0281[a] (0.0167)		0.0271 (0.0167)	0.0266 (0.0167)
Technical education not completed		0.0232 (0.0400)		0.0228 (0.0402)	0.0227 (0.0401)
Technical education		0.150[c] (0.0292)		0.149[c] (0.0293)	0.148[c] (0.0292)
University education not completed		0.126[c] (0.0317)		0.125[c] (0.0317)	0.124[c] (0.0316)
University-level education		0.227[c] (0.0335)		0.225[c] (0.0335)	0.224[c] (0.0335)
Post graduate		0.415[c] (0.0900)		0.411[c] (0.0901)	0.410[c] (0.0903)

	1	2	3	4	5
Married		0.0233		0.0234	0.0234
		(0.0175)		(0.0175)	(0.0175)
Single		0.00331		0.00355	0.00377
		(0.0191)		(0.0191)	(0.0191)
Separated/ divorced		−0.0102		−0.0103	−0.0102
		(0.0289)		(0.0290)	(0.0290)
Unemployed		−0.0806[c]		−0.0810[c]	−0.0813[c]
		(0.0237)		(0.0238)	(0.0238)
Middle class (between 401 USD and 1,600 USD)		0.0773[c]		0.0767[c]	0.0766[c]
		(0.0170)		(0.0170)	(0.0170)
High income (1,600 USD and above)		0.193[c]		0.193[c]	0.192[c]
		(0.0543)		(0.0545)	(0.0545)
Bolivia		0.0868[c]		0.0861[c]	0.0860[c]
		(0.0188)		(0.0188)	(0.0188)
Colombia		−0.0545[c]		−0.0548[c]	−0.0557[c]
		(0.0171)		(0.0172)	(0.0171)
Ecuador		−0.0827[c]		−0.0838[c]	−0.0843[c]
		(0.0170)		(0.0170)	(0.0169)
PRIDIT			0.00733	−0.00228	
			(0.00522)	(0.00536)	
Constant	−0.339[c]	−0.0623	−0.331[c]	−0.0643	−0.0611
	(0.0387)	(0.0727)	(0.0393)	(0.0732)	(0.0727)
Observations	4,871	4,411	4,871	4,411	4,411
R²	0.0626	0.152	0.0628	0.151	0.151
Controls	No	Yes	No	Yes	Yes

Note: PRIDIT is a financial literacy index calculated in two stages (see Table 15, Annex 3). Squared minimums weighted by country-wide sample weights (in the case of Bolivia and Ecuador they are not necessary), and by the proportion of the population over 18 years of age in each country with respect to the same population for the four countries and standard errors adjusted for 131 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$.

Table 9

OLS REGRESSIONS: INFORMAL SAVINGS 12 MONTHS (V4))

	1	2	3	4	5
Financial knowledge (2/3)	0.00688 (0.0180)	0.00911 (0.0189)			
Conscientious-ness index	0.185[c] (0.0666)	0.157[b] (0.0744)	0.206[c] (0.0670)	0.170[b] (0.0743)	0.160[b] (0.0740)
Numerical abilities	0.00208 (0.0221)	0.0129 (0.0233)	0.00920 (0.0208)	0.0195 (0.0223)	0.0163 (0.0222)
Women		0.0573[c] (0.0178)		0.0556[c] (0.0178)	0.0569[c] (0.0178)
Stable income		0.0634[c] (0.0194)		0.0654[c] (0.0194)	0.0635[c] (0.0194)
Age		−0.00472 (0.00329)		−0.00415 (0.00329)	−0.00460 (0.00329)
Age^2		0.00000759 (0.0000351)		0.00000166 (0.0000351)	0.00000635 (0.0000351)
Completed secondary education		0.00114 (0.0230)		0.00508 (0.0230)	0.00183 (0.0229)
Technical education not completed		0.0720 (0.0534)		0.0731 (0.0532)	0.0722 (0.0535)
Technical education		−0.0642[a] (0.0345)		−0.0592[a] (0.0345)	−0.0632[a] (0.0344)
University education not completed		−0.0595[a] (0.0355)		−0.0526 (0.0357)	−0.0583 (0.0355)
University-level education		−0.136[c] (0.0335)		−0.128[c] (0.0335)	−0.135[c] (0.0333)
Post graduate		−0.230[c] (0.0761)		−0.222[c] (0.0770)	−0.228[c] (0.0761)

	1	2	3	4	5
Married		−0.0487[b]		−0.0484[b]	−0.0488[b]
		(0.0227)		(0.0227)	(0.0227)
Single		−0.0569[b]		−0.0587[b]	−0.0571[b]
		(0.0246)		(0.0246)	(0.0246)
Separated/ divorced		−0.0184		−0.0193	−0.0184
		(0.0398)		(0.0397)	(0.0398)
Unemployed		−0.0149		−0.0124	−0.0145
		(0.0413)		(0.0414)	(0.0413)
Middle class (between 401 USD and 1,600 USD)		0.0291		0.0302	0.0295
		(0.0208)		(0.0208)	(0.0208)
High income (1,600 USD and above)		−0.0436		−0.0394	−0.0432
		(0.0591)		(0.0596)	(0.0594)
Bolivia		0.0345[a]		0.0356[a]	0.0349[a]
		(0.0210)		(0.0209)	(0.0209)
Colombia		0.0523[b]		0.0592[c]	0.0529[b]
		(0.0208)		(0.0210)	(0.0208)
Ecuador		0.0723[c]		0.0766[c]	0.0731[c]
		(0.0204)		(0.0204)	(0.0203)
PRIDIT			−0.0133[a]	−0.0156[b]	
			(0.00695)	(0.00728)	
Constant	0.217[c]	0.294[c]	0.205[c]	0.272[c]	0.293[c]
	(0.0483)	(0.0936)	(0.0492)	(0.0941)	(0.0935)
Observations	4,871	4,411	4,871	4,411	4,411
R²	0.00248	0.0387	0.00348	0.0400	0.0386
Controls	No	Yes	No	Yes	Yes

Note: PRIDIT is a financial literacy index calculated in two stages (see Table 15, Annex 3). Squared minimums weighted by country-wide sample weights (in the case of Bolivia and Ecuador they are not necessary), and by the proportion of the population over 18 years of age in each country with respect to the same population for the four countries and standard errors adjusted for 131 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$.

Table 10

OLS REGRESSIONS: POSSESSION OF FORMAL CREDIT (V5)

	1	2	3	4	5
Financial knowledge (2/3)	0.0651^c (0.0156)	0.0465^c (0.0158)			
Conscientious-ness index	0.597^c (0.0586)	0.318^c (0.0643)	0.601^c (0.0590)	0.327^c (0.0644)	0.331^c (0.0639)
Numerical abilities	0.0869^c (0.0218)	0.0327 (0.0219)	0.109^c (0.0203)	0.0487^b (0.0209)	0.0501^b (0.0209)
Women		−0.0367^b (0.0149)		−0.0382^b (0.0149)	−0.0388^c (0.0149)
Stable income		0.0611^c (0.0154)		0.0608^c (0.0154)	0.0616^c (0.0154)
Age		0.00748^c (0.00264)		0.00788^c (0.00265)	0.00809^c (0.00265)
Age^2		−0.0000837^c (0.0000277)		−0.0000879^c (0.0000279)	−0.0000900^c (0.0000279)
Completed secondary education		0.0482^b (0.0194)		0.0502^c (0.0195)	0.0517^c (0.0195)
Technical education not completed		0.0434 (0.0428)		0.0444 (0.0429)	0.0447 (0.0429)
Technical education		0.0886^c (0.0315)		0.0917^c (0.0316)	0.0935^c (0.0315)
University education not completed		0.0798^b (0.0313)		0.0832^c (0.0313)	0.0858^c (0.0312)
University-level education		0.145^c (0.0324)		0.148^c (0.0327)	0.151^c (0.0326)
Post graduate		0.311^c (0.0897)		0.319^c (0.0892)	0.322^c (0.0892)

	1	2	3	4	5
Married		0.0235		0.0230	0.0231
		(0.0191)		(0.0192)	(0.0192)
Single		−0.0311		−0.0316	−0.0323
		(0.0206)		(0.0207)	(0.0207)
Separated/ divorced		0.0303		0.0307	0.0303
		(0.0329)		(0.0329)	(0.0330)
Unemployed		−0.0427		−0.0419	−0.0409
		(0.0310)		(0.0308)	(0.0308)
Middle class (between 401 USD and 1,600 USD)		0.0857[c]		0.0872[c]	0.0875[c]
		(0.0181)		(0.0181)	(0.0181)
High income (1,600 USD and above)		0.229[c]		0.230[c]	0.232[c]
		(0.0599)		(0.0604)	(0.0604)
Bolivia		0.00330		0.00508	0.00540
		(0.0187)		(0.0187)	(0.0188)
Colombia		−0.0276		−0.0277	−0.0248
		(0.0180)		(0.0182)	(0.0180)
Ecuador		−0.209[c]		−0.206[c]	−0.205[c]
		(0.0154)		(0.0155)	(0.0154)
PRIDIT			0.0196[c]	0.00711	
			(0.00580)	(0.00594)	
Constant	−0.258[c]	−0.198[b]	−0.231[c]	−0.191[b]	−0.201[b]
	(0.0404)	(0.0790)	(0.0416)	(0.0798)	(0.0791)
Observations	4,871	4,411	4,871	4,411	4,411
R²	0.0528	0.136	0.0505	0.134	0.133
Controls	No	Yes	No	Yes	Yes

Note: PRIDIT is a financial literacy index calculated in two stages (see Table 17, Annex 17). Squared minimums weighted by country-wide sample weights (in the case of Bolivia and Ecuador they are not necessary), and by the proportion of the population over 18 years of age in each country with respect to the same population for the four countries and standard errors adjusted for 131 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$.

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Table 11

PRIDIT–IV FIRST STAGE RESULTS

	1
Conscientiousness index	0.561[b]
	(0.249)
Numerical abilities	0.233[c]
	(0.0634)
Women	−0.0546
	(0.0433)
Stable income	0.112[b]
	(0.0533)
Age	0.0420[c]
	(0.00938)
Age^2	−0.000405[c]
	(0.0000947)
Completed secondary education	0.181[c]
	(0.0501)
Technical education not completed	0.0942
	(0.164)
Technical education	0.245[c]
	(0.0758)
University education not completed	0.333[c]
	(0.0906)
University-level education	0.393[c]
	(0.0827)
Post graduate	0.347[b]
	(0.165)
Married	0.0251
	(0.0649)
Single	−0.123[b]
	(0.0540)
Separated/divorced	−0.0480
	(0.109)
Middle class (between 401 USD and 1,600 USD)	0.0260
	(0.0411)
High income (1,600 USD and above)	0.244[c]
	(0.0804)
Unemployed	0.157
	(0.101)

Bolivia	0.315[b]
	(0.127)
Colombia	0.605[c]
	(0.121)
Ecuador	0.415[c]
	(0.122)
Instruments:	
Number of universities	−0.00149[a]
	(0.000887)
Accumulated banking crises	−0.274[c]
	(0.0629)
Knowledge: deposit insurance	0.129[b]
	(0.0548)
Risk preferences	0.118[b]
	(0.0524)
Knowledge: investment funds and/or stock market	0.0642
	(0.0579)
Knowledge: insurance	0.115[a]
	(0.0681)
Constant	−1.433[c]
	(0.290)
Observations	4,709
F test of excluded instruments (6,130)	9.11
Value *p* (*F* instruments)	0.0000
Kleibergen-Paap rk LM (χ^2) sub-identification test	32.10
Value *p* (Kleibergen-Paap rk LM)	0.0000
Kleibergen-PaapWald (*F*) weak instruments test	9.11
Critical values Stock-Yogo (2005)	
10% maximum relative bias of IV	11.12
20% maximum relative bias of IV	6.76

Note: PRIDIT is a financial literacy index calculated in two stages (see Table 15, Annex 3). GMM calculation in two stages (Baum et al., 2007) and standard errors adjusted for 131 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$. The *F*-instruments test has a null hypothesis that the set of instruments is not significant for the calculation of financial literacy. The null hypothesis after the Kleibergen-Paap rk LM subidentification test is that the reduced-form matrix is under identified (vs. the alternative hypothesis that it is exactly identified). Meanwhile, the Kleibergen-Paap weak instruments *F* statistic reveals the relative maximum bias of the variable instrument calculators with respect to the OLS calculations, when compared to the critical values tabulated by Stock and Yogo (2005).

Table 12

SECOND STAGE PRIDIT-IV CALCULATION RESULTS

	V1	V2	V3	V4	V5
PRIDIT	0.101[a]	0.0215	0.0846[a]	−0.0884[a]	0.109[c]
	(0.0569)	(0.0594)	(0.0464)	(0.0487)	(0.0395)
Conscientious-ness index	0.478[c]	0.612[c]	0.477[c]	0.245[c]	0.284[c]
	(0.0854)	(0.0730)	(0.0678)	(0.0711)	(0.0563)
Numerical abilities	0.0913[c]	0.0519[b]	0.00220	0.0559[b]	0.0384[a]
	(0.0266)	(0.0216)	(0.0238)	(0.0252)	(0.0197)
Sex	−0.0256	0.00310	−0.0476[c]	0.0547[c]	−0.0329[c]
	(0.0209)	(0.0159)	(0.0180)	(0.0168)	(0.0110)
Stable income	0.0496[b]	0.0848[c]	0.0157	0.0680[c]	0.0328[b]
	(0.0198)	(0.0159)	(0.0137)	(0.0168)	(0.0143)
Age	0.00551[a]	−0.00831[c]	−0.00246	−0.00346	0.00785[c]
	(0.00311)	(0.00282)	(0.00235)	(0.00250)	(0.00201)
Age^2	−0.0000617[a]	0.0000399	0.0000201	−0.00000421	−0.000084[c]
	(0.0000339)	(0.0000302)	(0.0000257)	(0.0000258)	(0.0000215)
Completed secondary education	0.0853[c]	0.00831	0.0235	−0.00912	0.0333[b]
	(0.0183)	(0.0287)	(0.0159)	(0.0234)	(0.0153)
Technical education not completed	0.0961[b]	0.135[c]	0.0646[a]	0.0486	0.0630[a]
	(0.0404)	(0.0451)	(0.0380)	(0.0390)	(0.0377)
Technical education	0.242[c]	0.0895[c]	0.117[c]	−0.0456	0.0857[c]
	(0.0314)	(0.0326)	(0.0328)	(0.0418)	(0.0268)
University education not completed	0.190[c]	0.0633	0.113[c]	−0.0138	0.0501[b]
	(0.0393)	(0.0387)	(0.0398)	(0.0355)	(0.0252)
University-level education	0.253[c]	0.0888[b]	0.191[c]	−0.112[c]	0.137[c]
	(0.0457)	(0.0367)	(0.0402)	(0.0398)	(0.0341)
Post graduate	0.431[c]	0.178[c]	0.376[c]	−0.167[b]	0.258[c]
	(0.0480)	(0.0657)	(0.0944)	(0.0654)	(0.0621)

	V1	*V2*	*V3*	*V4*	*V5*
Married	0.0279[b]	−0.0164	0.0165	−0.0478[b]	0.0233
	(0.0136)	(0.0237)	(0.0200)	(0.0229)	(0.0146)
Single	0.0189	−0.0552[b]	0.00819	−0.0555[c]	−0.0210[b]
	(0.0194)	(0.0274)	(0.0206)	(0.0201)	(0.0106)
Separated/ divorced	0.0235	−0.0297	0.00300	−0.00892	0.0131
	(0.0259)	(0.0306)	(0.0281)	(0.0306)	(0.0244)
Middle class (between 401 USD and 1,600 USD)	0.141[c]	0.102[c]	0.0617[c]	0.0213	0.0438[c]
	(0.0220)	(0.0186)	(0.0177)	(0.0171)	(0.0131)
High income (1,600 USD and above)	0.100[b]	0.140[b]	0.161[c]	−0.0443	0.141[c]
	(0.0430)	(0.0631)	(0.0495)	(0.0356)	(0.0386)
Unemployed	−0.115[c]	−0.0922[c]	−0.0648[c]	0.00701	−0.0821[c]
	(0.0298)	(0.0265)	(0.0213)	(0.0353)	(0.0270)
Bolivia	0.0649[b]	0.138[c]	0.0862[c]	0.0440	−0.0165
	(0.0265)	(0.0360)	(0.0244)	(0.0300)	(0.0232)
Colombia	−0.0431	0.00650	−0.106[c]	0.0876[c]	−0.0961[c]
	(0.0359)	(0.0452)	(0.0283)	(0.0339)	(0.0247)
Ecuador	0.306[c]	0.00844	−0.108[c]	0.100[c]	−0.235[c]
	(0.0337)	(0.0442)	(0.0330)	(0.0332)	(0.0229)
Constant	−0.254[b]	0.255[b]	−0.0362	0.168[a]	−0.102
	(0.108)	(0.110)	(0.0952)	(0.0990)	(0.0830)
Observations	4,709	4,709	4,709	4,709	4,709
Hansen-*j*	18.54	4.172	5.122	6.249	6.520
Hansen-*p*	0.00234	0.525	0.401	0.283	0.259
PRIDIT endogeneity test	0.219	0.594	0.1150	0.2078	0.0418

Note: PRIDIT is a financial literacy index calculated in two stages (see Table 15, Annex 3). GMM calculation in two stages (Baum et al., 2007) and standard errors adjusted for 131 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$. Hansen-*j* and Hansen-*p* represent the statistic and value *p* of the Hansen test, respectively. The Hansen test is a proof of over-identification of instruments under the null hypothesis that the instrument cluster is valid, which is to say they are not correlated with the error and therefore the orthogonality conditions are satisfied. The endogeneity test shows the value p according to the hypothesis that PRIDIT can be treated as exogenous (Baum et al, 2007).

Table 13

PRIDIT–IV FIRST-STAGE RESULTS, BOLIVIA

	1
Conscientiousness index	2.007[c]
	(0.419)
Numerical abilities	0.181[c]
	(0.0695)
Women	−0.0379
	(0.0534)
Stable income	0.325[c]
	(0.0810)
Age	−0.00201
	(0.0109)
Age^2	0.00000547
	(0.000123)
Completed secondary education	0.227
	(0.151)
Technical education not completed	0.327[a]
	(0.197)
Technical education	0.454[c]
	(0.152)
University education not completed	0.277[a]
	(0.152)
University-level education	0.294[a]
	(0.158)
Post graduate	0.426
	(0.287)
Married	−0.174
	(0.140)
Single	−0.104
	(0.0724)
Separated/divorced	−0.162
	(0.184)

	1
Unemployed	−0.683[a]
	(0.390)
Middle class (between 401 USD and 1,600 USD)	0.0693
	(0.0836)
High income (1,600 USD and above)	−0.0308
	(0.155)
Instruments	
Knowledge: investment funds and/or stock market	0.183[c]
	(0.0550)
Knowledge: deposit insurance	0.456[c]
	(0.157)
Constant	−2.212[c]
	(0.565)
Observations	1,166
F test of excluded instruments (2.20)	10.84
Value *p* (*F* instruments)	0.0006
Kleibergen-Paap sub-identification test rk LM (χ^2)	10.93
Value *p* (Kleibergen-Paap rk LM)	0.0042
Kleibergen-PaapWald (*F*) weak instruments test	10.84
Critical values Stock-Yogo (2005)	
10% maximum relative bias of IV	19.93
20% maximum relative bias of IV	8.75

Note: GMM calculation in two stages (Baum et al., 2007) and standard errors adjusted for 21 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$. The *F*-instruments test has a null hypothesis that the set of instruments is not significant for the calculation of financial literacy. The null hypothesis after the Kleibergen-Paap rk LM sub-identification test is that the reduced-form matrix is under identified (vs. the alternative hypothesis that it is exactly identified). Meanwhile, the Kleibergen-Paap weak instruments *F* statistic reveals the relative maximum bias of the variable instrument calculators with respect to the OLS calculations, when compared to the critical values tabulated by Stock and Yogo (2005).

Table 14

PRIDIT–IV SECOND-STAGE RESULTS, BOLIVIA

	V1	V2	V3	V4	V5
PRIDIT	0.128	−0.0147	0.179[b]	−0.191[b]	0.202[c]
	(0.0850)	(0.0438)	(0.0823)	(0.0899)	(0.0770)
Conscientious-ness index	0.244	0.702	0.319[a]	0.301	−0.197
	(0.244)	(.)	(0.185)	(0.201)	(0.238)
Numerical abilities	0.108[b]	0.0534[b]	0.0827[c]	−0.0301	−0.00623
	(0.0446)	(0.0235)	(0.0316)	(0.0297)	(0.0384)
Sex	−0.0297	−0.0143	−0.0177	0.00729	0.0331
	(0.0225)	(0.0298)	(0.0356)	(0.0209)	(0.0221)
Stable income	0.0325	0.0643[a]	−0.00837	0.0589	−0.0130
	(0.0332)	(0.0378)	(0.0381)	(0.0458)	(0.0301)
Age	−0.000704	−0.00237	−0.00404	−0.00625	0.0110[c]
	(0.00386)	(0.00659)	(0.00371)	(0.00779)	(0.00381)
Age^2	0.0000143	−0.0000152	0.0000421	0.0000302	−0.000147[c]
	(0.0000388)	(0.0000732)	(0.0000392)	(0.0000827)	(0.0000411)
Completed secondary education	0.0442	0.0750	−0.0111	0.0874	−0.0931[c]
	(0.0362)	(0.0494)	(0.0275)	(0.0604)	(0.0277)
Technical education not completed	0.273[c]	0.140[b]	0.0741	0.0406	−0.0467
	(0.0791)	(0.0618)	(0.0732)	(0.0610)	(0.0890)
Technical education	0.211[b]	0.156[c]	0.236[c]	−0.0755	0.0288
	(0.0841)	(0.0327)	(0.0724)	(0.0714)	(0.0559)
University education not completed	0.187[c]	0.115[c]	0.135[b]	−0.0212	−0.00926
	(0.0591)	(0.0252)	(0.0607)	(0.0694)	(0.0502)
University-level education	0.276[c]	0.0828[b]	0.226[c]	−0.127[a]	0.0937
	(0.0802)	(0.0332)	(0.0668)	(0.0676)	(0.0720)
Post graduate	0.388[c]	0.225[c]	0.282[c]	−0.00363	0.216
	(0.139)	(0.0558)	(0.0974)	(0.141)	(0.158)

	V1	V2	V3	V4	V5
Married	0.0443	0.00199	0.0449	−0.0533[a]	0.0444
	(0.0414)	(0.0337)	(0.0341)	(0.0290)	(0.0315)
Single	−0.0216	−0.0226	−0.0224	−0.0247	−0.0418
	(0.0366)	(0.0229)	(0.0381)	(0.0354)	(0.0281)
Separated/ divorced	−0.0296	−0.124[a]	−0.00232	−0.0706	0.107
	(0.0476)	(0.0660)	(0.0694)	(0.0609)	(0.0680)
Unemployed	−0.0526	−0.381[c]	−0.315[c]	−0.0293	−0.0268
	(0.104)	(0.0771)	(0.0652)	(0.127)	(0.0797)
Middle class (between 401 USD and 1,600 USD)	0.0202	0.0119	0.0288	−0.00128	0.0458
	(0.0338)	(0.0197)	(0.0274)	(0.0375)	(0.0440)
High income (1,600 USD and above)	0.119	0.0795	0.186	−0.155	0.301[a]
	(0.118)	(0.0596)	(0.119)	(0.104)	(0.156)
Constant	0.143	0.220[b]	0.152	0.290[a]	0.224
	(0.248)	(0.105)	(0.152)	(0.168)	(0.206)
Observations	1,166	1,166	1,166	1,166	1,166
Hansen-*j*	0.374	0.000	2.415	2.455	0.501
Hansen-*p*	0.541	0.998	0.120	0.117	0.479

Note: GMM calculation in two stages (Baum et al., 2007) and standard errors adjusted for 21 clusters (urban and rural by governing department). [a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$. Hansen-*j* and Hansen-*p* represent the statistic and value *p* of the Hansen test, respectively. The Hansen test is a proof of over-identification of instruments under the null hypothesis that the instrument cluster is valid, which is to say they are not correlated with the error and therefore the orthogonality conditions are satisfied.

Annex 3. Financial Literacy PRIDIT

FINANCIAL LITERACY QUESTIONS AND WEIGHTING FOR BUILDING PRIDIT

Question	Percentage correct (%)	PRIDIT weighting
Q1: Now imagine that the brothers have to wait a year to get their share of the X pesos and inflation remains at 2% per year. After a year, will they be able to buy...? [four options; I do not know; No response; Irrelevant response.]	43.8%	0.382
Q2: Imagine that you lent X pesos to a friend one night and he returned these X pesos to you the next day. Did your friend pay any interest on this loan? [Note.]	87.7%	0.372
Q3: Let's assume you have $100 in a savings account that pays a 2% annual interest rate. You do not pay in any other money nor do you pay anything out (...) And considering the same 2% interest rate, how much would you have in the account at the end of five years? [four options; I do not know; no response.]	34.1%	0.247
Q4: I would like to know if you think the following statements are true or false: 1) When you invest a lot of money, there is also a possibility of losing a lot of money. [True; false; I do not know; no response.]	83.3%	0.400
Q5: I would like to know if you think the following statements are true or false: 2) High inflation means the cost of living is rising rapidly. [True; false; I do not know; no response.]	81%	0.511
Q6: I would like to know if you think the following statements are true or false: 3) The probability of losing all your money is lower if you invest it in more than one place. [True; false; I do not know; no response.]	65.2%	0.485

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Household Access to Financial Services in Peru

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Abstract

A sound financial system benefits national growth by enabling households to access financial products, develop their financial abilities and achieve greater economic well-being, while encouraging the development of financial markets and contributing to the reduction of poverty and inequality. To this end, this work has two objectives: First, to describe the evolution of household access to financial services, proposing a methodology for measuring it using the National Household Surveys of Life Conditions and Poverty (ENAHO) in Peru, conducted by the National Institute of Statistics and Informatics of Peru (INEI) between 2004 and 2014. Second, to use the proposed measure of access to financial services to analyze its principal determinants, such as where there is a positive relation between income, education, and age regarding the level of access to financial services (bankarization), and a negative relation when living in rural areas or being in poverty.

Keywords: financial inclusion, households, Peru.

JEL classification: D14, G21, I22.

1. INTRODUCTION

Economic literature provides evidence of the positive impact of a sound financial system on the growth of countries and the improvement of living conditions. Studies have shown that the benefits and opportunities that households with savings and credit instruments receive, be it to finance physical assets or human capital, to access basic goods and services, or to obtain resources to deal with adverse situations, (Levine, 2005; Clarke et al., 2006; and Thorsten et al., 2007).

In recent years, Peru, along with several other countries, has assumed responsibility for improving the conditions needed to expand access to, and promote the responsible use of, financial services. With this goal in mind, the Superintendency of Banking, Insurance, and Pension Fund Administrators in Peru (known by the intitials SBS in Spanish) and Peru's Central Reserve Bank have been working to establish a regulatory environment directed at favoring conditions for promoting a solid financial system with long-term stability.[1] The government's commitment to this process can also be seen in the activities undertaken by the Comisión Multisectorial de Inclusión Financiera (CMIF, 2015a)[2] in designing and managing three main avenues of support: the use, access, and quality of financial services as specified in the National Strategy for Financial Inclusion of 2015, which aims to motivate the progressive involvement of larger segments of the population in the financial system. One of its goals is to get 75% of the population to use a mobile account or savings account by 2021.

Likewise, with the participation of government representatives, the financial sector, and civil society, measures are being developed to improve infrastructure and digital technology and present lower-cost financial products that are more suited to the needs of the population (Arbulú, 2015). These advances include an increase in the

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[1] Together with macroeconomic stability, they have contributed to the development of a risk center administered by the SBS, and to the role of the central bank in the regulation and modernization of payment systems (see Vega et al., 2015).

[2] Representatives of the Ministry of the Economy and Finance and the Ministry of Development and Social Inclusion, as well as the Central Bank, the Banco de la Nacion and the SBS are involved. (Supreme Decree 029-2014).

number of financial entities issuing electronic money using a mobile wallet *(billetera móvil),*[3] which allows people to transfer and receive money from any cell phone to all parts of the country at a lower cost.

These actions have been accompanied by a series of proposals for strengthening the financial education of certain population sectors, aimed at improving their knowledge, attitudes, and financial abilities (according to their needs), in order to "increase their participation in financial markets and facilitate the financial inclusion of groups that are the most vulnerable" (García et al., 2013).[4] Along these lines, the National Financial Education Plan is looking to articulate ongoing initiatives to achieve successes "beyond small, time-limited projects [...] that undertake and finance in a sustainable and long-term manner profitable initiatives for financial education," (Comisión Multisectorial de Inclusión Financiera, 2016, p.4).[5]

This interest in improving policies and strategies for financial inclusion, as mentioned, is based on evidence shown by several studies regarding the benefits of access to a solid and stable financial system. This has also led to an intense debate among academics on the most relevant concepts for measuring the levels and determinants of financial inclusion.

In this respect, efforts have occurred to find a consensus definition regarding the "access and use of quality banking services" (Allen et al., 2016, and Demirgüç-Kunt and Klapper, 2012). In this case, access refers to the degree to which financial services are available

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[3] This financial product, called Modelo Perú, was launched by the Association of Banks of Peru (Asbanc) in February of 2016 in accordance with guidelines set by the Law 29985 pertaining to electronic money.

[4] Higher-income nations have government entities which guide financial education strategies such as the Financial Literacy and Education Commission (www.treasury.gov/resource-center/financial-education) in the United States and the Financial Conduct Authority (FCA) (www.fca.org.uk) of Great Britain.

[5] Peru's Superintendency of Banking, Insurance and Pension Fund Administrators (SBS) has been working to focus in an integral fashion on financial education (including mapping out the distinct initiatives underway). Coordination is occurring with the Ministry of Education and the Center for Finance Studies (CEFI) of Asbanc, to include the topic of curriculum design and teacher training programs with the Ministry of Development and Social Inclusion to train beneficiaries of social aid transfer programs (Juntos, Pension 65) and productive development of FONCODES.

(infrastructure and service locations) while the question of use focuses on an analysis of the frequency or intensity with which quality financial products such as credit or savings are used.

Using these concepts, official statistics have been presented to measure advances over time at the national and regional levels (see the SBS financial inclusion portal[6]). However, due to the failure to look at the characteristics of individuals or households that use financial products, a deeper analysis of the demand for services has not been possible.

To better understand the demand for financial services, various international organizations (World Bank Global Findex 2011 and 2014; OECD/INFE, 2011; CAF 2010 and 2013) and national organizations (SBS, 2013) have promoted the development of specialized surveys on the subject. This has resulted in the definition of some common concepts and the establishment of methodological criteria for analyzing the determinants of access to the financial system. Demirgüç-Kunt and Klapper (2012), using information from the Global Findex (GF) 2011, defined use of a financial system as having an account (current or savings). This concept has been used by Aurazo (2016) in Peru following the Global Findex.

The difficulty of continuously developing specialized surveys has led several researchers to use the information from household surveys to analyze the determinants of financial inclusion. Although not designed for this purpose, the National Household Surveys of Life Conditions and Poverty (ENAHO) in Peru has made it possible to carry out several works along these lines because of the amount of information available from households. For example, Jaramillo et al. (2013) used the 2007-2011 panel survey to collect information about the issuing of direct credit in some districts as an indicator of the use of financial services and its determinants. Cámara et al. (2013), with the ENAHO 2011, used the following criteria: if the household has interest for a financial product, possesses a housing credit, or performs electronic banking transactions.

In this context, the present study seeks to harness and systematize information from ENAHO carried out by INEI between 2004-2014 to achieve two objectives: *1)* to contribute to the knowledge of the evolution of Peruvian households access to the financial system by proposing a measurement methodology that summarizes the use or

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6   See < https://www.sbs.gob.pe/inclusion-financiera>.

possession of financial products into a given indicator; and *2)* distinguish the determinants of bankarization according to households' socioeconomic characteristics.

As for the first objective, the construction of a use of financial services indicator has had to be adapted to the existing ENAHO variables. In order to arrive at a better approximation, all the modules of the survey were reviewed, so as to collect a greater number of variables than those proposed by Cámara et al. (2013) and Jaramillo et al. (2013). In addition, the results are presented at the household level since many questions about bankarization are addressed to the head of the household (unlike the Global Findex information that focuses on the individual). For this task, it is considered pertinent to differentiate between two household groups: those who use financial products on their own initiative (Group 1) and those who are obliged to have a product (opening an account) to receive social program conditional money transfers (Group 2).

The main results, considering the ENAHO 2004-2014 expansion factors, show a positive evolution in this process, although the bankarization is still limited. In this period, the percentage of households that used financial services on their own initiative (Group 1) rose from 20% in 2005 to 29.4% in 2014 (a level close to the results of the GF 2014). When including households receiving conditional transfers (Group 2), the percentage of banked households increased from 20.7% in 2005 to 42.8% in 2014.

To analyze the factors that determine the probability of participating in the financial system, those belonging to Group 1 (dependent variable) were considered as banked households. Using a standard probit model of binary choice, we find that the factors with the greatest incidence in the probability of using formal financial services are related to household living standards (poverty, income, savings) and some head-of-household demographic characteristics (sex, age, marital status). In addition, when analyzing the marginal effects, a higher positive relation between the level of income, education, and age with the level of bankarization is observed, while a negative relation is seen with respect to rural households living in extreme poverty.

To develop these themes, in addition to the introduction, our study is structured in the following manner: Section 2 presents a proposed methodology for measuring the use-of-financial-services indicator and then describes its evolution and relation with some household socioeconomic characteristics. Section 3 shows the results of the

analysis on the determinants of the access of Peruvian households to financial services. Finally, Section 4 presents our conclusions.

2. THE EVOLUTION OF HOUSEHOLD ACCESS TO THE FINANCIAL SYSTEM

In this section we develop the primary goal of our work: we propose a methodology for measuring an indicator of Peruvian households' access to the financial system. Then we make a descriptive analysis of its evolution over time, as well as its relation with other variables related to living-condition and supply of financial services, and by provinces.

2.1 Official Statistics

Official statistics show a positive evolution of financial penetration and supply of financial services in Peru between 2009 and 2014 (SBS, 2014). However, the related indicators show limited levels if compared with the financial penetration rates in some neighboring countries or countries with greater economic development.

Regarding supply of services, the number of service locations for every 100,000 persons grew notably between 2009 and 2014, from 99 to 362 locations (an increase of 265%). This was due to the high degree of growth in the number of banking correspondents[7] (438.3%) and ATMs (155.8%). Also, within Peru, the number of services delivery points is more concentrated in the urban areas of some provinces such as Arequipa (544) and Lima (398), which contrast with low levels in Huancavelica (72), Puno (80), and Loreto (81). (See SBS, 2014).

The expansion of financial service offerings has had a positive effect on their greater use, but the growth rate has been small. Between 2009-2014, for example, the depth of loans and deposits increased by 9.5 and 5.8 percentage points respectively, reaching 37% and 37.8% of gross domestic product (GDP) in 2014 (SBS, 2014)—levels below the rates of financial services penetration seen in some

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[7] Service channels used by financial system entities that operate at commercial establishments (stores and pharmacies, among others) allow multiple banking and payment operations subject to maximum amounts which vary according to the entity, the type of transaction allowed, or the availability of funds at stores acting as banking correspondents (Asbanc TE EDUCA, Boletín 3. www.hablemosmassimple.com).

Latin American and Caribbean countries (such as Brazil, Chile, Colombia, and Costa Rica).

As for the use of services, defined as the holding of an account, the entities that provide these statistics in Peru, such as the SBS, have had difficulties finding an indicator that does not overestimate or double the results when information issued by each financial institution is consolidated.

In this regard, there is a proposal to measure the use of financial services by the *number of debtors*, since reporting focuses on the same person in one province even if they have outstanding loans at several banks.[8] Also, SBS has developed the indicator *percentage of adult debtors* in the Peruvian financial system, where the rates of the entire adult population went from 27% to 36.1% between 2009 and 2014. This is considered a reduced level given the financial needs of the population it reflects, as well as the large gaps that exist between provinces. For example, in 2014, the percentage of debtors in Lima, Arequipa, and Ica ranged between 39.5% and 48.6%, while in Ayacucho, Apurímac, Amazonas, and Huancavelica—provinces with high poverty rates—it did not reach 15 percent.

2.2 ENAHO Description, 2004 to 2014

Official statistics, despite their importance in showing the evolution of financial inclusion and the gaps between regions, do not allow for greater details about the socioeconomic characteristics of the individuals or households that use financial services. As such, there exists the need to use household surveys to perform a deeper analysis of the demand for financial services over the long term and establish what influences this demand according to distinct demographic variables (sex, age), social variables (education, housing), and economic variables (employment, income, poverty).

The present study uses ENAHO 2004-2014 data applied quarterly and annually on a sample composed of about 30,000 homes or 20,000 households per year on average (see survey data sheets). This makes it possible to cover all private dwellings and their occupants residing in urban and rural areas in the 24 provinces of the country and in the Constitutional Province of Callao.

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[8]   There are restrictions, however, because it excludes people that have only deposit accounts.

Statistics from the Population and Housing Census and updated cartographic material constitute the framework for the sample. The sample is a multistage probability type, independently taking into consideration individual areas and stratification in each of the provinces studied. Each year the same household groups were visited during the same month, while distinct households were chosen. (The level of confidence for the results is 95%.) The questionnaire collects questions about various socioeconomic characteristics of the households through various modules (household, education, health, economically active population, and household income and expenditures, among other modules).

The Estimation methodology for processing the data of the National Household Survey involves the use of a weight or expansion factor for each record that is then multiplied by all of the data that belongs to the corresponding record. The basic expansion factor for each sample home is determined by the sample design. It is equal to the inverse of the final probability of being in the selection, which is the outcome of the selection probabilities at each stage.

The basic expansion factors are adjusted, taking into account the population projections by age group and sex for each survey month, and levels of inference proposed in the sample design. For the degree to which variables collected at the household level are worked with, an estimated expansion factor is used for each household (see survey technical sheets), which has permitted us to make inferences at the level of presenting the descriptive analysis results.

2.3 Methodology for Measuring the Use of Financial Services

In this section we develop the primary goal of our work: we propose a methodology for measuring an indicator of Peruvian households' use of the financial system. Then we make a descriptive analysis of the evolution of the use of financial services over time, as well as its relation with other living condition variables. This is complemented by an analysis of the supply of financial services by provinces.

The basic information for the development of this methodology comes from the household surveys conducted annually in Peru between 2004 and 2014. Although the ENAHO surveys have not been designed with the goal of measuring financial inclusion, they allow us to approximate some variables regarding ownership of financial

Table 1

METHODOLOGY FOR MEASURING THE FINANCIAL-SERVICES-USE INDICATOR

In thousands of households

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Group 1	1,324	1,305	1,455	1,847	2,046	2,233	2,350	2,303	2,495	2,410	2,411
Receive social program transfers	516	393	543	670	702	857	862	787	755	800	848
Remittances at banks	-	-	-	150	161	177	151	134	111	79	96
Pensions	766	810	834	852	878	847	888	922	999	995	1,002
Interest on deposits	39	40	33	63	88	117	117	98	94	77	53
Housing credit	95	80	96	163	193	205	231	244	382	379	349
Financial services	145	136	178	374	507	591	633	559	621	435	424
Electronic banking operations	-	-	-	249	304	485	445	435	495	456	488
Group 2	1,324	1,350	1,522	2,060	2,407	2,638	2,795	2,762	3,069	3,291	3,502
Social program benefits	-	45	67	213	361	405	445	459	574	881	1,091

Note: Group 1 considers each household individually although a household may be using two or more financial services. Group 2 includes the households in Group 1, plus the beneficiaries of social transfer programs such as payments to the impoverished (since 2005), pensions, and scholarships (since 2012) that are not registered in Group 1.
Source: INEI, ENAHO.

products (Table 1) and to know some socioeconomic characteristics of the households. For this purpose, the same methodology has been used to select the same variables and compare their evolution over time.[9] As has been mentioned, the concept used to determine the level of the use of financial services (or being *banked*) is ownership of formal financial products, as defined by the international conventions used by the 2015 National Strategy for Financial Inclusion.

The analysis focuses on the household because some of the selected variables are collected at this level. The methodology consists of differentiating two segments of households: a) Group 1–those that use financial products on their own initiative, which is calculated by selecting households that have at least one financial product of the seven items listed in Table 1 (receive unemployment insurance, remittances at banks, pensions, interest on deposits, housing credit, financial services, and electronic banking operations); b) Group 2–added to Group 1–households that benefit from social programs involving cash transfers (i.e. payments to the impoverished, pensions, scholarships), and who are therefore obligated to open an account at the Banco de la Nacion.

The expansion factors applied in the ENAHO allow us to make inferences at the household level, as shown in Table 1. In Group 1, we can speak of an increase in households that use financial services from 1.3 million in 2004 to 2.4 million in 2014, a level which increases when considering the social programs that transferred money to 3.5 million individuals in 2014.

2.4 Evolution of the Indicator and Its Relation with the Other Variables

Figure 1 illustrates the evolution of the percentage of households that used financial services in the two groups analyzed.

Despite its positive evolution, the use of financial services on an individual's own initiative, as shown in Figure 1, has tended to stagnate, which could reflect some restrictions on the entry of new customers into the financial system. However, Group 2 experienced greater dynamism sparked by the growth in the number of social program beneficiaries. In spite of these advances, as indicated by

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[9] In 2015, ENAHO included four questions about financial inclusion in its employment module.

EVOLUTION OF HOUSEHOLDS THAT USE FINANCIAL SERVICES
Percentages
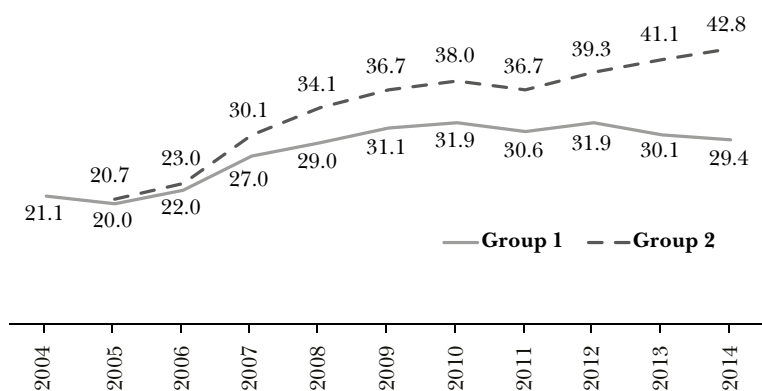
Source: INEI, ENAHO.

the figures below, the proportion of households that are unbanked is high among both those who are in poverty and those with higher incomes.

The rate of use of financial services in Group 1 rose from 20% of households in 2005 to 29.4% in 2014 (9.4 percentage points), which indicates a decline compared to the rate of 2010 (31.9%). Group 2, displaying a different trend, increased continuously to 42.8% in 2014 (22 percentage points).

The analysis by income quintiles of Group 1 (Table 2) shows an increase in the bankarization rates as the income brackets advance, which also expresses a strong concentration of persons banked in the higher-income groups. In 2014, the highest income groups in Group 1, quintile 5 (one million households) and fourth quintile (673,000 households) reached rates of 61.1 and 41%, respectively. While at the lower income brackets, the first and second quintiles, there were no more than 60,000 and 227,000 households, representing bankarization levels of 3.6% and 13.8% respectively.

Richer quintiles access more financial services, but the increase in the beneficiaries of social transfer programs encouraged the entry

Table 2

HOUSEHOLDS BANKED BY INCOME QUINTILE
As percentages of total households

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
						Group 1					
Total	21.1	20.0	22.0	27.0	29.0	31.1	31.9	30.6	31.9	30.1	29.4
Quintile 1	0.9	1.2	1.4	1.2	2.2	2.8	3.5	4.0	4.6	3.9	3.6
Quintile 2	4.5	5.6	6.5	8.8	12.1	13.4	14.8	14.9	15.3	14.6	13.8
Quintile 3	17.0	15.7	17.9	23.7	26.8	27.8	30.8	28.6	30.2	28.6	27.2
Quintile 4	33.2	30.5	31.9	39.0	42.1	45.7	46.7	43.9	45.7	43.3	41.0
Quintile 5	50.1	47.1	52.2	62.2	61.5	65.5	63.7	61.6	63.9	60.1	61.1
						Group 2					
Total	21.1	20.7	23.0	30.1	34.1	36.5	38.0	36.7	39.3	40.1	42.8
Quintile 1	0.9	1.8	5.2	12.8	21.6	22.3	23.7	25.0	28.7	35.9	40.5
Quintile 2	4.5	6.6	7.5	12.1	17.2	20.2	22.2	21.9	23.9	30.4	32.4
Quintile 3	17.0	16.6	31.9	24.3	27.8	29.1	33.0	30.4	33.2	34.2	35.4
Quintile 4	33.2	30.9	31.9	39.1	42.3	46.1	47.1	44.4	46.7	44.8	43.8
Quintile 5	50.1	47.7	52.2	62.3	61.5	65.8	63.7	61.8	63.9	60.4	61.7

Note: Average per capita monthly income quintiles at Metropolitan Lima prices in 2014.
Source: INEI, ENAHO.

of lower-income sectors into financial markets, helping to attenuate the differences by income levels. In this scenario, the participation of the poorest quintile increased from 1.8% in 2005 (in programs with few beneficiaries) to 40.5% in 2014, and in the second quintile from 6.6 to 32.4%. Rates are still lower than the richest quintiles, as can be seen in Table 2.

The evidence shown by ENAHO regarding the continuous increase in household incomes (as demonstrated by the fall in poverty) between 2004-2014 has influenced a significant increase in household savings capacity (incomes greater than expenditures). In absolute terms, these households increased from 2.4 million in 2005 (51.6% of households) to 5.3 million in 2014 (64.3% of households).

The figures for 2014 also allow us to see a higher percentage of banked households with savings capacity in Group 1 (79.6%) than in nonbanked households (57.9%).[10] However, when analyzing the distribution of services used by the 5.3 million that had savings capacity in 2014, only 36.4% were banked according to the criterion of Group 1, and 47.3% in Group 2 (Figure 2).

Figure 2

BANKED HOUSEHOLDS WITH SAVINGS CAPACITY
Percentages of total households with savings capacity
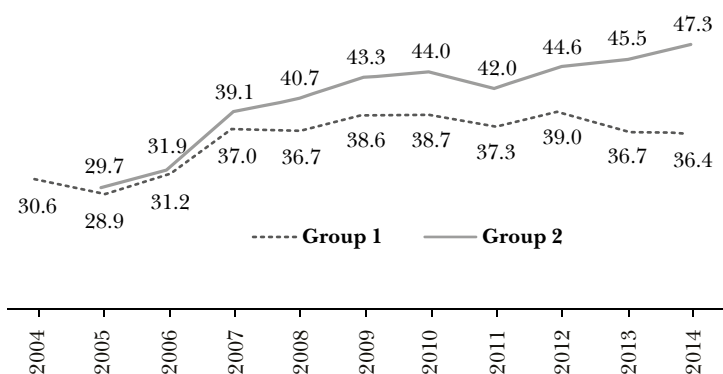
Source: INEI, ENAHO.

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[10] In Group 2, the percentage of banked who were able to save was 71.1%, while in the unbanked, it increased slightly to 59.2%.

The existence of nonbanked sectors in households with savings capacity, even in the richest quintiles, reveals the difficulties of offering financial services to meet the needs of potential users, be it because of the high cost of financial transactions, lack of money, or lack of confidence in the financial sector, as some specialized surveys indicate.

For example, in the GF 2014 survey in Peru, 41.1% of respondents aged 18 and over (912 people) reported having saved in the last 12 months either to finance their children's education expenses (54.9%), for their businesses or farms (33.9%), or to have funds in their old age (25.3%). Only 32% of them saved using an account in the financial system, while 68% opted for other systems such as savings clubs.[11] Among the reasons for not saving in the financial system (multiple answer) were the high cost of having an account (53.7%), lack of confidence in the financial sector (51.1%), and lack of money (51.6%).

The need to see the factors that limit access to financial services has led to a differentiation in the levels of financial services use in different life conditions. Table 3 shows that in 2014, according to the criteria of Group 1, only 7.5% of households in poverty[12] used financial services compared to 34.3% for nonpoverished households. These differences are relatively similar to those (10.4%) estimated to have some basic unsatisfied need (known by the initials NBI in Spanish) and those who do not have NBI (33.6%). Likewise, household heads with higher education had a higher bankarization level (49.8%) than those who did not (12%) or those who studied only to primary (18.4%) or secondary (29.3%) school level.

Group 2 shows different trends from those of Group 1 according to living conditions. For example, among the poor, the use

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[11] Although the figures differ, the Financial Capabilities Survey in Peru (Mejía et al., 2015) indicates a strong presence of informal savings systems. Of the 55% of respondents who reported having saved in the last 12 months, only 22% indicated that they had done so in the financial system, while 42% mentioned other modalities: 26% saved at home, 9% in informal groups, and the rest by investing in property or the purchase of goods such as livestock.

[12] The poverty indicator is monetary poverty. The ENAHO defines a household as being poor when its per capita expenditure is below a poverty line, and it is considered as extremely poor when the household's per capita expenditure is lower than the extreme poverty line.

of financial services was 44.3%, 1.9 points more than the nonpoor (42.4%), although in homes with some basic unsatisfied need (NBI), it was less (37.4%) than among those with no unsatisfied basic need (44%). The level rose to 49% among those who had no education and was 42.8% among those who attended primary school. However, as in Group 1, more heads of household with a university level of education used financial services (51.4%).[13]

In Group 1, the provinces of Lima and Callao, Ica, and Arequipa, showed the highest levels of banked households (between 35.9 and 47.4 percent in 2014), which contrasts with rates in Apurímac, Ayacucho, Huancavelica, and Cajamarca Amazonas (no more than 11% of banked households). However, by focusing on social programs in these provinces, the use of financial services increased markedly (Group 2), as shown in Figure 3. This indicates that social programs involving conditional money transfers are the main engine of change between Group 1 and Group 2.

The panels in Figure 4 also show a positive relation between the supply of financial services (SBS, 2014), measured by the number of offices, ATMs, banking correspondents, and total service points (per 100,000 adults over the age of 18), and the level of banked households (Group 1).

3. DETERMINANTS OF FINANCIAL SERVICES ACCESS

This section develops the second objective of this paper, which is to perform a quantitative approximation of the factors that determine the probability of household participation in the financial system. The variable to be explained is the indicator of access to financial services or financial inclusion proposed in the previous section. To this end, econometric estimates are made using a standard probit model of binary choice.

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[13] Distribution according to sex, insofar as only heads of households are considered, shows no great difference in both groups of banked households.

Table 3
HOUSEHOLDS USING FINANCIAL SERVICES ACCORDING TO LIFE CONDITIONS
Percentages

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
						Group 1					
Total	21.1	20.0	22.0	27.0	29.0	31.1	31.9	30.6	31.9	30.1	29.4
Poverty											
Poor	8.7	7.1	7.1	7.2	7.6	7.4	8.5	7.3	8.3	7.4	7.5
Not poor	34.1	31.8	32.8	38.2	38.7	40.4	40.0	37.6	38.3	35.6	34.3
Basic needs											
Unsatisfied	8.6	5.7	7.8	10.2	10.6	10.3	9.7	10.8	11.8	9.8	10.4
Satisfied	29.3	26.9	29.8	36.5	35.8	38.0	38.3	36.1	37.0	34.8	33.6
Education											
No level	8.9	10.1	8.8	11.1	14.0	13.2	14.6	12.6	13.3	11.9	12.0
Primary level	14.0	13.5	14.5	17.0	18.0	18.7	19.4	19.6	20.2	19.5	18.4
Secondary level	20.1	19.5	21.4	25.1	27.3	29.6	31.7	29.5	31.1	29.1	29.3
University level	40.2	36.2	39.6	48.4	50.0	54.3	53.9	51.5	52.9	50.7	49.8

	Group 2										
Total	21.1	20.7	23.0	30.1	34.1	36.7	38.0	36.7	39.3	41.1	42.8
Poverty											
Poor	8.7	7.9	9.5	14.9	22.2	24.0	26.6	25.7	30.4	39.0	44.3
Not poor	34.1	32.4	32.8	38.7	39.5	41.7	41.9	40.0	41.7	41.7	42.4
Basic needs											
Unsatisfied	8.6	6.4	9.9	16.9	19.9	19.5	19.5	21.7	25.3	31.3	37.4
Satisfied	29.3	27.6	30.2	37.6	39.3	42.4	42.4	40.8	42.8	43.4	44.0
Education											
No level	8.9	10.9	11.0	17.3	21.1	22.6	26.0	23.9	31.6	42.2	49.0
Primary level	14.0	14.3	16.3	23.0	28.1	29.4	31.1	31.1	33.9	39.5	42.8
Secondary level	20.1	20.2	21.9	26.9	30.3	33.3	35.3	33.5	35.5	35.4	36.2
University level	40.2	36.8	39.7	48.6	50.3	54.9	54.4	52.0	53.4	51.7	51.4

Note: Percentage related to the total number of households in each group according to poverty, basic needs unsatisfied, or education level.

Source: INEI, ENAHO.

Figure 3

LEVEL OF BANCARIZATION BY REGION IN 2014
Percentages

GROUP 1

GROUP 2

Figure 4

**BANKARIZATION AND SUPPLY OF FINANCIAL SERVICES
BY REGION, 2014**
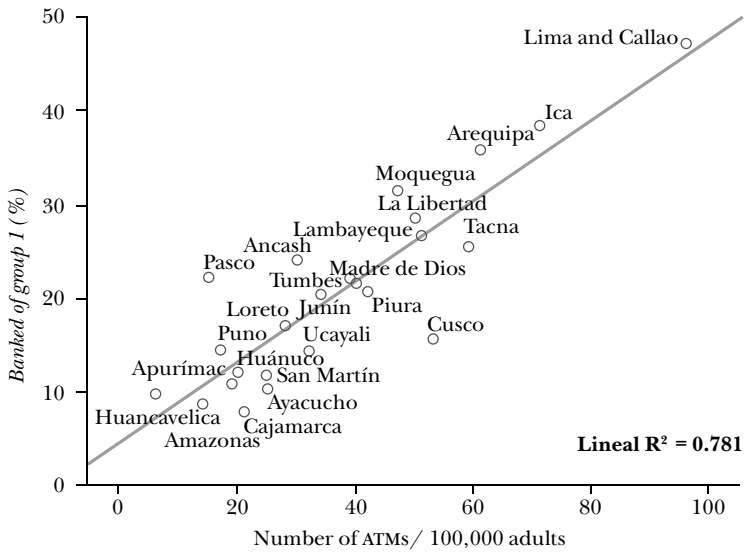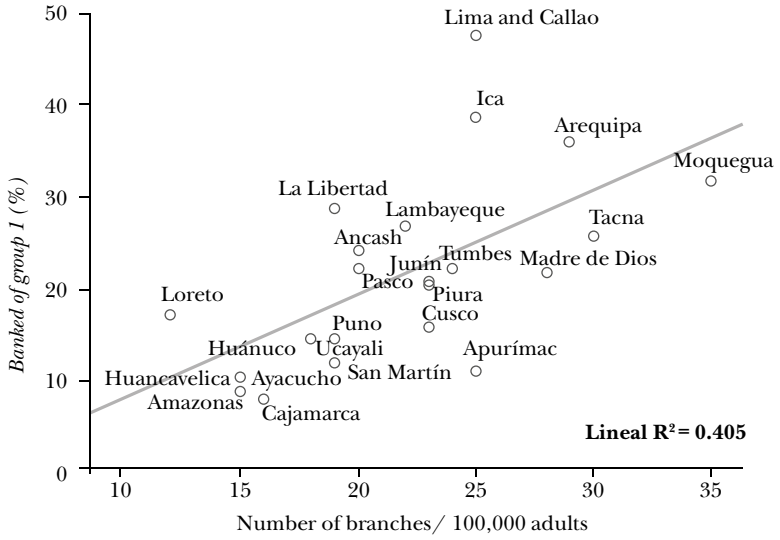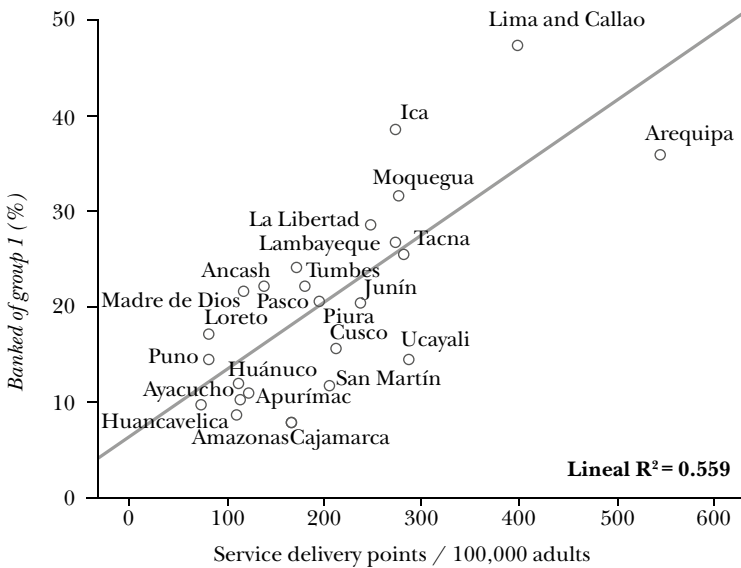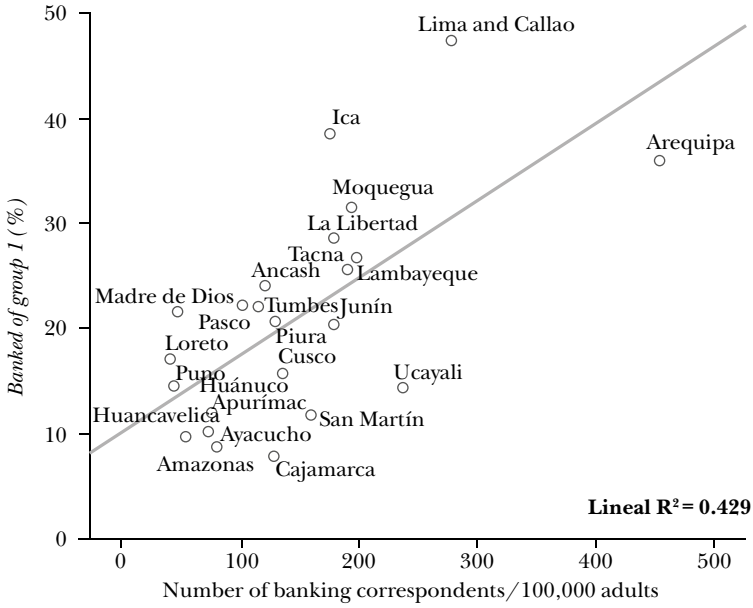

Lineal R² = 0.405

Lineal R² = 0.781

Figure 4 (cont.)

**BANKARIZATION AND SUPPLY OF FINANCIAL SERVICES
BY REGION, 2014**

3.1 Related Literature

The analysis of the factors that explain access to the financial system has been approached from distinct perspectives, either to estimate the influence of certain macroeconomic variables (GDP, inflation) and the effect the offering of financial services has on the depth of the financial services market (Aparicio and Jaramillo, 2012), or to measure the context and the policies that influence financial system access (Hopkins and Charles, 2014). Specialized surveys on this topic have promoted the analysis of the economic and social factors involved in the decision to use financial services. Among them are the works of Cano et al. (2014) in Colombia, Peña et al. (2014) in Mexico, and Tuesta et al. (2015) in Argentina.

Some studies have addressed the analysis with data from household surveys. Murcia (2007) used the 2003 Quality of Life Survey by Colombia's national statistics administration to evaluate the impact of income (summarized in an indicator of wealth) on the probability of having a housing loan. Jaramillo et al. (2013) used the 2007–2011 ENAHO panel survey to collect information about the issuing of direct loans in some districts as an indicator of the use of financial services and its determinants. Cámara et al. (2013) used the ENAHO 2011 to study the factors that explain the access of households and small businesses to the financial system in Peru, and Aurazo (2016) studied the determinants of the use of credit cards, savings accounts, and loans accounts in Peru households using the Global Findex database.

3.2 The Information Source

As has been mentioned in Section 2.2., this study uses ENAHO data from the years 2004 to 2014. ENAHO is a survey that is conducted on a quarterly and annual basis (with greater coverage) to collect information on the relevant life condition variables of health, education, employment, income, and access to housing services. In this sense, it is a very important source for investigating the socioeconomic characteristics of households.

The size of the annual samples–some 30,000 households per year– and the possibility of visiting the same groups each year in the same month as the survey, while selecting distinct households has allowed us to make yearly Estimations instead of panel data. The level of confidence of the sample results is 95 percent.

On the other hand, to avoid losing information about all of the households, (panel surveys are restricted to a limited number of households extracted from the annual sample and do not include all question modules) we preferred to make the Estimation separately, year by year. This allows a more dynamic approach over the long term, which is not possible with panel-organized surveys that are restricted to a maximum of five years of surveys. Currently the panel surveys for the years 2007-2011 and 2011-2015 can be downloaded from the INEI website.

3.3 Dependent and Explanatory Variables

In order to examine the variables that most often occur in the probability of using financial services, a discrete choice probability probit model was used, which is standard in studies of this type (Cámara et al. 2013, and Murcia, 2007). It is proposed that the decision by households to participate in the financial system (dependent variable) is influenced by some life standard characteristics such as poverty, income, expenditures, savings, occupation, education level, age, sex, and marital status of the head of household. Some of these variables, such as being of legal age or owning your own home, are considered requirements for getting a bank loan.

The dependent variable is the proposed indicator of access to financial services stated in Section 2, and includes households that use financial products on their own volition (Group 1). In this sense, households that receive money transfers as a part of social programs, and that are required to open accounts at the Banco de la Nacion, are excluded.[14] The selected explanatory variables have been organized in a binarian form, taking the value of 1 when the condition is fulfilled and 0 when it is not fulfilled (see Table 4).[15] To see the impact of income, households were classified by spending quintiles.

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[14] Households obligated to have a financial product were not considered since their inclusion biases the Estimation results. The analysis of this group in regard to why households do not use financial services requires a more careful analysis, including variables that act as barriers, for example the indicators found in the Global Findex such as the lack of trust in the financial sector, low financial education, and the high cost of transactions.

[15] Other explanatory variables can be included in the analysis, such as the head of household sex (no significant result was seen in the regres-

3.4 Estimation Results

The results of the Estimation for the years 2004 to 2014 are presented in Table 5. In general, the coefficients show expected results similar to Cámara et al. (2013). The analysis of the average marginal effects[16] in Table 6 leads to the general conclusion that income (as measured by expenditures), age, educational level, and savings capacity have a greater impact on the probability of a household belonging to the financial system, which coincides with the results of Peña et al. (2014) and Murcia (2007).

Table 6 shows a higher probability of households accessing financial services where the head of the household is 60 or older, which may be related to their higher financial education. A second high-impact variable is when the household belongs to the upper-income quintile (measured through expenditures), producing results that are in line with the home having a greater savings capacity, a variable that is also positive and significant.

It is also interesting to see that as the head of household reaches higher levels of education (primary, secondary, and university level), the probability of the household accessing the financial system grows. That is to say that households where the head of household has higher education are more likely to use financial services than households with heads that have only a primary education.

In distinguishing the impact of the possession of some assets, such as a mobile phone, computer or vehicle, on the use of financial services, it can be seen that the effect is stronger in homes that own a computer. This could be explained by the advantages that a computer offers for carrying out banking transactions and for gaining access to more information about the conditions of the banking system, which also results in greater financial knowledge.

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sions), marital status, region where the household is located (including if the household is in an urban or rural area), or age as a continuous variable. This study includes the most important explanatory variables about the household and it is hoped that other specifications give results of similar quality.

[16] The average marginal effect (AME) is calculated first for each individual with their observed levels of the covariables. These values are then averaged across all individuals. Since the regressors are indicator variables, the finite difference method is used. See Cameron and Trivedi (2010) for more details regarding the method.

Table 4

HOUSEHOLD CHARACTERISTICS

Explanatory variables	Description
Extreme poverty	One if the household is in extreme poverty, zero if it is not.
Not extreme poverty	One if the household is in poverty that is not extreme, zero if it is the contrary.
Housing condition	One if the home is inadequate, zero if the home is adequate.
Householder owns his/her home	One if the home is owned by the householder, zero if not
Primary education	One if the head of household has a primary-level education, zero if not.
Secondary-level education	One if the head of household has a secondary education, zero if not.
University education	One if the head of household has a university education, zero if not.
Basic services	One if the household has water, sewage, and electricity, zero if not.
Owns a computer	One if the household owns a computer, zero if not.
Vehicle ownership	One if the household owns vehicles, zero if not.
Mobile (cellphone) services	One if the household has cell service, zero if not.
From 25 to 29 years of age	One if the head of household is between the ages of 25 and 29, zero if not.
From 30 to 59 years of age	One if the head of household is between the ages of 30 and 59, zero if not.
60 years of age and above	One if the head of household is 60 or older, zero if not.
Savings capacity	One if the household saves, zero if not.
Quintile 2 expenditures	One if the household is in quintile 2 for per capita expenditures, zero if not.
Quintile 3 expenditures	One if the household is in quintile 3 for per capita expenditures, zero if not.
Quintile 4 expenditures	One if the household is in quintile 4 for per capita expenditures, zero if not.
Quintile 5 expenditures	One if the household is in quintile 5 for per capita expenditures, zero if not.
Rural area	One if the household is located in a rural area, zero if not.
Formal employment	One if the head of household has formal employment, zero if not.

Table 5

DETERMINANTS OF FINANCIAL SYSTEM PARTICIPATION

Explanatory variables	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Extreme poverty	−0.33[a]	−0.55[a]	−0.62[a]	−0.37[a]	−0.39[a]	−0.52[a]	−0.55[a]	−0.29[a]	−0.20[a]	−0.23[a]	−0.41[a]
Not in extreme poverty	0.00	−0.19[a]	−0.27[a]	−0.05	−0.04	−0.13[a]	−0.06	−0.06	−0.10[a]	−0.13[a]	−0.03
With housing	−0.25[a]	−0.18[a]	−0.21[a]	−0.20[a]	−0.22[a]	−0.22[a]	−0.19[a]	−0.22[a]	−0·19[a]	−0.19[a]	−0.28[a]
Householder owns his/her home	0.20[a]	0.11[a]	0.13[a]	0.18[a]	0.15[a]	0.09[a]	0.07[a]	0.13[a]	0.13[a]	0.18[a]	0.14[a]
Primary education	0.25[a]	0.09	0.21[a]	016[a]	0.13[a]	0.20[a]	0.17[a]	0.13[a]	0.16[a]	0.14[a]	0.13[a]
Secondary-level education	0.49[a]	0.34[a]	0.47[a]	0.39[a]	0.32[a]	0.37[a]	0.38[a]	0.29[a]	0.31[a]	0.32[a]	0.32[a]
University level education	0.67[a]	0.46[a]	0.63[a]	0.45[a]	0.42[a]	0.45[a]	0.46[a]	0.41[a]	0.42[a]	0.43[a]	0.44[a]
Basic services	0.18[a]	0.22[a]	0.23[a]	0.26[a]	0.18[a]	0.18[a]	0.20[a]	0.15[a]	0.17[a]	0.13[a]	0.14[a]
Owns a computer	0.20[a]	0.18[a]	0.21[a]	0.24[a]	0.18[a]	0.28[a]	0.31[a]	0.25[a]	0.28[a]	0.29[a]	0.31[a]
Vehicle ownership	0.09[a]	0.09[a]	0.02	0.07[a]	0.13[a]	0.11[a]	0.09[a]	0.12[a]	0.14[a]	0.11[a]	0.16[a]
Mobile services	0.22[a]	0.13[a]	0.13[a]	0.18[a]	0.12[a]	0.17[a]	0.22[a]	0.16[a]	0.20[a]	0.14[a]	0.15[a]
From 25 to 29 years of age	0.85[a]	0.69[a]	0.49[a]	0.34[a]	0.20[a]	0.06	0.17[a]	0.32[a]	0.27[a]	0.34[a]	0.38[a]
From 30 to 59 years of age	0.90[a]	0.83[a]	0.63[a]	0.51[a]	0.35[a]	0.17[a]	0.35[a]	0.36[a]	0.33[a]	0.37[a]	0.41[a]
60 years of age and above	1.85[a]	1.72[a]	1.50[a]	1.38[a]	1.12[a]	0.91[a]	1.06[a]	0.98[a]	0.96[a]	1.00[a]	1.03[a]
Savings capacity	0.65[a]	0.61[a]	0.60[a]	0.49[a]	0.39[a]	0.44[a]	0.44[a]	0.41[a]	0.41[a]	0.43[a]	0.45[a]
Quintile 2 expenditures	0.33[a]	0.39[a]	0.29[a]	0.27[a]	0.23[a]	0.21[a]	0.17[a]	0.23[a]	0.22[a]	0.30[a]	0.29[a]
Quintile 3 expenditures	0.59[a]	0.46[a]	0.30[a]	0.49[a]	0.46[a]	0.37[a]	0.35[a]	0.47[a]	0.41[a]	0.49[a]	0.49[a]
Quintile 4 expenditures	0.71[a]	0.60[a]	0.41[a]	0.64[a]	0.62[a]	0.54[a]	0.57[a]	0.66[a]	0.60[a]	0.64[a]	0.67[a]
Quintile 5 expenditures	0.93[a]	0.82[a]	0.66[a]	0.90[a]	0.89[a]	0.84[a]	0.78[a]	0.91[a]	0.87[a]	0.94[a]	0.96[a]
Rural area	−0.45[a]	−0.43[a]	−0.47[a]	−0.39[a]	−0.39[a]	−0.46[a]	−0.42[a]	−0.41[a]	−0.41[a]	−0.37[a]	−0.40[a]
Formal employment	−0.50[a]	−0.28[a]	−0.45[a]	0.32[a]	0.37[a]	0.35[a]	0.34[a]	0.32[a]	0.31[a]	0.26[a]	0.21[a]
Constant	−3.58[a]	−3.17[a]	−2.92[a]	−2.99[a]	−2.53[a]	−2.35[a]	−2.54[a]	−2.58[a]	−2.61[a]	−2.74[a]	−2.79[a]
Observations	19,502	19,895	20,577	22,204	21,502	21,753	21,496	24,809	25,091	30,453	30,848

Note: [a] indicates significance at 10 percent

Table 6

AVERAGE MARGINAL EFFECTS FOR INDICATOR VARIABLES

Explanatory variables	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Extreme poverty	-0.05[a]	-0.08[a]	-0.09[a]	-0.07[a]	-0.08[a]	-0.10[a]	-0.11[a]	-0.06[a]	-0.04[a]	-0.05[a]	-0.09[a]
Not in extreme poverty	0.00	-0.03[a]	-0.05[a]	-0.01	-0.01	-0.03[a]	-0.01	-0.01	-0.02[a]	-0.03[a]	-0.01
Housing condition	-0.04[a]	-0.03[a]	-0.04[a]	-0.04[a]	-0.05[a]	-0.05[a]	-0.04[a]	-0.05[a]	-0.05[a]	-0.05[a]	-0.07[a]
Householder owns his/her home	0.03[a]	0.02[a]	0.02[a]	0.03[a]	0.03[a]	0.02[a]	0.02[a]	0.03[a]	0.03[a]	0.04[a]	0.03[a]
Primary education	0.04[a]	0.02	0.04[a]	0.03[a]	0.03[a]	0.04[a]	0.04[a]	0.03[a]	0.04[a]	0.03[a]	0.03[a]
Secondary-level education	0.09[a]	0.06[a]	0.08[a]	0.08[a]	0.07[a]	0.08[a]	0.09[a]	0.07[a]	0.07[a]	0.08[a]	0.07[a]
University-level education	0.13[a]	0.08[a]	0.13[a]	0.10[a]	0.10[a]	0.11[a]	0.11[a]	0.10[a]	0.11[a]	0.11[a]	0.11[a]
Basic services	0.03[a]	0.04[a]	0.04[a]	0.05[a]	0.04[a]	0.04[a]	0.05[a]	0.04[a]	0.04[a]	0.03[a]	0.03[a]
Owns a computer	0.04[a]	0.03[a]	0.04[a]	0.05[a]	0.04[a]	0.06[a]	0.07[a]	0.06[a]	0.07[a]	0.07[a]	0.08[a]
Vehicle ownership	0.02[a]	0.02[a]	0.00	0.01[a]	0.03[a]	0.03[a]	0.02[a]	0.03[a]	0.04[a]	0.03[a]	0.04[a]
Mobile services	0.04[a]	0.02[a]	0.02[a]	0.04[a]	0.03[a]	0.04[a]	0.05[a]	0.04[a]	0.05[a]	0.03[a]	0.03[a]
From 25 to 29 years of age	0.17[a]	0.14[a]	0.10[a]	0.07[a]	0.04[a]	0.01	0.04[a]	0.08[a]	0.07[a]	0.09[a]	0.09[a]
From 30 to 59 years of age	0.13[a]	0.12[a]	0.10[a]	0.09[a]	0.07[a]	0.04[a]	0.08[a]	0.08[a]	0.07[a]	0.08[a]	0.09[a]
60 years of age and above	0.38[a]	0.35[a]	0.31[a]	0.30[a]	0.26[a]	0.21[a]	0.25[a]	0.24[a]	0.24[a]	0.25[a]	0.25[a]
Savings capacity	0.11[a]	0.10[a]	0.10[a]	0.09[a]	0.08[a]	0.09[a]	0.10[a]	0.09[a]	0.10[a]	0.10[a]	0.10[a]
Quintile 2 expenditures	0.06[a]	0.07[a]	0.05[a]	0.05[a]	0.05[a]	0.05[a]	0.04[a]	0.05[a]	0.05[a]	0.07[a]	0.07[a]
Quintile 3 expenditures	0.11[a]	0.08[a]	0.05[a]	0.10[a]	0.10[a]	0.08[a]	0.09[a]	0.11[a]	0.10[a]	0.12[a]	0.12[a]
Quintile 4 expenditures	0.13[a]	0.11[a]	0.08[a]	0.13[a]	0.14[a]	0.12[a]	0.14[a]	0.16[a]	0.14[a]	0.16[a]	0.16[a]
Quintile 5 expenditures	0.19[a]	0.17[a]	0.14[a]	0.21[a]	0.23[a]	0.21[a]	0.20[a]	0.24[a]	0.23[a]	0.26[a]	0.26[a]
Rural area	-0.07[a]	-0.07[a]	-0.08[a]	-0.07[a]	-0.08[a]	-0.10[a]	-0.09[a]	-0.09[a]	-0.10[a]	-0.09[a]	-0.09[a]
Formal employment	-0.07[a]	-0.04[a]	-0.07[a]	0.07[a]	0.08[a]	0.08[a]	0.08[a]	0.08[a]	0.08[a]	0.06[a]	0.05[a]
Observations	19,502	19,895	20,577	22,204	21,502	21,753	21,496	24,809	25,091	30,453	30,848

Note: [a] indicates significance at 10 percent.

Among the significant variables related to household characteristics, such as poverty, formal employment, housing conditions, basic services, and region (rural or urban), the level of probability of participating in the financial system shows less variability over time (with the expected signs).

However, compared to 2004, it is observed that by 2014, households that are in extreme poverty, those with inadequate housing conditions, and those living in rural areas are less likely to enter the financial system on their own volition. In contrast, the probability increases among those that have higher incomes and access to a computer.

It should be noted that the variable of owning vehicles, which has less impact or is not significant in the Estimations from 2004 to 2007, becomes significant and more important between 2008 and 2014. Given the relation of income to vehicle acquisition, it is important to take into account that the year 2008 represented a period of cutbacks where real wages were stagnant, followed by a period of high sustained growth until 2014. An analysis of panel data incorporating national income measures would make for an interesting hypothesis for evaluation.

Although this study focuses on the analysis of household characteristics in the determination of access to financial services, the results allow us to infer the impact of policy towards financial education for increasing banking participation in the country. In terms of policy, the implication points to a communications strategy that would target information about the financial sector to households where the head of household is young, as well as to low-income households.

Actions should also be taken to reduce the costs of access to financial services, supported by the expansion of infrastructure and digital technology, since as has been observed, the possession of a computer has a significant impact on the probability of using the financial system. Furthermore, the introduction of the mobile wallet, which allows people to transfer and receive money from any mobile phone, is expected to boost the use of financial services to larger segments of the population.

Likewise, economic policy should be more efficiently applied by other public policies related to improving access to quality education and income levels, in order to generate greater access to financial services. However, the slower growth rate of the Peruvian economy

since 2016 could affect incomes, which means more proactive behavior by the financial system will be needed to boost entrepreneurship.

Note that the explanatory variables when considering only household characteristics focus on demand for financial services at the national level. This analysis, however, could be extended to an approach by provinces incorporating financial services supply variables (various points of service, number of offices, number of ATMs, etc.) Although there is a direct relation between the greater supply of services and greater banking (figure 4), the availability of financial services is also lower in regions of greater poverty. Therefore, this type of analysis could be useful to analyze the factors that explain the gaps between regions or provinces, an analysis which would be very relevant for future research.

One important issue is the effect of macroeconomic factors (GDP, inflation) and infrastructure variables on the evolution of household access to financial services over time, as well as an analysis that includes variables that act as barriers to access, such as the lack of confidence in the financial sector, the lack of a culture of financial education, and the high transaction costs as indicated by the Global Findex. This however would require following households over time, where the houses surveyed are surveyed again each year. Without doubt, these themes would be interesting for future investigation.

4. CONCLUSIONS

In consideration of the positive impact household access has on the financial market, the Peruvian government has designed a financial inclusion strategy aimed at increasing the country's level of bankarization. Likewise, advances in the financial environment have given greater solidity and solvency to the system and facilitated financial transactions. In this context, banking in Peru has shown a positive evolution towards greater penetration of financial services, diversity of products and services, and greater use of financial services. These indicators, however, are lower for other countries such as Chile, Brazil, or Colombia.

In order to have regular indicators regarding the progress of household access to financial services and to analyze its determinants, we have worked with information from the ENAHO. We have proposed a methodology for measuring an indicator of access to

financial products and services and looked at this across two household groups according to their use of financial products. Group 1 is defined as using banking services and products at the individual's own volition, and our results show that the use of financial products grew from 20% of these household surveyed in 2005 to 29.4% in 2014. When looking at households that received conditional transfer payments from government social programs (Juntos, Pension 65, and Beca 18), our results show that the percentage of banked households grew from 20.7% in 2005 to 42.8% in 2014 (22 percentage points).

The descriptive study shows strong differences in the level of bankarization according to life conditions regarding variables including poverty, basic needs not met, income level, savings possibilities, and the educational level of the head of the household. Despite these limitations to financial inclusion, there are also unbanked sectors in the richest quintiles and among those with higher education and lower needs. This demonstrates the need to complement this work with other studies on the barriers that limit the use of banking services in these groups.

The analysis of the savings capacity among distinct income quintiles shows that families with lower incomes also save, although there are high-income households with the ability to save that nonetheless are unbanked. This shows the need to investigate the difficulties financial services providers face in meeting the needs of potential users. Low levels of education and financial knowledge, and the high costs of financial transactions act as barriers to entry into the financial system, according to the results of the Global Findex survey of 2011 and 2014.

In order to make a quantitative approximation of the factors that determine the probability of the households participating in the financial system, a standard probit model of binary choice was used, employing the indicator of the use of financial services as a dependent variable. Also, the model selected some explanatory variables that could have a greater incidence in the probability of households using formal financial services.

The analysis of marginal effects shows that between 2004 and 2014 the probability of using financial services in rural areas declined among the poor and those with inadequate housing conditions. The likelihood of using financial services increased in the higher income quintiles households with savings capacity, a head of household with university-level education, and households with a computer. This

could make it increasingly difficult for vulnerable groups to enter the financial system, a situation that works against the concept of financial inclusion, and which shows the need to assess the important role of these factors in the formation of public policy.

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Knowledge, Information, and Financial Decisions: Why Do People Choose to Finance from Informal Credit Markets?

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Abstract

Informal credit markets constitute an important and expensive source of household financing, especially in developing countries. In this paper, we assess how a lack of financial information and financial knowledge affect the probability that an individual will obtain credit from an informal source. We also identify some of the main factors that determine households' financial decisions. Specifically, we use a multinomial logit framework to test how individuals' knowledge and ability to solve basic financial problems affect their selection among formal and informal credit options. Our findings suggest that financial literacy affects financial behavior, increasing the probability of acquiring informal credit. Low income and the lack of commercial relations with banks have the same effect on households' financial behavior.

Keywords: personal finance, informal credit, multinomial logit, financial frictions.

JEL classification: D14, E51, G21.

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1. INTRODUCTION

Financial institutions play a crucial role in economic growth. As financial markets develop and become more integrated into society, they aid pave the way for market efficiency and reduce the costs of financing (Rajan and Zingales, 1996; La Porta et al., 1997; Degryse et al., 2009; Gorton and Winton, 2016). Although financial systems have developed in low- and middle-income countries, however, the use of informal financial systems has persisted over the years. For example, informal credit operations constitute approximately 30% of total lending operations in Argentina, 25% in Brazil, 29% in Peru, 29% in Mexico, and up to 30% in the Dominican Republic (De la Torre and Schmukler, 2012).[1]

In contrast to formal sources of credit, access to informal credit is simple, nonbureaucratic, and does not require financial literacy. Nevertheless, informal credit markets can be a source of financial frictions, and obstruct restrictive monetary policies (Batini et al., 2011).

Notable authors (Bell, 1990; Arnott and Stiglitz, 1991; Kochar, 1997) have identified that informal credit markets may result from information asymmetry, leading to problems of adverse selection and moral hazard. However, several studies show how personal knowledge of financial products, or the ability to solve basic financial problems, might affect an individual's decision to borrow from formal or informal credit markets.

For example, according to Lusardi and Tufano (2015), many individuals make poor economic decisions because they lack financial literacy, and show that financial education can benefit society. Moreover, the empirical findings of Lusardi and de Bassa Scheresberg (2013) prove that, among other factors, financial literacy plays a role in explaining why economic agents incur such high costs when taking credit. Thus, one objective of this paper is to address this potential correlation in the credit market of the Dominican Republic.

Using data from the First Survey of Economic and Financial Culture of the Dominican Republic (EGCEF), we create a multinomial logit model to assess how a lack of information on financial products affects the probability that individuals will finance their

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[1] The informal financial market is composed of unregulated financial institutions such as moneylenders, family members, and friends.

expenditures with informal credit rather than formal credit, given a number of socioeconomic and individual characteristics. Moreover, we test how an individual's ability to solve basic financial problems might affect the decision to choose among formal or informal credit options. The survey utilized contains information from 2,313 households on 74 questions, covering issues from financial literacy to financial decision-making in the Dominican financial market.

The multinomial logit model allows us to understand the determinants of individuals' decisions to acquire informal credit, formal credit, or to stay out of the credit market. Our findings suggest that policy measures aimed at promoting financial education, as well as financial integration, could greatly improve household financial decisions. It is important to take into account that given the nature and source of our data, our results only refer to households' credit destined to finance *current expenditures.*

This paper is organized as follows: Section 2 reviews the existing literature. Section 3 presents a description and an analysis of the data. Section 4 details the econometric approach used in this study, and Section 5 presents our results. Finally, Section 6 articulates the conclusions of the paper.

2. LITERATURE REVIEW

Economic literature has found many ways financial literacy affects financial behavior (see Lusardi and Mitchell, 2014). A significant number of authors has studied the subject, to the extent that surveys have found a link between agents' financial education and the efficiency of their financial decisions.

Studies have shown that consumers who do not understand the meaning of compound interest tend to borrow higher amounts of money, and to accept higher interest rates (Lusardi and de Bassa Scheresberg, 2013; Lusardi and Tufano, 2015). According to the S&P Global FinLit Survey, this is especially true for poorer and less educated people.

In addition, Campbell (2006) found that a minority of households makes significant mistakes when refinancing mortgages. Again, members of these households appear to be poorer and less educated. Similarly, Agarwal, Driscoll, Gabaix, and Laibson (2009) studied lifecycle patterns in financial mistakes, focusing on decisions

related to credit, and found that these prevail among the groups of old and young people with the lowest levels of financial literacy.

Furthermore, the S&P Global FinLit Survey found that regardless of individuals' income, those who use financial services, like bank accounts and credit cards, usually have higher financial knowledge. Hence, the use of formal financial services may deepen agents' financial skills. It is important to mention that, according to this survey, 35% of the adult population (15 and older) in the Dominican Republic is financially literate.

Stango and Zinman (2009) show that controlling for household characteristics, exponential growth bias[2] explains the tendency of households to underestimate the interest rate, and that biased households tend to borrow more. Almenberg and Gerdes (2011) expanded these findings by studying the correlation between exponential growth bias and financial literacy, finding a negative correlation between the magnitude of the bias and financial literacy.

Moreover, Guirkinger (2006) studies the determinants of the demand for informal credit, despite its high-interest rate, in Piura, Peru, using a panel data survey of households, along with information on informal lenders' behavior regarding contractual risk. Her findings suggest that households use informal loans when they cannot access the formal sector. Similarly, households are significantly more likely to use informal credit when they perceive high contractual costs and high risk from formal contracts (Cole, 2010).

According to the credit markets theory, informal credit markets can be either a complement or a substitute for formal credit markets. For instance, in the case of Mexico, Campero and Kaise (2013) show that informal credit markets play a role in the demand for different segments of the population across different situations. That is, individuals participating in the formal credit market might value informal credit in certain situations, such as emergencies, which supports the hypothesis of complementarity between informal and formal credit markets. In contrast, using survey data from 200 rice farmers, Muhammed (2013) finds that informal credit sources can act as substitutes for formal lending sources.

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[2] Exponential growth bias is the pervasive tendency to linearize exponential functions when assessing them intuitively (Stango and Zinman, 2009).

Following the aforementioned literature, we will analyze how the role of information on financial products and financial literacy might affect the probability of acquiring credit from an informal lender in the Dominican Republic. Presently, a significant number of government agencies and central banks around the world implement national programs on financial education and financial literacy to promote financial inclusion among low- and middle-income households. Thus, we expect that our findings will contribute to the development of these policy programs in our country.

3. SURVEY DATA ANALYSIS

For this research, we use data from the First Survey of Economic and Financial Culture of the Dominican Republic (EGCEF), published in November 2014. This survey contains information from interviews of 2,313 households in the Dominican Republic, with 74 questions pertaining to their financial literacy and other factors that potentially played an important role in their financial decisions.[3]

Our sample contains information on 947 individuals who answered questions related to their lending behavior and the sources from which they acquired financing. Specifically, this survey asked individuals: "In the last twelve months, did expenditure exceed income?" If the respondents answered *yes*, they then answered the following: "What actions were taken when this happened?" We classify individuals' answers to this question according to whether they financed their expenditures from formal or informal credit, drew from both sources simultaneously, or stayed out of the market and did not acquire any credit (Table 1). At this point, it is important to take into account, given the nature and source of our data, our results only refer to households' credit destined to finance *current expenditures*.

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[3] The Central Bank of the Dominican Republic conducted this survey with the financial support of the Inter-American Development Bank (IDB) and the collaboration of the US Department of the Treasury's Office of Technical Assistance (OTA).

Table 1

CREDIT CLASSIFICATION

Formal credit	Authorized overdraft
	Mortgage
	Personal loan
	Payroll loan
	Unauthorized overdraft
	Credit card cash advance
Informal credit	Borrowed credit from an informal provider
	Borrowed money from friends and/or family
	Took a loan/San[1]
	Pawned something that belongs to them
Out of the market	Reduced expenditures
	Money withdrawn from savings
	Sold something of their property
	Worked extra hours

Note: [1] The San is a system of community savings based on the contributions by quotas of those who form the community. In a particular date, previously selected, the amount of the accummulated contributions is given to whom in the next on turn.

Figure 1

HOUSEHOLD's SOURCE OF FINANCING
From a sample of 947 households, in percentages
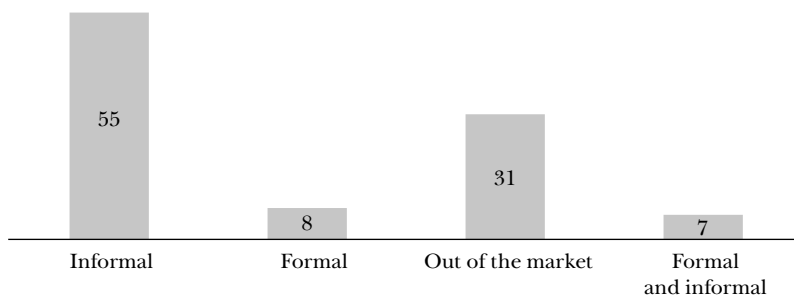
The survey data indicates that approximately 55% of households financed their expenditures from the informal credit market, approximately 8% financed their expenditures from the formal credit market, and approximately 31% reported that they did not take any form of credit but instead adjusted their expenditures (stayed out of the market). Additionally, 7% of households financed their expenditures combining formal and informal credit (see Figure 1). In other words, the percentage of households that obtained credit from the informal market may have varied between 55% and 62% among all Dominican households.

To assess how information asymmetry and how respondents' cognitive abilities can influence the decision to obtain informal credit, we use a number of variables that help us measure both the ability to solve basic financial problems, and the level of financial information held by households. Specifically, they answer the following questions.

Question	*Answer*
The interest rate on Bank A's credit card is 5% (monthly) and Bank B's interest rate is 60% (annual). Assuming that the interest is simple, not compounded:	Bank A charge a lower interest rate than Bank B.
	Bank A charge a higher interest rate than Bank B.
	Both Banks charge the same interest rate.
	Do not know.
Let's say you have DOP 200 (Dominican pesos) in a savings account. The account accrues 10% interest per year. How much will you have in the account after two years?	More than DOP 200.
	Less than DOP 200.
	Exactly DOP 200.
	Do not know.

Both comprehension of simple interest and ability to distinguish between a monthly and annual rate was tested. In addition, individuals indicated if they felt the need of more financial information to make efficient financial decisions.

These variables reveal important results. For example, we find that 61% of individuals who acquired credit from the informal credit market were not able to differentiate between monthly and annual interest rates successfully. On the other hand, more than half of the households that acquired credit from the formal credit market (54%) answered the question on interest rates correctly.

Moreover, 32% of those who took credit from the informal market seem to lack financial education, since they did not answer the question about the simple interest rate correctly. In contrast, 76% of those who borrowed from formal sources answered the question correctly.
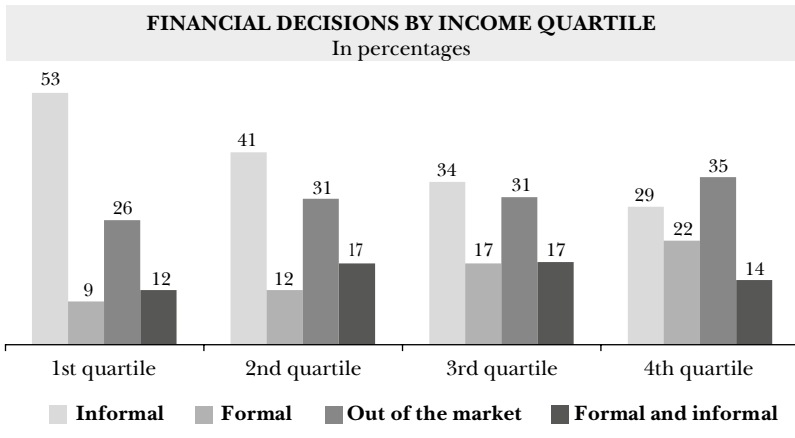
Additionally, roughly 64% of the sample expressed the need for more financial information; of these respondents, a large number were individuals who either took credit from informal markets or decided to stay out of the market. As a number of authors have suggested, the information gap causes individuals to make suboptimal decisions in the credit market (Claessens, 2006).

Furthermore, the survey provides a measure of financial discipline, derived from a set of questions about attitudes towards expenditure. Since our study focuses on credit for current expenditure, we decided to test the effect of this variable on households' financial behavior in the credit market. The Dominican Republic shows the highest score of the region since 78% of the respondents got a positive score.

Regarding income distribution, households have an average income of DOP 15,346.12 (USD 337.77). By dividing the data into quartiles, we find that the first quartile has an average income of USD 133.58; the second, USD 230.18; the third, USD 370; and the fourth, USD 914.88. Also noteworthy is the observation that lower incomes tend to be associated with greater involvement in the informal credit market, while higher incomes are more likely to finance their expenditures in the formal market (see Figure 2).

In our sample, approximately 40% of all households reported that they had no commercial relations with banks—i.e., no savings, deposits, or credit accounts. Such households are sometimes referred to as *unbanked households*. Notably, 64% of unbanked households participated in the informal credit market, and only 3% acquired credit from the formal credit market. Additionally, 30% of unbanked households declared that they had not participated in the credit market at all, and 4% financed their expenditures through a combination of formal and informal loans.

Figure 2

FINANCIAL DECISIONS BY INCOME QUARTILE
In percentages

| Informal | Formal | Out of the market | Formal and informal |

4. ECONOMETRIC MODEL

4.1 Multinomial Logit

To model the dynamics of the credit market in the Dominican Republic, we use a logit model with a multinomial distribution. With this, we model the probability of alternative j being chosen by household i, where j = {informal credit, formal credit, no credit, formal and informal credit}, given a set of variables that describe a households' characteristics.

Multinomial logit models aim to provide a more realistic representation of individual behavior by following microeconomic theory. Thus, it is assumed that household i chooses among different j alternatives, and selects the one with the highest utility:

<div>1</div>

$$U_{ij} = \max\left(U_{i1},\ldots,U_{i4}\right).\,[4]$$

In our model, alternative 1 (j = 1) corresponds to operating in the informal credit market, alternative 2 (j = 2) refers to operating in the formal market, alternative 3 (j = 3) refers to the choice of staying out of the market, and alternative 4 (j = 4) corresponds to choosing to obtain credit from both markets simultaneously.

---

[4]   Note that the last j in brackets is four; that is, the model attempts to capture four possible decisions.

Since the utility levels derived from households' financial decisions are not observed, we need to make additional assumptions:

$$U_{ij} = \mu_{ij} + E_{ij}.$$

U_{ij} is determined by a nonstochastic function of observable variables (μ_{ij}), such as income level, age, or financial information held by the household, among others, and a stochastic function of unobservable variables (E_{ij}). Therefore, the probability of household i choosing alternative j is

$$P(Y_i = j) = P\left[U_{ij} = \max(U_{i1}, \ldots, U_{i4})\right].$$

To evaluate this probability, we must consider that we are using the maximum number of random variables. Despite the difficulties that this entails, it is convenient if we can assume that all E_{ij} are mutually independent with a so-called log Weibull distribution or extreme value type I distribution (Verbeek, 2012). In this case, the distribution function of each E_{ij} is given by

$$F(t) = \exp\left(-e^{-t}\right).$$

Under these assumptions, the probability of household i choosing alternative j can be modeled as

$$P\{Y_i = j\} = \frac{exp(x_i\beta_j)}{1 + \exp(x_i\beta_2) + \ldots + \exp(x_i\beta_4)}, \quad \beta_1 = 0 \;^5$$

This is the multinomial logit model. Under regularity conditions, and assuming the model is correctly specified, this model provides consistent, efficient, and asymptotically normal estimators for the β coefficient.

However, this model assumes that each E_{ij} is independent, meaning the utility levels derived from any of the four alternatives are independent of each other, conditional upon observed characteristics.[6] Thus, we assume that the factors that increase the utility of

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[5] The multinomial logit model is overidentified. Therefore, it is normalized by $\beta_1 = 0$.

[6] This assumption is known in academia as independence of irrelevant alternatives (IIA).

covering the budget deficit in the formal market, in the informal market, out of the market, or in both markets are simultaneously independent of each other. In effect, we also assume that the elements that increase the utility derived from obtaining credit from the formal market, the informal market, or both markets simultaneously are independent of each other.

The test of independence among the alternatives does not reject the null hypothesis of the errors' independence between alternatives, validating our assumption and the results for each group (see appendix).[7]

4.2 Relative Risk Ratios

The properties of the multinomial logit model allow a comparison between the probabilities of a households' set of choices. For example, we compare the probability of taking credit from the informal market with the probability of borrowing formal credit (base group). We do so by analyzing the relative risk ratio (RRR):

6
$$RRR = \frac{\Pr\left(j \neq base | x_i \right)}{\Pr\left(j = base \mid x_i \right)}.$$

This ratio calculates by what amount the probability of choosing alternative j, conditional upon x_i, exceeds the probability of choosing the base alternative under the same conditions (result set as the *base group*).

Furthermore, to understand how the change in an explicative variable can change the RRR, we calculate:

7
$$\frac{\partial RRR}{\partial x_i} = \beta_i \left[\exp\left(x_i \beta_i \right) \right] = \beta_i * RRR.$$

This equation represents the first derivative of the relative risk ratio regarding the variable i (x_i), and measures the changes in the relative risk ratio when x_i increases one unit.[8]

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[7] A Haussman transformation test is used to test whether there are significant differences between regressions when one of the alternatives (j) is removed from the estimation. In all cases, the null hypothesis is rejected.

[8] The software used calculates the relative risk ratios when $x_i = 1$; therefore, for quantitative variables, we are interested in seeing the first derivative of the relative risk ratios instead of only the relative risk ratio.

5. RESULTS

Table 2 indicates how many times the probability going to the informal credit market or staying out of the market exceeds the probability of acquiring formal credit. Thus, using equation 6 we can calculate to what extent the probability of an outcome exceeds the probability of the base group, and using equation 7 (taking the RRR of tables and regression coefficients, β) we can measure the change of the RRR given how the change in one of the control variables affects the RRR.

According to our results, not knowing financial concepts, such as *simple interest rate*, has a significant negative effect on the probability of acquiring informal credit. In addition, knowing the difference between annual and monthly interest rate has a positive effect on the probability of acquiring informal credit. Nevertheless, this variable is not significant in the model. Thus, it seems that the effect of financial literacy is captured by the question: *Let's say you have DOP 200 in a savings account. The account accrues 10% interest per year. How much will you have in the account after two years?*

Moreover, individuals that feel the need for financial information have a higher probability of obtaining formal credit. However, this effect could emerge from the fact that individuals feel the need for more financial information once in the formal market. This could be true as 68% of the households in the formal market said they needed more financial information.

The financial discipline shown by households also has an effect on credit behavior. The less disciplined an individual the more prone to acquire credit from the informal market, or to stay out of the credit market.

Estimates suggest that when a household experiences an increase of DOP 1,000 (or USD 21) in its monthly income, the ratio of the probability of obtaining credit in the informal market over the likelihood of acquiring credit from the formal market decreases by 2.5%.[9] Specifically, an increase of USD 21 decreases the likelihood of obtaining credit from the informal market by 0.40 percentage points, while the probability of obtaining credit from the formal market increases by 0.25 percentage points.

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[9] Income is measured in thousands of Dominican pesos. Therefore, in the marginal analysis, we consider increases of DOP 1,000 (or USD 21).

Table 2

RELATIVE RISK RATIOS; FORMAL CREDIT AS BASE GROUP

	Informal Credit	Out of the Market
Income	0.9999[c]	0.9999[a]
Age		
25-46	0.2470[b]	0.3033[a]
47-59	0.2107[b]	0.2865[a]
60 and older	0.1278[c]	0.2145[b]
Education		
Secondary	0.9111	1.0628
Tertiary	0.4405[b]	0.5293[a]
Banked	0.3851[c]	0.3682[c]
Financial discipline	0.7074[c]	0.7062[c]
Financial literacy (Dif annual and monthly)	1.2532	1.0437
Financial literacy (Concept)	0.5398[b]	1.6268
Needs information	0.6225[a]	0.5499[b]
Number of observations = 947		
LR $\chi^2(33)$ = 96.45		
Prob > χ^2 = 0.0000		
Pseudo R^2 = 0.0476		

Nota: [a]p<0.1, [b]p<0.05, [c]p<0.01.

It is important to consider that the estimated parameter in the income variable might be negatively biased. The households in our sample have a lower income on average than the rest of the households in the survey. Since lower-income households are more prone to acquire credit from the informal credit market, the effect of an income increase on the probability of acquiring formal credit might be underestimated. Because the average income of the households in our sample is significantly different from the average income of the rest of the households, the presence of higher-income individuals in our sample would have had important positive effects on the income coefficient.[10] This implies that changes in the probability of acquiring formal credit, given an increase of DOP 1000 in household income, would have been higher, on average, if the higher-income individuals had experienced budget deficits in the past twelve months.

On the other hand, the relative risk ratio conditioned upon the variable *banked* measures the percentage by which the relative risk ratio of a banked individual exceeds the RRR of an unbanked individual. In the Dominican Republic, this percentage is 160% (1/0.38), meaning that compared to an unbanked individual, a banked individual is more prone to obtain credit from the formal credit market than from the informal market.

Since possible endogeneity would stem from the fact that those who use financial services like bank accounts and credit cards usually have higher financial knowledge (S&P Global FinLit Survey), we tested the interaction of financial literacy with the variable *banked* to see if there was a possible effect of using formal financial services and financial literacy. Nevertheless, the variable was not significant, and the coefficients did not show important changes. (See Annex)

Furthermore, following Guirkinger (2006), we tested the possibility of individuals not entering the formal credit market due to the possibility of rejection from it. But the introduction of this variable to the model produced similar results.

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[10] This is possible if we assume that the high-income individuals in our sample behave similarly to the rest of the high-income individuals in the survey.

6. CONCLUSIONS

The goal of this paper was to analyze the effect of financial literacy on the behavior of economic agents in the credit market of the Dominican Republic. We could understand the role of this variable through the study of individuals facing the decision of choosing between informal and formal credit to finance their current expenditures.

By measuring financial literacy as the comprehension of the interest rate, our results allow us to conclude that lack of financial literacy has important effects on credit behavior. Specifically, a literate individual has an 85% higher probability of acquiring formal credit over obtaining informal credit. Tertiary education also increases the probability of acquiring formal credit.

Our model shows that those who feel the need of financial information have a higher probability of being in the formal credit market. This could indicate that once in the formal market, households feel the need of financial information, which is interesting as it points to a lack of information on the formal credit market.

Financially disciplined households tend to finance their expenditures with formal credit, rather than informal credit. This goes hand-in-hand with financial literacy since financially educated individuals tend to be more disciplined when it comes to credit.

Moreover, the banked variable shows high significance, suggesting that inclusion in the banking system is a key factor in the promotion of formal credit. However, since banks perceive low-income individuals as risky, they establish a threshold for income level debtors. They must pass this threshold to qualify for credit, thus excluding low-income individuals from the formal market. Consequently, for some individuals, an income increase has no effect on the probability of acquiring credit from the formal credit market.

Consequently, our results support the hypothesis of Campero and Kaiser (2013) regarding the complementarity of formal and informal credit markets. Households below the income threshold established by banks are automatically excluded from the formal market. Therefore, informal agents' advantage of monitoring lenders allows them to reach the marginalized segment of the market (Tressel, 2003), functioning as a fund channel from the banking sector (Bose, 1998; Floro and Ray, 1997; Hoff and Stiglitz, 1998). [11]

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[11] Specifically in Latin America, monitoring mechanisms often rely on violence and threats and depend on the proximity between lenders and borrowers (CAF, 2011).

Our results also coincide with Campbell (2006) and the S&P Global FinLit Survey, as within our model poorer and less educated individuals have higher probabilities of acquiring informal credit. However, the informal credit market can strengthen development by reaching segments of the population that formal credit entities cannot reach. Even so, the formal credit market has lower transactional costs, as well as a more efficient allocation of capital, financial resources, and economic risk.

The findings of our study in the Dominican Republic and in other literature suggest efforts should be made to expand financial education and banking services among poor households.

ANNEX

Model

Informal credit

	Coefficients	Standard error	z	P>|z|	[95% Confidence interval]	
Income	−2.6E−05	5.92E−06	−4.39	0	−3.8E−05	−1.4E−05
Age						
25-46	−1.39832	0.669675	−2.09	0.037	−2.71086	−0.08578
47-59	−1.55712	0.703804	−2.21	0.027	−2.93655	−0.17769
60 and older	−2.05726	0.72619	−2.83	0.005	−3.48057	−0.63395
Education						
Secondary	−0.09307	0.346205	−0.27	0.788	−0.77162	0.585478
Tertiary	−0.81977	0.343306	−2.39	0.017	−1.49264	−0.14691
Banked	−0.9542	0.333584	−2.86	0.004	−1.60801	−0.30039
Financial discipline	−0.34616	0.133664	−2.59	0.01	−0.60814	−0.08418
Financial literacy (Monthly and annual)	0.225698	0.273251	0.83	0.409	−0.30986	0.761261
Financial literacy (simple interest)	−0.6166	0.323684	−1.9	0.057	−1.25101	0.017805
Needs information	−0.4737	0.284825	−1.66	0.096	−1.03194	0.084551
Constraint	6.83513	1.000461	6.83	0	4.874262	8.795998

Formal credit	Coefficients	Standard error	z	P>|z|	[95% Confidence interval]	
Out of the market	(base outcome)					
Income	-5.24E-06	3.11E-06	-1.69	0.092	-1.1E-05	8.48E-07
Age						
25-46	-1.19317	0.680406	-1.75	0.079	-2.52674	0.140402
47-59	-1.25009	0.715269	-1.75	0.081	-2.65199	0.151815
60 and older	-1.53927	0.737131	-2.09	0.037	-2.98402	-0.09452
Education						
Secondary	0.060867	0.353763	0.17	0.863	-0.6325	0.75423
Tertiary	-0.63613	0.351405	-1.81	0.07	-1.32487	0.052614
Banked	-0.99923	0.338589	-2.95	0.003	-1.66286	-0.33561
Financial discipline	-0.34786	0.135574	-2.57	0.01	-0.61358	-0.08214
Financial literacy (Monthly and annual)	0.042753	0.279676	0.15	0.879	-0.5054	0.590908
Financial literacy (Simple interest)	-0.46716	0.330169	-1.41	0.157	-1.11428	0.179959
Needs information	-0.59801	0.289561	-2.07	0.039	-1.16554	-0.03048
Constraint	5.776349	1.013449	5.7	0	3.790025	7.762673

Formal and informal

Income	-9.07E-06	8.23E-06	-1.1	0.27	-2.5E-05	7.06E-06
Age						
25-46	-1.13457	0.863079	-1.31	0.189	-2.82617	0.557036
47-59	-0.68465	0.897622	-0.76	0.446	-2.44396	1.074657
60 and older	-1.40091	0.957622	-1.46	0.143	-3.27781	0.475999
Education						
Secondary	-0.01179	0.490417	-0.02	0.981	-0.97299	0.949413
Tertiary	-0.59126	0.50241	-1.18	0.239	-1.57596	0.393447
Banked	-0.09607	0.471873	-0.2	0.839	-1.02093	0.82878
Financial discipline	-0.56045	0.172965	-3.24	0.001	-0.89946	-0.22145
Financial literacy (Monthly and annual)	0.551547	0.396845	1.39	0.165	-0.22625	1.329348
Financial literacy (Simple interest)	-0.52703	0.450214	-1.17	0.242	-1.40943	0.355372
Needs information	-0.48508	0.396704	-1.22	0.221	-1.26261	0.292444
Constraint	3.687037	1.256388	2.93	0.003	1.224562	6.149512

Testing Independence of Irrelevant Alternatives

Test [m1_3 = m2_3], cons	Test [m1_4 = m2_4], cons
[m1_3]ingreso - [m2_3] ingreso = 0	[m1_4]ingreso - [m2_4] ingreso = 0
[m1_3]1b.age - [m2_3]1b. age = 0	[m1_4]1b.age - [m2_4]1b. age = 0
[m1_3]2.age - [m2_3]2.age = 0	[m1_4]2.age - [m2_4]2.age = 0
[m1_3]3.age - [m2_3]3.age = 0	[m1_4]3.age - [m2_4]3.age = 0
[m1_3]4.age - [m2_3]4.age = 0	[m1_4]4.age - [m2_4]4.age = 0
[m1_3]1b.educ - [m2_3]1b. educ = 0	[m1_4]1b.educ - [m2_4]1b. educ = 0
[m1_3]2.educ - [m2_3]2. educ = 0	[m1_4]2.educ - [m2_4]2. educ = 0
[m1_3]3.educ - [m2_3]3. educ = 0	[m1_4]3.educ - [m2_4]3. educ = 0
[m1_3]ban - [m2_3]ban = 0	[m1_4]ban - [m2_4]ban = 0
[m1_3]actitud_fin - [m2_3] actitud_fin = 0	[m1_4]actitud_fin - [m2_4] actitud_fin = 0
[m1_3]dif_tasa - [m2_3] dif_tasa = 0	[m1_4]dif_tasa - [m2_4] dif_tasa = 0
[m1_3]tasa_av - [m2_3]tasa_ av = 0	[m1_4]tasa_av - [m2_4]tasa_ av = 0
[m1_3]nec_info - [m2_3] nec_info = 0	[m1_4]nec_info - [m2_4] nec_info = 0
[m1_3]_cons - [m2_3]_ cons = 0	[m1_4]_cons - [m2_4]_ cons = 0
Constraint 2 dropped	Constraint 2 dropped
Constraint 6 dropped	Constraint 6 dropped
$\chi^2(12) = 8.02$	$\chi^2(12) = 4.50$
Prob > χ^2 = 0.7834	Prob > χ^2 = 0.9726

Test [m1_2 = m3_2], cons	*Test [m1_4 = m3_4], cons*
[m1_2]ingreso - [m3_2] ingreso = 0	[m1_4]ingreso - [m3_4] ingreso = 0
[m1_2]1b.age - [m3_2]1b. age = 0	[m1_4]1b.age - [m3_4]1b. age = 0
[m1_2]2.age - [m3_2]2.age = 0	[m1_4]2.age - [m3_4]2.age = 0
[m1_2]3.age - [m3_2]3.age = 0	[m1_4]3.age - [m3_4]3.age = 0
[m1_2]4.age - [m3_2]4.age = 0	[m1_4]4.age - [m3_4]4.age = 0
[m1_2]1b.educ - [m3_2]1b. educ = 0	[m1_4]1b.educ - [m3_4]1b. educ = 0
[m1_2]2.educ - [m3_2]2. educ = 0	[m1_4]2.educ - [m3_4]2. educ = 0
[m1_2]3.educ - [m3_2]3. educ = 0	[m1_4]3.educ - [m3_4]3. educ = 0
[m1_2]ban - [m3_2]ban = 0	[m1_4]ban - [m3_4]ban = 0
[m1_2]actitud_fin - [m3_2] actitud_fin = 0	[m1_4]actitud_fin - [m3_4] actitud_fin = 0
[m1_2]dif_tasa - [m3_2] dif_tasa = 0	[m1_4]dif_tasa - [m3_4] dif_tasa = 0
[m1_2]tasa_av - [m3_2]tasa_ av = 0	[m1_4]tasa_av - [m3_4]tasa_ av = 0
[m1_2]nec_info - [m3_2] nec_info = 0	[m1_4]nec_info - [m3_4] nec_info = 0
[m1_2]_cons - [m3_2]_ cons = 0	[m1_4]_cons - [m3_4]_ cons = 0
Constraint 2 dropped	Constraint 2 dropped
Constraint 6 dropped	Constraint 6 dropped
$\chi^2(12) = 16.64$	$\chi^2(12) = 2.96$
Prob $> \chi^2 = 0.1635$	Prob $> \chi^2 = 0.9958$

Test [m1_2 = m4_2], cons	*Test [m1_3 = m4_3], cons*
[m1_2]ingreso - [m4_2] ingreso = 0	[m1_3]ingreso - [m4_3] ingreso = 0
[m1_2]1b.age - [m4_2]1b. age = 0	[m1_3]1b.age - [m4_3]1b. age = 0
[m1_2]2.age - [m4_2]2.age = 0	[m1_3]2.age - [m4_3]2.age = 0
[m1_2]3.age - [m4_2]3.age = 0	[m1_3]3.age - [m4_3]3.age = 0
[m1_2]4.age - [m4_2]4.age = 0	[m1_3]4.age - [m4_3]4.age = 0
[m1_2]1b.educ - [m4_2]1b. educ = 0	[m1_3]1b.educ - [m4_3]1b. educ = 0
[m1_2]2.educ - [m4_2]2. educ = 0	[m1_3]2.educ - [m4_3]2. educ = 0
[m1_2]3.educ - [m4_2]3. educ = 0	[m1_3]3.educ - [m4_3]3. educ = 0
[m1_2]ban - [m4_2]ban = 0	[m1_3]ban - [m4_3]ban = 0
[m1_2]actitud_fin - [m4_2] actitud_fin = 0	[m1_3]actitud_fin - [m4_3] actitud_fin = 0
[m1_2]dif_tasa - [m4_2] dif_tasa = 0	[m1_3]dif_tasa - [m4_3] dif_tasa = 0
[m1_2]tasa_av - [m4_2]tasa_ av = 0	[m1_3]tasa_av - [m4_3]tasa_ av = 0
[m1_2]nec_info - [m4_2] nec_info = 0	[m1_3]nec_info - [m4_3] nec_info = 0
[m1_2]_cons - [m4_2]_ cons = 0	[m1_3]_cons - [m4_3]_ cons = 0
Constraint 2 dropped	Constraint 2 dropped
Constraint 6 dropped	Constraint 6 dropped
$\chi^2(12) = 8.02$	$\chi^2(12) = 3.57$
Prob > χ^2 = 0.7835	Prob > χ^2 = 0.9900

Testing the Interaction of Financial Literacy with the Variable Banked

	Coefficients	Standard error	z	P>|z|	[95% Confidence interval]	
Informal credit						
Income	−2.6E−05	5.97E−06	−4.42	0	−0.0000381	−0.0000147
Age						
25-46	−1.44579	0.671708	−2.15	0.031	−2.762317	−0.1292706
47-59	−1.59759	0.704881	−2.27	0.023	−2.979134	−0.2160502
60 and older	−2.11035	0.728343	−2.9	0.004	−3.537879	−0.6828266
Education						
Secondary	−0.11384	0.347864	−0.33	0.743	−0.7956391	0.5679642
Tertiary	−0.80661	0.343863	−2.35	0.019	−1.48057	−0.1326514
Banked	−2.01311	1.022146	−1.97	0.049	−4.016478	−0.009739
Financial discipline	−0.34112	0.133641	−2.55	0.011	−0.6030462	−0.0791849
Financial literacy (Monthly and annual)	−0.08019	0.597015	−0.13	0.893	−1.25032	1.089936
Financial literacy (Simple interest)	−1.49054	1.003928	−1.48	0.138	−3.458205	0.4771215
Needs information	−0.47151	0.285234	−1.65	0.098	−1.030556	0.0875397
Monthly-annual_ban	0.942225	1.062058	0.89	0.375	−1.139371	3.023821
Simpleinterest_ban	0.482863	0.661766	0.73	0.466	−0.8141749	1.7799
Constraint	7.771248	1.336776	5.81	0	5.151216	10.39128

	Coefficients	Standard error	z	P>|z|	[95% Confidence interval]
Formal credit					
Out of the market	(base outcome)				
Income	−5.49E−06	3.12E−06	−1.76	0.078	−0.0000116	6.19E−07
Age						
25-46	−1.15438	0.682198	−1.69	0.091	−2.491463	0.182705
47-59	−1.22059	0.716188	−1.7	0.088	−2.624289	0.1831138
60 and older	−1.50326	0.738577	−2.04	0.042	−2.950847	−0.0556784
Education						
Secondary	0.075177	0.354812	0.21	0.832	−0.6202428	0.7705961
Tertiary	−0.63297	0.351687	−1.8	0.072	−1.322265	0.0563217
Banked	−1.76295	1.030501	−1.71	0.087	−3.782693	0.2567954
Financial discipline	−0.34564	0.135505	−2.55	0.011	−0.6112238	−0.0800545
Financial literacy (Monthly and annual)	0.216001	0.607648	0.36	0.722	−0.9749673	1.40697
Financial literacy (Simple interest)	−1.41119	1.012238	−1.39	0.163	−3.395142	0.5727568
Needs information	−0.59756	0.289872	−2.06	0.039	−1.165693	−0.0294167
Monthly-annual_ban	1.077975	1.072325	1.01	0.315	−1.023743	3.179693
Simpleinterest_ban	−0.33432	0.674649	−0.5	0.62	−1.656604	0.9879726
Constraint	6.460918	1.349243	4.79	0	3.816451	9.105385

Formal and informal

Income	−8.90E-06	7.73E-06	−1.15	0.249	−0.000024	6.24E-06
Age						
25-46	−1.14256	0.869294	−1.31	0.189	−2.846345	0.5612229
47-59	−0.67648	0.90241	−0.75	0.453	−2.445169	1.092214
60 and older	−1.42338	0.959529	−1.48	0.138	−3.304023	0.4572602
Education						
Secondary	−0.06807	0.48837	−0.14	0.889	−1.025258	0.8891163
Tertiary	−0.60804	0.502147	−1.21	0.226	−1.592226	0.3761529
Banked	−2.16724	1.218572	−1.78	0.075	−4.555597	0.2211151
Financial discipline	−0.56531	0.173932	−3.25	0.001	−0.9062077	−0.2244073
Financial literacy (Monthly and annual)	1.144198	0.870187	1.31	0.189	−0.561337	2.849733
Financial literacy (Simple interest)	−3.33816	1.189385	−2.81	0.005	−5.669315	−1.00701
Needs information	−0.46055	0.398611	−1.16	0.248	−1.241811	0.3207141
Monthly-annual_ban	3.799344	1.318304	2.88	0.004	1.215517	6.383172
Simpleinterest_ban	−0.77625	0.961426	−0.81	0.419	−2.660609	1.108113
Constraint	5.095929	1.587076	3.21	0.001	1.985316	8.206541

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Bankarization among Households in the Dominican Republic

Carlos Delgado Urbáez

Abstract

This research studies the determinants of the probability that a Dominican family is banked. Data is used from the Encuesta de Cultura Económica y Financiera 2014 (Financial and Economic Culture Survey 2014) of the Banco Central de la República Dominicana. Results show a significant role of variables related to financial attitudes, as financial issues oversight and previous payment capacity verification, and work status.

Keywords: bankarization, probability models, financial inclusion, financial attitudes, financial education

JEL classification: C21, D14, G21, G28.

1. INTRODUCTION

During recent years, different public and private sectors initiatives have been implemented in the Dominican Republic targeted at promoting bankarization (defined in this paper as ownership by any member of a Dominican household of at least one banking product). Such initiatives are related to regulatory policies or the application of financial education programs.

These initiatives have been motivated by the low bankarization rates estimated for the Dominican Republic. In this regard, the Encuesta de Cultura Económica y Financiera 2014 (Financial and Economic Culture Survey 2014) conducted by the Banco Central de la República Dominicana showed that approximately 62% of Dominican households own at least one banking sector instrument, which under the most conservative scenario would imply per capita bankarization rates of around 31%.

According to data from the World Bank`s 2014 Global Findex Survey, 54% of adults in the Dominican Republic reported having applied for some type of credit in the prior 12 months. Of this group, 18.2% performed this type of operation through formal financial institutions, while 20.9% (13.5% in 2011) accessed them through so-called informal lenders. This figure is above the world average (4.6%), as well as that for the group of Latin American and Caribbean countries (4.7%). A similar phenomenon can be seen on the side of deposit instruments, with 57% of adults reporting having saved, 26.5% of which used formal financial institutions for such purposes.

In this setting of low bankarization in the Dominican Republic and the existence of initiatives implemented to promote it, there remains an absence of academic research to serve as a basis for establishing guidelines for designing larger scale more coordinated efforts, such as financial education and inclusion strategies. The objective of this paper is therefore to provide an initial analytical framework for public policy dialogue on bankarization to build upon, studying what factors are determining bankarization rates.

To this end, we use data from the abovementioned Financial and Economic Culture Survey 2014 to estimate binary response models that allow for answers on factors that influence the likelihood that a Dominican household owns at least one banking product. We start with a base estimation that is gradually made more robust through the application of techniques that evaluate the presence of heteroscedasticity, endogeneity, and selection bias.

The paper is divided into four sections besides this introduction. Section 2 presents the literature related to the benefits of financial development and subsequently addresses the determinants of it. Section 3 provides a description of the data and the context in which it is employed. Section 4 contains the results of the probability estimates, an analysis of the results obtained and their implications in terms of public policies. Finally. section 5 summarizes the

findings, recommends policy actions, and makes suggestions for future research.

2. PREVIOUS STUDIES

There is a body of literature describing the advantages of financial development–of which bankarization forms part–for promoting economic wellbeing through different means. This literature includes the theoretical works of Banerjee and Newman (1993), Lloyd-Ellis and Bernhardt (2000), Cagetti and De Nardi (2006), Buera et al. (2011, 2012), Moll (2014) and Dabla-Norris et al. (2015), establishing the links between financial development, productivity and labor income, as well as financial development and aggregate economic growth.

Meanwhile, empirical research exists that emphasizes the importance of financial development for long-term economic expansion, such as the papers of Levine (2005), Beck et al. (2000), and King and Levine (1993). Moreover, with respect to the topic of deposit predictability and resilience to consumption are the works of Han and Melecky (2013), and Mehrotra and Yetman (2015).

Empirical literature has also focused efforts on the use of surveys and more detailed data to research the determinants underpinning the processes for accessing financial services. In this regard, we can cite the research papers of Devlin (2005) and Hogarth et al. (2005), which conclude that financial exclusion is associated to employment status, income levels, housing tenure, net worth, marital status, education, race, and age. Likewise, Fungáĉová and Weill (2014), Weill and Zins (2016), and Rodríguez-Raga and Riaño-Rodríguez (2016) found that, for the case of China, Africa and Colombia, access to financial products is linked to income levels, education, job stability, age, and sex. Furthermore, the work of Allen et al. (2016) provides evidence that access to bank accounts is determined by lower account costs, greater proximity to financial intermediaries, a framework protecting legal rights, and a stable political environment.

In the case of financial education as a factor determining access to banking products, there are the contributions of Lusardi and Mitchell (2007, 2009), Alessie et al. (2011), and Klapper et al. (2013), providing evidence that participation in financial markets increases with levels of financial literacy. The latter is in contrast

to the findings of Xu and Zia (2012) that there is no clear relation between financial education and having a bank account, although the authors refer to several papers in which such education encourages saving among low income individuals and minority groups. More recently, meta-analysis of 188 research papers conducted by Miller et al. (2014) suggests that interventions targeted at improving financial education can have a positive impact on savings generation, although not on other aspects, such as credit delinquency. In a similar way, Fernandes et al. (2014) performed a meta-analysis for 168 research papers on the link between financial education and financial behavior, and concluded that financial education interventions explain just 0.1% of changes in financial decision-making.

Research work has also undergone a change with regard to the estimation techniques employed. In the beginning, the authors' concerns concentrated on aggregate measures of saving and credit and their interaction with other similar metrics. They therefore mainly employed time series methods, later shifting towards more appropriate techniques for working with panel data structures. However, the emergence of surveys related to financial inclusion and financial literacy has led to a shift in the balance of research towards favoring microeconomic-type studies with an emphasis on sociodemographic aspects as determinants for banking products. In this process, the use of microeconometrics, reflected in the application of probability models for binary variables, has intensified with them being frequently employed together with techniques for addressing bias selection, as well as endogeneity. Subsequently, the increase in surveys on financial inclusion has made it possible to construct panel data, which has led to the use of dichotomous response probability models with panel data structures. Moreover, the use of control experiments with an approach from the behavioral branch of economics has become more common, while sampling and design techniques for surveys concerning access to financial services have become gradually more specialized in response to the difficulties of consistently estimating the causality of access to financial services.

3. DATA

The data used in this study correspond to those obtained by the Banco Central de la República Dominicana through application of

Table 1

DESCRIPTIVE STATISTICS FOR AGE AND MONTHLY HOUSEHOLD INCOME

Variable	Banked	Unbanked	Percentile 25	Median	Percentile 75
Age (years)	43	47	32	42	53
Monthly household income, in USD	511.9	241.7	179.1	271.0	436.3

Source: Own calculations based on data from the Financial and Economic Culture Survey.

the Financial and Economic Culture Survey 2014, the main characteristics of which are summarized in Annex 1.

In the survey, 54% of respondents were women and 46% men. As for work status, approximately 33% of respondents reported being self-employed, 25% reported being employed in the private sector, 12.9% were homemakers, and 12.1% were public sector employees. As a result of these economic activities, households received an average monthly income of 271 dollars (see Table 1).[1]

With respect to marital status, 34% of respondents answered being co-habiting with a partner, 21.5% said they had been married, while 21.1% were separated. Finally, 13.6% said they were single.

As for bankarization rates, 62.3% of households owned at least one banking product. In terms of adults per household –the average is 2.3 adults–, if all of them own banking products it would mean that the bankarization level was indeed 62.3%. That is, 62.3% of adults in the sample were banked. Nevertheless, under a different scenario

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[1] Dominican pesos (DOP) were converted into United States dollars (USD) at the exchange rate of 43.55 DOP/USD in August 2014. This value of 271 USD can be compared to the figures reported according to World Bank data by Costa Rica (1,980 USD), Panamá (1,863 USD), El Salvador (900 USD), Honduras (702 USD), and Nicaragua (855 USD) as their average per capita income or consumption, according to surveys. To do this, data reported on a monthly basis is multiplied by three, which is the average number of Dominican household members according to the Financial and Economic Culture Survey.

Table 2

LIST OF BANKING PRODUCTS BY OWNERSHIP AND USE

Banking product	Households owning them	Household using them
Savings account	967	891
Accounts at cooperatives	267	256
Current account	96	85
Foreign currency account	31	29
Payroll account	680	664
Fixed-term deposit		54
Consumer loan		76
Cooperative loan		156
Mortgage loan		48
Line of credit		51
Payday loan		106
Personal loan		246
Car loan		45
Small- and medium-sized business loan from a private bank		56
Small- and medium-sized business loan from an nongovernment organization		21
Small- and medium-sized business loan from an ethical bank		63
Credit card	478	458
Prepaid card	159	148

Source: Own calculations based on data from the Financial and Economic Culture Survey.

where only one adult in the household owned banking products, the actual level of bankarization would decrease to 31.2%.

It is important to point out that the most commonly owned products were savings accounts, payroll accounts, and credit cards, as illustrated in Table 2.

The survey also captures data on the reasons why households do not own banking products. Such information is used to determine whether the specifications are missing variables that could be

important for explaining bankarization. Thus, 68.1% of unbanked individuals reported that a lack of income prevented them from owning formal banking products, 42.7% mentioned not having a regular income as the reason preventing them from being banked, while 20% said they prefer to deal with informal entities. To a lesser extent, 16.4% argued that a large amount of requirements and documents prevent them from being banked, 12.7% expressed their distrust in formal institutions, while 11.5% mentioned high banking commissions as a disincentive. Finally, 6.4% stated that transportation difficulties and distances from banking facilities were some of the reasons for not owning financial products.

4. ECONOMETRIC STRATEGY AND RESULTS

The aim of this paper is to study the factors determining the likelihood of a Dominican household being banked. To this end, a household is considered banked when the respondent reports there being at least one member who owns some type of banking product. Thus, the bankarization variable is a binary variable that takes the value one when it fulfills the aforementioned condition, and zero if not.

In such cases where the variable of interest is dichotomous, the traditional practice is to use probability models for binary response variables. To write this type of model we turn to a latent variable interpretation. Being that y^* is a latent unobservable variable determined by:

1
$$y^* = x'\beta + v \, .$$

It can be seen, however, that there is another variable z, allowing the following to be identified:

2
$$z = \begin{cases} 1, y^* > 0 \\ 0, y^* \leq 0 \end{cases} \, .$$

Therefore,

3
$$\Pr(z = 1) = \Pr(x'\beta + v > 0) = \Pr(x'\beta > -v) = F(x'\beta) \, .$$

Hence, $F(x'\beta)$ is the cumulative distribution function of $-v$, and is estimated according to a probit model by assuming that v is

distributed according to a normal standard distribution. The problem of identifying $x'\beta$ implies restricting the variance of v to one. Estimation of this specification is performed via the maximum likelihood method.

In our case, the variable z represents the binary variable for bankarization. To estimate the probability of being banked it is necessary to define the variables to be included in the vector of explanatory variables x'. These variables are obtained from observations in the empirical literature and the obstacles to bankarization reported in the survey. Table 3 provides a summary of the variables included.

4.1 Base Estimation

The results of the base estimation, following the methodological criteria described in the first part of section 4, are summarized in Table 4.

First, it stands out that the coefficients estimated are statistically significant at the 1% level, except the indicative variable for the East Rural geographic area that exhibits statistical significance at the 95% confidence level. The coefficients also present signs consistent with a priori expectations.

The estimation was submitted to the comparison proposed by Stukel (1988), verifying whether this rejects the null hypothesis that the model does not need to be generalized to include nonlinear items, with a probability value of 62.2%. In addition, the Hosmer and Lemesbow (1980) statistics test was also used to assess the goodness of fit in the model, and found that there is no evidence to reject the null hypothesis of correct specification at a 5% significance level in any case from group specifications 3 to 15.

In goodness of fit terms, the model correctly classifies 1,461 households out of a total of 2,227, equivalent to 79.4%. In particular, the probability of predicting that a household is banked when it is indeed banked is 86.0%, while the probability of classifying a household as unbanked when it is not is 68.2%. This implies a false positive rate of 31.8% and a false negative rate of 14.0%.

4.2 Heteroscedastic Estimation

Specification of binary probabilistic models assumes that error variance is constant in the underlying or latent variable model, which is

Table 3

DESCRIPTION OF EXPLANATORY VARIABLES

Variable	Description
Final year of educational attainment	The final year of educational attainment is used as a proxy for formal education. It is included in the model assigning a separate category to each education level, with a value of one when this category represents the final academic year attained, and zero if not. We expect levels of formal education to have a positive effect on bankarization probability given that formal education levels build people's capacities for understanding the importance and advantages of using banking products.
Age	The age reported by the respondent. We expect a positive sign because older age implies a longer amount of time for an individual to accumulate the experience necessary to establish the incentives eventually leading them to being banked. Furthermore, Xu and Zia (2012) point out that there is a relation between age and financial education, meaning that financial education not measured by this survey is possibly channeled into age.
Work status	Included in the model by assigning a separate category to each work status, with the value of one when said category represents the corresponding employment status, and zero if not. We generally expect a work status that implies a certain amount of job security and stability to be positively linked to the probability of being banked, particularly because payroll and saving accounts are often used to pay wages. For instance, the case of public employees is particularly interesting given the formality of the public sector and the fact that wages are usually paid through banks. This is also the case for retirees or pensioners.
Monthly household income	Monthly household income is included as a Napierian logarithm. We expect positive sign coefficient given that higher levels of monthly income allow a household to finance the costs of accessing and using financial products. Apart from this, the literature assigns recurring importance to this variable for explaining bankarization.
Contributes to the household budget	A dichotomous variable that takes the value one when a respondent answers yes to the question on whether they contribute to the household budget, and zero if not. We expect that contributing to the family budget raises the probability of being banked because it implies the existence of excess income for budgeting and assumes an organization of family resources that reflects a certain level of diligence.

Table 3 (cont.)

Variable	Description
Time household can subsist if it loses its main source of income	This variable is included identifying each category with a specific dichotomous variable that takes the value one if the respondent answers in the category, and zero if not. This variable measures a household's saving capacity and its capacity to diversify sources of income. In general, low subsistence should be associated with a reduced likelihood of using banking products because it reflects nonexistence of excess income for house-holds to finance themselves during emergencies, and consequently limits their capacity to acquire banking products.
Trust in financial information	A dichotomous variable that takes the value one when some respondent answers yes to the question on wheth-er they trust in the available financial information, and zero if not. We expect a positive sign given that the perception of reliable financial information suggests a greater willingness to consume banking products. In fact, the survey demonstrates that distrust in the formal banking sector and the preference for informality are obstacles to being banked.
Money is for spending	A dichotomous variable that takes the value one when the respondent answers yes to the question on whether money is for spending, and zero if not. In this way, it seeks to measure a respondent's willingness to save or their attitude towards it. We expect a negative associa-tion with the probability of being banked, particularly in a context of informality, given that a predisposition to this attitude reduces the probability of saving and thereby the incentive for having savings accounts.
Assesses if they can pay before making a purchase	This variable is included identifying each category with a specific dichotomous variable that takes the value one if the respondent answers in the category, and zero if not. The variable registers the answer of the respondent to the question on whether before making a purchase they carefully consider if they can pay for it. It therefore measures a precautionary attitude when making pur-chases. We expect an attitude of constant assessment is positively associated to a greater probability of owning financial products in a similar way to the predisposition to spend money.

Monitors financial affairs	This variable is included identifying each category with a specific dichotomous variable that takes the value one if the respondent gives an answer in the category, and zero if not. The variable registers the respondent's answer to the question on whether they personally monitor their financial affairs. It therefore measures their level of diligence regarding financial affairs, which is interpreted as a precondition for banking products to be used for financial management and to encourage behavior that makes the respondent a candidate for accessing credit products. A vigilant attitude is expected to have a positive influence on the probability of being banked.
Marital status	This variable is included identifying each category with a specific dichotomous variable that takes the value one if a respondent gives an answer in the category, and zero if not. This variable registers a respondent's answer to the question on their marital status. We expect a marital status that implies cohabiting with a partner to increase the probability of being banked due to the scale effect of a united effort. Likewise, a marital status that implies separation or loss of a partner reduces the probability of owning financial products.
Financial education	This variable is included identifying each category with a specific dichotomous variable that takes the value one if a respondent answers the question on financial education correctly, and zero if not. This variable registers a respondent's answer to the financial education questions. As stated in some of the previously mentioned literature, we expect correct answers to be associated with higher levels of banking given how it indicates an individual can understand the advantages of acquiring banking products.
Geographic areas	We incorporate this group of dichotomous variables, which take the value one when a household is located in the referred area and 0 if it is not. Inclusion of this type of variable responds to the need to control for the effects on banking of a particular region having few bank branches or agencies, or that a large population density can be reflected in a higher number of unbanked individuals.

Note: Descriptive statistics for these variables are presented in the Annex (tables A.1 to A.13).
Source: Own elaboration based on the Financial and Economic Culture Survey.

Table 4

BASE MODEL

Dependent Variable	Household owns at least one banking instrument: Yes = 1; No = 0
Model	Method	Probit model	Maximum likelihood
Observations	2,227 Households

Variable	Coefficient	Marginal effect (on the mean)	Probability (coefficient = 0)[1]	Mean coefficient
Constant	−6.26		0.00%	
Final year of educational attainment				
University degree	0.67	0.20	0.00%	0.12
Incomplete university degree	0.69	0.20	0.00%	0.11
Completed secondary education	0.34	0.11	0.00%	0.15
Work status				
Public employee	1.52	0.34	0.00%	0.12
Private employee	0.87	0.26	0.00%	0.25
Retired or pensioned	1.46	0.29	0.00%	0.03
Household income				
Logarithm	0.56	0.20	0.00%	9.44
Time household can subsist if it loses its main source of income				
One week	−0.26	−0.10	0.00%	0.28

Trust in financial information				
Yes	0.24	0.09	0.00%	0.51
Money is for spending				
Strongly agree	−0.30	−0.11	0.00%	0.21
Assesses if they can pay before making a purchase				
Almost never	−1.82	−0.60	0.00%	0.01
Monitors financial affairs				
Never	−0.71	−0.27	0.00%	0.05
Does not know	−1.64	−0.57	0.00%	0.03
Contributes to the household budget				
Yes	0.29	0.11	0.10%	0.91
Age				
Age	0.04	0.01	1.00%	44.25
Age squared	−0.0004	−0.0001	0.00%	2,185
Geographic areas				
Urban Santo Domingo	−0.35	−0.13	0.00%	0.22
Rural East	−0.48	−0.18	2.80%	0.02
Urban East	−0.23	−0.08	0.50%	0.21
Pseudo R²	34.6%			

Note: ¹Calculated using robust standard errors. This becomes unnecessary if the model is correctly specified.

commonly understood as the assumption of error homoscedasticity. Considering that during the use of robust errors some differences were revealed with respect to the ordinary errors, we therefore test the assumption of homoscedasticity.

Given that in a binary model the underlying variable follows a binomial process and variance is determined by the mean, there is a possibility that the variables employed to estimate variance are, alternatively, ones that have been omitted from the conditional mean estimation. Such omission is addressed following Cameron and Trivedi (2010) by estimating a heteroscedastic probit model in which variance is modeled according to the variables correlated with the squared residual. A summary of the estimation results is presented in Table 5.

The results from the heteroscedastic model estimation reveal that the contrast for testing if the log variance is equal to zero –variance is unitary and constant– gives a χ^2 statistic with two degrees of freedom of 8.4, with a statistical significance of less than 5% probability of being below its critical value. With this, we reject the null hypothesis and conclude that there are advantages for estimating a probit model that includes a specification for variance.

The results of the heteroscedastic model presented in Table 5 include a binary variable for *internet services* that takes the value one when a household has said services, and zero if not[2]. This variable, statistically significant at 1%, exhibits a marginal effect on the probability of being banked of 0.14 points. The significance of this variable for explaining the likelihood of a household being banked is indicative of the lower transportation costs made possible by being able to use financial services remotely.

With these inclusions, the conditional mean model shown in Table 5 correctly classifies 79.4% of households between banked and unbanked, meaning that in terms of predicting inside the sample, a similar situation is observed as with the base model. However, Hosmer and Lemesbow (1980) test statistics more broadly reiterate the null hypothesis of correct specification by verifying that a less than 20% probability for rejecting the null hypothesis was observed in any of the group specifications–from 3 to 15 groups.

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[2] Out of the group of variables selected for estimating variance, this variable was the only one statistically significant for estimating the conditional mean. The rest are presented in the annexes.

4.3 Estimation with Endogenous Regressor

In the estimations performed previously, the possibility persists of a regressor being endogenous. That is, it is determined by a common factor with the independent variable, and consequently the value estimated for the coefficient associated with said endogenous regressor is biased and inconsistent.

Out of the explicative variables included in the previous estimations, there is a well-founded suspicion that the household income variable might be endogenous. The reason for this is that while income allows for financing the costs of accessing and using financial instruments, thereby fostering bankarization, the use of them could also favor higher household income by generating yields on their investments. This overlap can bias the coefficient associated with the logarithm of household income, and will mainly depend on whether the investment instruments really do generate sufficient returns to be statistically important.

We therefore re-estimate the probabilistic model including instrumental variables correlated with household income, but not directly associated with the probability of being banked. The instrumental variables we use are listed in Table 6 along with their respective levels of correlation regarding log of household income. It is important to point out that the reported correlation s are statistically different from zero at a significance level of 5 per cent.

We perform the estimations of the endogenous model based on a structural specification, which is an estimate of the probability of a household being banked. We simultaneously estimate an equation for identifying the log of household income that includes structural model variables and the instruments described in Table 6 above as regressors. The correlation between the residuals of both models allows for testing the exogeneity of household income: if this correlation is statistically different from zero, both equations therefore have unexplained factors in common, leading to the conclusion that household income is endogenous.

The results of the endogenous model are presented in Table 7. The coefficients and marginal effects estimated do not exhibit important differences from those obtained using the heteroscedastic model. The most important result in this regard consists of the exogeneity test: the estimated correlation between structural and identification equation residuals is 0.07, with a 62% likelihood of being

Table 5

HETEROSCEDASTIC PROBIT MODEL

Dependent variable	Household owns at least one banking instrument: Yes = 1; No = 0
Model | Method	Probit model with variance estimate | Maximum likelihood
Observations	2,227 households

Variable	Coefficient	Marginal effect (on the mean)	Probability (coefficient = 0)
Constant	−5.48		0.00%
Final year of educational attainment			
University degree	0.56	0.20	0.00%
Incomplete university degree	0.62	0.22	0.00%
Completed secondary education	0.29	0.11	0.20%
Work status			
Public employee	1.47	0.53	0.00%
Private employee	0.86	0.31	0.00%
Retired or pensioned	1.43	0.51	0.00%
Household income			
Logarithm	0.48	0.17	0.00%
Time household can subsist if it loses its main source of income			
One week	−0.26	−0.09	0.00%

Trust in financial information			
Yes	0.24	0.08	0.00%
Money is for spending			
Strongly agree	−0.30	−0.11	0.00%
Assesses if they can pay before making a purchase			
Almost never	−1.83	−0.66	1.10%
Monitors financial affairs			
Never	−0.68	−0.24	0.00%
Do not know	−1.62	−0.58	0.00%
Contributes to household budget			
Yes	0.29	0.11	0.10%
Age			
Age	0.04	0.01	0.20%
Age squared	−0.0004	−0.0002	0.00%
Geographical areas			
Urban Santo Domingo	−0.32	−0.11	0.00%
Rural East	−0.45	−0.16	5.50%
Urban East	−0.24	−0.08	0.40%
Has internet services			
Yes	0.39	0.14	0.00%

Table 6

DESCRIPTION OF INSTRUMENTAL VARIABLES

Variable (correlation with income logarithm)	Description
Number of adults living in the househol (income correlation: 0.25)	Family income increases with the number of adults living in the household as their presence increases the probability of employment or performing economic activities that increase a household's sources of income. For this reason, the number of adults is not a direct predictor of being banked, given that they can only become banked if they are able to obtain a job and generate financial resources. In other words, the number of adults only benefits banking through pre-existing conditions.
Think they will finance their old age with family help (income correlation: −0.16)	This variable takes the value one when the respondent reports thinking they will finance consumption in their old age with family help. This assumes the existence of an incapacity to generate their own income in the future, putting into perspective the need to be financed by their close relatives. Thus, this variable is not directly linked to being banked, given that it originated in a context of low income, a variable that is a powerful predictor for bankarization. From another point of view, this type of attitude within a setting of high household income is probably not an obstacle to the household being banked. Moreover, these types of forward-looking statements by an individual are not necessarily determinants of current ownership of financial products.
Think they will finance their old age with nonfinancial assets (income correlation: 0.17)	This variable takes the value one when the respondent reports thinking they will finance consumption in their old age with nonfinancial assets. We assume the individual reporting this has had time to accumulate these assets, meaning such expectations should be associated to a current and future capacity to generate income. That is, they refer to a pre-existing condition. If this is not the case, it is interpreted as just an aspiration, and is therefore not a direct predictor for being banked.

| Transferred or loaned dwelling (income correlation: –0.08) | This variable takes the value one when a respondent reports living in a transferred or loaned dwelling. Reporting this variable suggests low income, which is also a predictor of low bankarization rates. By being a reflection of income, this variable does not directly determine bankarization rates. Intuitively for instance, for a high-income household, living in a transferred or loaned dwelling would not prevent it from having a savings account. |

Source: Own elaboration based on the Financial and Economic Culture Survey.

equal to zero, therefore not rejecting the null hypothesis of exogeneity for household income.

Given the distribution assumptions of the procedure employed in the probability model for endogeneity, that is the joint normality and homoescadicity of residuals from the equations, it is advantageous to test the results obtained using a linear probability model estimated with two-stage least squares.

We proceed in this way, performing exogeneity tests using the score diagnostics proposed by Wooldridge (1995). For both tests, score statistics exhibit a χ^2 value with 1 degree of freedom of 1.15, and a F of 1 and 2,205 degrees of freedom of 1.15, with associated probabilities of 69.6% and 69.7% respectively, meaning the null hypothesis of exogeneity is not rejected. Meanwhile, testing for instrument noncorrelation with the error using the specification of Wooldridge with three degrees of freedom gives a χ^2 value of 6.06 associated to a p-value of 10.9%, meaning the null hypothesis on the value of the instruments used is not rejected.

4.4 Selection Bias

The Financial and Economic Culture Survey is designed in such way that when the questions start household members have to say who would be the best person to answer for them. This mechanism makes it impossible to observe the specific variables of every household member, such as their financial attitudes, financial literacy, and references, among others, as well as the connection to whether the individual owns banking instruments or not.

Table 7

PROBIT MODEL WITH ENDOGENOUS REGRESSOR

Dependent variable	Household owns at least one banking instrument: Yes =1; No =0
Model | Method	Probit nodel with endogenous regressor | Maximum likelihood
Observations	2,227 households

Variable	Coefficient	Probability (coefficient = 0)[1]
Constant	−4.77	1.70%
Final year of educational attainment		
University degree	0.62	0.10%
Incomplete university degree	0.64	0.00%
Completed secondary education	0.34	0.10%
Work status		
Public employee	1.55	0.00%
Private employee	0.89	0.00%
Retired or pensioner	1.45	0.00%
Household Income		
Logarithm	0.39	7.70%
Time household can subsist if it loses its main source of income		
One week	−0.28	0.20%
Trust in financial information		
Yes	0.26	0.00%
Money is for spending		
Strongly agree	−0.31	0.00%
Assesses if they can pay before making a purchase		
Almost never	−1.85	1.10%
Monitors financial affairs		
Never	−0.71	0.00%
Does not know	−1.65	0.00%
Contributes to household budget		
Yes	0.30	0.60%
Age		
Age	0.04	0.10%

Age squared	−0.0005	0.00%
Geographic areas		
Urban Santo Domingo	−0.33	0.00%
Rural East	−0.46	3.40%
Urban East	−0.24	0.50%
Has internet services		
Yes	0.50	0.40%

Note: [1]Probability calculation based on robust standard errors.

This is different from the classic selection bias problem because the study question we are concerned with in this paper whether a household owns at least one banking instrument or not includes the ownership of banking products by household members who were not chosen to answer. Nonetheless, there could be a bias in the estimations given that ownership of banking products might not be related to a respondent's own variables, but to other members who were not surveyed and whose characteristics go unobserved.

One way to establish the size of this bias is by including dichotomous interaction variables in the heteroscedastic model that we codify as *adults_ 1*, and that take the value one when the household consists of just one adult, and zero if not. These variables are introduced as multipliers of household variables that might be biased. Thus, if they are statistically significant, the magnitude of the coefficient of the interacted variables will reveal the size of the bias as compared to households composed of just one adult, while statistical nonsignificance implies the referred selection bias will not affect the coefficients estimated.

The results of the estimations can be seen in Table 8. They indicate that there is no statistically significant difference between the coefficients estimated for all the households and those corresponding to households with only one adult living in them, implying that bias for the unobserved characteristics of household members that did not answer the survey is not a concern. The results can therefore be discussed with the estimates contained in the heteroscedastic model shown in Table 5.

Table 8

HETEROSCEDASTIC PROBIT MODEL WITH INTERACTION VARIABLES

Dependent variable instrument:	Household owns at least 1 banking
	Yes = 1; No = 0
Model | Method	Probit model with variance estimation | Maximum likelihood
Observations	2,156 households

Variable	Coefficient	Probability (coefficient = 0), percentage
Constant	−5.60	0.00
Final year of educational attainment		
University degree	0.55	0.10
University degree*adults_1	0.10	80.7
Incomplete university degree	0.58	0.00
Incomplete university degree *adults_1	0.15	64.8
Completed secondary education	0.32	0.20
Completed secondary education *adults_1	−0.13	57.1
Work status		
Public employee	1.31	0.00
Private employee	0.86	0.00
Private employee*adults_1	0.02	90.7
Retired or pensioned	1.37	0.00
Retired or pensioned*adults_1	0.40	51.0
Household income		
Logarithm	0.48	0.00
Logarithm*adults_1	0.07	34.4
Time household can subsist if it loses its main source of income		
One week	−0.23	0.40
One week*adults_1	−0.05	78.1

Trusts in financial information		
Yes	0.27	0.00
Yes*adults_1	−0.16	32.4
Money is for spending		
Strongly agree	−0.29	0.10
Strongly agree*adults_1	−0.08	69.6
Assesses if they can pay before making a purchase		
Almost never	−1.56	4.50
Monitors financial affairs		
Never	−0.73	0.00
Never*adults_1	0.25	43.4
Does not know	−1.63	0.00
Contributes to household budget		
Yes	0.25	2.30
Yes*adults_1	0.37	34.7
Age		
Age	0.05	0.00
Age*adults_1	−0.04	14.9
Age squared	−0.0005	0.00
Age squared*adults_1	0.0004	18.4
Geographic areas		
Urban Santo Domingo	−0.33	0.00
Rural East	−0.46	3.40
Urban East	−0.24	0.50
Has internet service		
Yes	0.37	0.00
Yes*adults_1	0.06	85.5

Note: Perfectly colinear variables are excluded from the table.

4.5 Discussion of Results

The proposed methodological process began with a base estimation, which was made more robust by including an estimation for variance in the heteroscedastic model. At this point, it became necessary to test whether the model should be revised due to endogeneity in the regressors or selection bias stemming from the unobserved characteristics of household members who did not answer the survey. In the former case, we confirmed the exogeneity of household income, while in the latter we found the referred selection bias was not statistically significant. Hence, the coefficients obtained from the heteroscedastic model are valid and we can proceed to summarize the results.

4.5.1 Attitude Matters

First, the strongest marginal effects were observed in the attitude variables for whether a respondent assesses whether they can pay before making a purchase (−0.66) and if a respondent monitors their financial affairs (−0.58). As mentioned, not having these attitudes can eliminate the positive influence of being employed on the probability of being banked. Meanwhile, including these variables in the specification led to the variables related to financial education not being statistically significant.

This highlights how financial education policies should be aimed towards programs for developing good financial habits such as planning and monitoring income and expenditure, as well as budgeting. This is similar to the recommendations arrived at in Fernandes et al. (2014) with respect to the benefits to be gained from financial literature addressing poor financial skills.

In addition, the variable indicating that the respondent believes money is for spending is associated to a marginal effect that reduces the probability of a household being banked by −0.11. This value is fully offset by the effect of an increase of 0.11 implied by the respondent contributing to the household budget.

4.5.2 After Correcting Attitudes, It Is the Turn of Employment, Wages and Retirement

Being employed in the public sector implies a 0.53-point increase in the probability of being banked, while employment in the private sector would mean an increase of 0.31 points, with part of this

difference explained by levels of informality in the private sector. Although less than the marginal effects of attitudes, the impact of work status should be coupled with the marginal effect of the income (0.17) received by simply moving into the category of employee. Hence, being an employee and receiving income implies a substantial increase in the probability of being banked, particularly at low-income levels, where the marginal effect of income is greater.

With respect to being retired or pensioned, this status implies an increase in the probability of being banked amounting to 0.51 points, similar to the effect of being employed in the public sector. This can be explained by the underlying narrative in this category: it involves a long time with work and income stability that, regardless of the level of income, facilitates banking at some point in a person's life. One matter that merits further study concerns the proportion of the retirement or pensions that corresponds to granting pensions and whether said pension is disbursed through financial institutions.

As for public policy objectives, income levels and work status should be placed within the context of a long-term strategy given the fact that they are variables that cannot be changed in the short term and their significant value for increasing the probability of being banked. The latter, along with promoting employment and income growth, should encourage formality and the creation of instruments, mechanisms, and regulations that allow for leveraging higher income levels.

4.5.3 Education Helps

On another front, the results show that if a respondent has completed a secondary education this has a marginal effect of a 0.1-point increase in the probability of a household being banked. Said effect doubles to 0.22 if a respondent has started university studies, even if they have still not finished them, although it falls slightly to 0.20 if studies have been completed. The latter might be explained by abandoning studies in order to enter the labor market. Thus, university education helps offset the effect of bad financial habits, if only partially. This impact is conditioned by the diversity of university degree courses, as well as the many different circumstances that influence the education of an individual during the university stage. Consequently, there is room for improvement to

include programs on financial literacy and attitudes adapted to the circumstances of secondary and tertiary education in order to increase the importance of the marginal effect of formal education.

4.5.4 The Golden Age

Finally, the estimations show that, given the combined marginal effects of age, its positive impact on the probability of a household being banked reach a maximum level of 0.13 points when a respondent reports being 25 years old, with this positive effect gradually disappearing at 50. This could indicate that incentives for acquiring banking products reach their highest level at 25 years of age, in line with the stage in a person's life associated with growing levels of indebtedness. From a public policy point of view, this shows that bankarization campaigns should be targeted at the 20- to 30-year-old age group, a period during which the positive marginal effect of age remains above 0.12 points.

It is worth pointing out that including the respondent's age resulted in the variables for marital status not being statistically significant.

5. CONCLUSIONS

This paper proposed studying the determinants of bankarization among households in the Dominican Republic, defining it as ownership of at least one product from the banking sector. With this aim in mind, we used data from the Financial and Economic Culture Survey of 2014, conducted by the Banco Central de la República Dominicana to perform probability estimations, including specifications to control for heteroscedasticity of residuals, as well as regressor endogeneity and selection bias stemming from nonobservation of household members who did not answer the survey.

The results indicate that the probability of Dominican households being banked is determined by financial attitudes, work status, education, and age of the respondent, as well as average household income, its geographic location, and time it can subsist when without its main source of income.

To judge from marginal effects, variables related to financial attitudes, labor market participation, income levels, and formal education are the most important. Hence, several lines of public policy actions appear plausible. These include programs that encourage

positive attitudes towards financial mattersin the setting of secondary and university education, among other scenarios, and that encompass diligence and care in financial matters, as well as a culture of saving. Programs should also bolster policies that promote employment and income levels, accompanied by financial policies that leverage said boost and turn it into bank penetration, and focus on a target audience of 20- to 30-year-old.

In terms of research, it is important to delve deeper into financial education measures that better reflect the skills really necessary for guaranteeing access to formal financial products, and similarly carry out further study into possible controls for those types of measures that allow for establishing stronger causal relationships. It is also advisable that future versions of the Financial and Economic Culture Survey include questions and measures that enable higher quality control variables.

ANNEX

Annex 1. Main Data from the Financial and Economic Culture Survey, 2014

Census framework	All areas of census supervision such as geographic clusters or primary sampling units (PSUs) of the VIII National Population and Housing Census conducted in October 2002.
Sampling framework	Sampling framework used as of 2008 to conduct the Encuesta Nacional de Fuerza de Trabajo (National Workforce Survey, ENFT), which has 1,968 census supervision areas or PSUs.
Type of sampling	Three-stage probability: three stages of sample selection.
Sample selection	Out of all census supervision areas or geographic clusters from the 2002 Census, the PSU's with probability proportional to occupied private dwellings were selected. In the second stage, 362 clusters with the same probability were selected as secondary sampling units from a sampling framework of 1,046 clusters based on the ENFT framework. Finally, eigth dwellings with the same probability were chosen as final or tertiary sampling units (PSU's) via random start systematic sampling.
Target population	Individual households living in noncollective occupied dwellings in the main municipal districts of the most important provinces of the country's four largest regions, always including the municipal districts of the province's capital.
Domain estimations or statistical inference	Municipal districts selected from Greater Santo Domingo. Municipal districts chosen from the Northern Region or Cibao. Municipal districts chosen in the Southern Region. Municipal districts selected from the Eastern Region. Municipal districts inland urban areas. Municipal districts inland rural areas.

Sample confidence level and maximum allowed error	The sample confidence level is 95% in estimates for proportions, percentages, rates, and ratios, and the maximum allowed error was estimated for the total sample also taking into account maximum variance in proportions and the design effect of complex samples equal to two: 2.92% for the total sample; 5.67% for Greater Santo Domingo; 5.42% for the Northern Region or Cibao; 6.13% for the Eastern Region; and 6.25% for the Southern Region.
Effective sample or interviews performed	The total effective sample was 2,313 private individual households.
Implementation periods	August 4 to 10, 2014.
Sampling weight factor	Calculated by strata based on the number of households registered in the National Population and Housing Census 2010, and the number of actual households in the sample.

Source: First Financial and Economic Culture Survey of the Dominican Republic, 2014.

Annex 2. Descriptive Statistics for Selected Variables, Constructed Based on Data from the Financial and Economic Culture Survey of the Dominican Republic

Table A.1

OWNS FINANCIAL PRODUCTS (DEPENDENT VARIABLE)

Value	Number	Percentage
0	871	37.66
1 (owns)	1,442	62.34
Total	2,313	100.00
Mean	0.62	
Median	1.00	
Maximum	1.00	
Minimum	0.00	
Standard deviation	0.48	

Table A.2

FINAL YEAR OF ACADEMIC ATTAINMENT

Value	Number	Percentage
1 (PhD)	15	0.70
2 (Master's)	15	0.70
3 (University degree)	269	12.51
4 (Incomplete university degree)	249	11.58
5 (Technical university education)	6	0.28
6 ((Incomplete technical university education)	12	0.56
7 (Nonuniversity technical education)	6	0.28
8 (Completed secondary school)	350	16.28
9 (Incomplete secondary school)	431	20.05
10 (Completed primary school)	168	7.81
11 (Incomplete primary school)	619	28.79
12 (None)	10	0.47
Total	2,150	100.00
Mean		8.03
Median		9.00
Maximum		12.00
Minimum		1.00
Standard deviation		2.97

Table A.3

AGE

Value	Number	Percentage
[0-20)	34	1.47
[20-40)	924	39.95
[40-60)	946	40.90
[60-80)	367	15.87
[80-100)	42	1.82
Total	2,313	100.00
Mean		44.50
Median		43.00
Maximum		99.0
Minimum		1.00
Standard deviation		15.34

Table A.4

WORK STATUS

Value	Number	Percentage
1 (public employee)	279	12.06
2 (private employee)	577	24.95
3 (domestic service)	113	4.89
4 (employer)	29	1.25
5 (self-employed)	780	33.72
6 (seeking work)	63	2.72
7 (homemaker)	299	12.93
8 (disabled)	17	0.73
9 (unable to work due to health)	30	1.30
10 (retired or pensioned)	77	3.33
11 (student)	23	0.99
12 (not looking for work)	8	0.35
13 (apprentice)	1	0.04
14 (other)	15	0.65
97 (does not know, does not answer)	2	0.09
Total	2,313	100.00
Mean	4.41	
Median	5.00	
Maximum	97.00	
Minimum	1.00	
Standard deviation	3.75	

Table A.5

MONTHLY HOUSEHOLD INCOME

Value	Number	Percentage
[0, 50,000)	2,111	94.66
[50,000-100,000)	96	4.30
[100,000-150,000)	12	0.54
[150,000-200,000)	5	0.22
[200,000-250,000)	4	0.18
[250,000-300,000)	0	0.00
[300,000-350,000)	1	0.04
[450,000-500,000)	1	0.04
Total	2,230	100.00
Mean	17,913.00	
Median	12,000.00	
Maximum	460,000.00	
Minimum	500.00	
Standard deviation	21,451.79	

Table A.6

TIME HOUSEHOLD CAN SUBSIST IF IT LOSES ITS MAIN SOURCE OF INCOME

Value	Number	Percentage
1 (7 days)	644	27.84
2 (8 to 30 days)	641	27.71
3 (31 to 90 days)	436	18.85
4 (91 to 180 days)	226	9.77
5 (over 180 days)	180	7.78
97 (does not know)	172	7.44
98 (does not answer)	14	0.61
Total	2,313	100.00
Mean	9.98	
Median	2.00	
Maximum	98.00	
Minimum	1.00	
Standard deviation	25.79	

Table A.7

TRUST IN FINANCIAL INFORMATION

Value	Number	Percentage
1 (Trusts)	1,157	50.02
2 (Partly)	568	24.56
3 (Does not trust)	299	12.93
97 (does not know)	274	11.85
98 (does not answer)	15	0.65
Total	2,313	100.00
Mean	13.51	
Median	1.00	
Maximum	98.00	
Minimum	1.00	
Standard deviation	31.58	

Table A.8

MONEY IS FOR SPENDING

Value	Number	Percentage
1 (strongly agree)	482	20.84
2	155	6.70
3	276	11.93
4	207	8.95
5 (strongly disagree)	1,151	49.76
97 (does not know)	35	1.51
98 (does not answer)	7	0.30
Total	2,313	100.00
Mean	5.31	
Median	5.00	
Maximum	98.00	
Minimum	1.00	
Standard deviation	12.60	

Table A.9

ASSESSES IF CAN PAY BEFORE MAKING A PURCHASE

Value	Number	Percentage
1 (always)	2,010	86.90
2 (almost always)	172	7.44
3 (sometimes)	84	3.63
4 (almost never)	15	0.65
5 (never)	10	0.43
97 (does not know)	14	0.61
98 (does not answer)	8	0.35
Total	2,313	100.00
Mean		2.10
Median		1.00
Maximum		98.00
Minimum		1.00
Standard deviation		9.35

Table A.10

MONITORS FINANCIAL AFFAIRS

Value	Number	Percentage
1 (always)	1,658	71.68
2 (almost always)	211	9.12
3 (sometimes)	151	6.53
4 (almost never)	60	2.59
5 (never)	127	5.49
97 (does not know)	66	2.85
98 (does not answer)	40	1.73
Total	2,313	100.00
Mean		5.94
Median		1.00
Maximum		98.00
Minimum		1.00
Standard deviation		20.07

Table A.11

CONTRIBUTES TO THE BUDGET

Value	Number	Percentage
0 (does not contribute)	225	9.73
1 (contribute)	2,088	90.27
Total	2,313	100.00
Mean	0.90	
Median	1.00	
Maximum	1.00	
Minimum	0.00	
Standard deviation	0.30	

Table A.12

GEOGRAPHICAL AREAS

Value	Number	Percentage
Rural South	464	20.06
Urban South	478	20.67
Rural East	94	4.06
Urban East	47	2.03
Rural North	152	6.57
Urban North	536	23.17
Greater Rural Santo Domingo	34	1.47
Greater Urban Santo Domingo	508	21.96
Total	2,313	100.00

Table A.13

ADULTS PER HOUSEHOLD

Value	Number	Percentage
0	1	0.04
1	506	21.88
2	1,030	44.53
3	467	20.19
4	209	9.04
5	72	3.11
6	19	0.82
7	4	0.17
8	3	0.13
9	2	0.09
Total	2,313	100.00
Mean	2.31	
Median	2.00	
Maximum	9.00	
Minimum	0.00	
Standard deviation	1.11	

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Cultural and Financial Dollarization of Households in Uruguay

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Abstract

In this paper, we analyze factors associated with the financial and cultural dollarization of households in Uruguay. We estimate cultural dollarization with data from the 2013 financial survey of Uruguayan households, particularly using the currency reporting option available to respondents. Financial dollarization, meanwhile, is estimated as the share of US dollar-denominated bank assets in total assets. We find that the level of dollarization of bank savings is mainly explained by the size of savings and household wealth. We also observe that our proxy variable for cultural dollarization is associated with wealth and home ownership. Other factors that influence cultural dollarization are age and years of formal education, which are positively and significantly correlated with the use of the US dollar as a unit of account and asset valuation. Larger households, on the other hand, are less culturally dollarized. The evidence points to the key role played by the pricing system in the dollarization culture.

Keywords: dollarization, financial decisions, households, indebtedness, saving.

JEL classification: E, D1, D4.

1. INTRODUCTION

After 15 years of policy actions aimed at reducing dollarization, Uruguay continues to be one of world's most dollarized countries (Catão and Terrones, 2016). Dollarization of household savings, although it might be justified as a risk management strategy, is a behavior seldom observed in most countries. In environments such as Uruguay's, external shocks are commonplace. This generates high volatility in the real exchange rate, and there is a negative correlation between the real exchange rate and real wages. Household saving in dollars can be seen as a way of diversifying risks stemming from wage flows and the value of real assets that are highly correlated with wages, such as housing and human capital. Despite these benefits of the dollarization of household saving, this behavior is relatively unusual in the international environment, where the majority of household financial saving is in domestic currency.

Cultural dollarization is much less common than financial dollarization. We understand cultural dollarization as the phenomenon by which agents use the dollar as tenure in circumstances where local currency is used in most countries. In Uruguay, we are accustomed to government officials or ordinary individuals expressing amounts in dollars when they wish to give an idea of large sums. For instance, when a minister in Uruguay talks about their budget, or the head of the Directorate General of Taxation refers to total tax collection, the amounts are commonly expressed in foreign currency. Such practices are not normal in other countries. In fact, they are almost only seen in Uruguay.

In this empirical analysis, we study what financial and cultural dollarization are associated with in Uruguayan households. This type of study is different in several ways. First, there are not many studies on households' portfolio decisions, especially concerning the composition of portfolios by currencies, given the lack of financial information regarding household balance sheets. Second, the 2013 financial survey of households in Uruguay allows for differentiating the currency assets are denominated in from that used for reporting their value. This enables us to separate the real dollarization of the portfolio from the cultural practice of reporting by currencies, which we use as a proxy variable for cultural dollarization. We mainly focus on aspects such as denomination by currency of assets and liabilities, as well as households' income and expenditure

flows. Besides analyzing the proportion of household assets, mainly bank savings, that are denominated in dollars, we also study the factors associated with the fact that Uruguayans think in dollars, even in cases where this is not justified from a financial point of view.

Note that we refer to factors associated to cultural dollarization and not the causes of dollarization. Showing the contribution of different causal factors for dollarization would require a set of longitudinal data that is not available to us. Uruguay only has household financial data for the years 2011 and 2013, deriving from the two editions of the household financial survey conducted by the Instituto Nacional de Estadísticas. There is also no data available from other countries for similar periods that allows us to focus on this topic from an international cross-sectional perspective. Hence, we confine ourselves to seeing what data from the household survey can tell us in the hope of being able to link those results to some key determining factor. To do this we assess the dollarization phenomenon in two dimensions. On the one hand, an objective dimension that is reflected in portfolio decisions to hold dollar denominated bank savings. On the other hand, a subjective or cultural dimension implied by the fact that Uruguayans value or use the dollar as a unit of account, even when it concerns assets or liabilities not necessarily denominated in said currency.

We find that the level of dollarization of bank savings is mainly explained by the size of savings and household wealth. In particular, female household heads display greater dollarization in their savings. Moreover, we find that our proxy variable for cultural dollarization is associated to wealth and being a homeowner. Other factors that influence cultural dollarization are age and years of formal education, variables that are positively and significantly correlated with the use of the dollar as a unit of account and asset valuation. Meanwhile, the largest households are less culturally dollarized. We understand that the weight of real assets in wealth, and of these in dollarization and cultural dollarization, suggests that the dollarization of high value asset prices in Uruguay (housing and automobiles) is a key factor for explaining cultural dollarization. Furthermore, all the factors reinforcing the idea that large amounts should be expressed in dollars would contribute to deepening cultural dollarization.

This study reveals there is an opportunity for dedollarization policies for pricing systems, as well as for financial education and public communication policies.

The rest of the paper is organized as follows. Section 2 describes the data employed and the variables defined. Section 3 reviews the models used and the results obtained. Section 4 presents the conclusions.

2. HISTORICAL BACKGROUND

Just as in any economy open to external trade, Uruguayan agents have always presented asset and liability positions in foreign currency. However, Uruguay began to undergo a strong process of dollarization in the 1950s. To understand why dollarization is a cultural phenomenon, it is worth making a brief review of the events that led up to this process. A brief overview of the history of dollarization and the financial reform process at the start of the 21st century is presented below. We also describe progress made in matters of reducing dollarization, and define the problem of cultural dollarization.

2.1 Dollarization and Financial Fragility: Origins and Reform

Licandro and Licandro (2003) explain the origins of dollarization in Uruguay as a combination of accumulated macroeconomic management mistakes (inflationary financing accompanied by successive failures to stabilize inflation with a fixed exchange rate and sudden sharp exchange rate depreciations); incomplete markets (lack of effective hedging against alternatives to dollar inflation, failure of the index-linked unit of currency); coordination problems and externalities (failure to include the systemic impact of dollarization in private risk concessions); incentives from public banks to develop dollarization (Tealde, 2007); and learning the role of dollar hedging in tackling real exchange rate shocks (Güenaga et al., 2004; and Achugar et al., 2004). The combined result of all these incentives led to Uruguay becoming one of the most dollarized countries in the world.

Dollarization and currency mismatches are described in the literature as one of the Uruguayan economy's main weaknesses up until 2002, when it was hit by the crisis in Argentina (see Licandro, 2003; and De Brun and Licandro, 2005). During this crisis, the financial system lost 42% of its deposits. This caused a credit crunch that would lead Uruguay's GDP to contract by over 20% from the start

of the crisis in 2001 until the debt renegotiation of 2003, on top of a negative regional demand shock.

Once the bank run had been overcome, and after generating a sustainable fiscal outlook by restructuring Uruguay's sovereign debt in 2003, the country set about implementing a strategy for reducing the financial weaknesses derived from dollarization. This strategy (Licandro and Licandro, 2003) was based on two pillars: recognizing risks through financial system regulation and supervision, and reconstructing markets in domestic currency. The first pillar included, among others, the creation of deposit insurance with risk premiums adjusted to currency risk and coverage spreads (coverage of the insurance in domestic currency was initially triple the coverage in foreign currency); changes to liquidity and reserve requirements in recognition of Banco Central del Uruguay's greater capacity to provide lenders of last resort services in pesos; changes to credit risk regulation preventing clients that could not withstand depreciations of 60% in real terms from obtaining the highest credit ratings; and changes to pension fund portfolio and insurance company regulations to achieve better currency matching. In the second pillar, the most important measure–floating the currency–was unintentional. However, progress was also made by creating the indexed unit (IU), (an indexation alternative based on the Unidad de Fomento used in Chile); issuing securities in indexed units by the Central Bank as well as the Central Government; and changing the activities of public banks that supported development of the IU and restricted the profit extraction mentioned by Tealde (2007) from the consumer credit segment in domestic currency and changed mortgage credit indexation to the IU, among others.

2.2 Progress in Reducing Financial Weakness and Dollarization

Outstanding progress has been achieved in matters of reducing financial weaknesses stemming from dollarization, but the results in terms of dedollarization have been disappointing, even though the strategy highlighted in the previous section was implemented within an extremely favorable international macroeconomic setting. In fact, changes in developed countries' energy policies (reorientation towards biofuels) and the growth of Chinese demand, led to very substantial increases during the period 2003-2013 in the prices of

Uruguay's export commodities. In 2009, the reduction of monetary policy rates around the world added to these increases, leading to an unprecedented expansion in Latin American economies. In this environment, domestic agents experienced a previously unseen period of appreciation in the nominal exchange rate, which fell from 32.4 Uruguayan pesos in September 2002 to 18.3 Uruguayan pesos in July 2011. As for inflation, after the correction of relative prices took it temporarily above 20% in 2003, it rapidly returned to single digits, reaching 3.5% by June 2005.

In this context, although considerable progress was made in currency mismatches, dollarization–especially that of bank deposits–only fell from 90% to 80% of total deposits. Among the progress made is a change in the role of domestic currency in transactions, which is illustrated in figure A.1, the dedollarization of public debt (Figure A.2, Annex 1), a reduction in firms' financial mismatches (Figure A.3), the equalization of external finance premiums for currencies reported in Licandro and Mello (2012), and a reduction in the dollarization of credit (Figure A.4). Nevertheless, as can also be seen in the latter figure, the dollarization of deposits has changed very little.

Despite regulatory incentives and a favorable environment, Uruguay was not able to generate a reconstruction of markets in pesos comparable to that of other countries with similar financial and risk characteristics. Figure A.5 shows that during the same period, countries such as Costa Rica, Peru, and Bolivia were much more successful in constructing markets in domestic currency, as evidenced by their share of M2 (total deposits in domestic currency) in gross domestic product (GDP).

The absence of a reaction from dollarization is a cause for concern, due to its impact on long-term financial stability and–potentially–long-term economic growth. Indebtedness in domestic currency is the natural way to hedge against real exchange rate shocks. When there is a negative shock, such as a sudden halt in capital flows, the real exchange rate of fundamentals should depreciate, In the presence of nominal rigidities and a degree of monetary flexibility, this leads to temporary adjustments in inflation that offset indebtedness in domestic currency. This property, highlighted by Bohn (1990) for developed countries, was analyzed in countries with liability dollarization for the case of public debt by Calvo and Guidotti (1990) and Goldfajn (1997), and for the case of Uruguay's public debt by Licandro and Masoller (2000). The link to economic growth stems from

the impact of inflation on the development of the financial system in domestic currency. Rousseau and Wachtel (2002), for instance, use a series of rolling panel regressions–to find an inflation threshold beyond which the financial depth of an economy has a negative effect on growth.

2.3 Dollarization Culture and Persistence

2.3.1 What Factors Might Be Behind the Persistence of Dollarization in Uruguay?

First, although Uruguay has managed to keep inflation at historically low levels, it still has relatively high inflation by international standards–in addition to problems of monetary policy credibility. In fact, over the last ten years inflation has averaged 8%, one point above the inflation target range and three points higher than the middle of said band. Inflation expectations have also remained systematically above the band, as illustrated in Figure 6 of the Annex, implying that the failure to meet the inflation target has eventually affected the Central Bank's credibility. The lack of stability in the currency has affected agents' confidence in it, and has prevented indexing practices, such as holding foreign currency denominated assets, being abandoned.[1]

Second, banks continue to have an attitude of extracting profits in domestic currency. By international comparison there is a large spread between average bank deposit rates and interbank market rates. Under an inflationary setting, the real interest rates received by depositors are highly negative, which discourages deposits in domestic currency. Initiatives have been implemented that attempt to generate competition among banks for small savers using the vehicle of investment funds. However, despite offering higher interest rates, these initiatives have not attracted significant support among depositors.[2] The persistence of these interest rate spreads in domestic currency demonstrates the decision of banks to charge their costs in such activities where they face little competition, and where the

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[1] Real interest rates in pesos have been highly negative, but the financial system provides the option to deposit in units indexed to inflation with close to zero rates.

[2] Although the funds are invested in low risk instruments, households probably still lack confidence in them.

clear leadership of public banks has set the tone (see Mello, 2009).

Third, households have learnt the advantages of holding their assets in foreign currency (dollars). The majority of household assets are normally indexed to wages. This occurs with households' wages, human capital, and their main asset, housing. In a country where real exchange rate shocks predominate, and where the covariance of the real exchange rate and wages is negative, the dollar is perfect for hedging against real exchange rate shocks. Perceptions also persist of asymmetric adjustments in the exchange rate: that when it appreciates it does so slowly, but when it depreciates it does so much faster. Furthermore, dollarization appears at the same time as inflation, in the presence of nominal interest rate ceilings established by the usury law, and in the absence of substitute indexation mechanisms, such as the *unidad de fomento* in the case of Chile.

The latter assessment should make us wonder why households in other small open economies are not dollarized like in Uruguay. One simple answer might be that in other countries inflation is a transitory nonrepetitive phenomenon. By the mid-1990s, Uruguay was classified as a chronic-inflation country due to its repeated failure to stabilize inflation. Each failed plan, because it was based on a fixed exchange rate, ended in a sudden depreciation of the exchange rate and a resurgence of inflation. Even when households do not have incentives to use foreign currencies under normal conditions, in environments such as those described for Uruguay, households quickly learn the asymmetry of asset yields and their cyclical properties.

Another factor which takes place in practice is that dollarization is a cultural phenomenon. This statement goes hand in hand with that saying money in the broad sense has cultural components. It is not the aim of this paper to give an overview of historical, sociological, anthropological, and psychological literature on money, but the link between culture and money has been demonstrated in all these social sciences.

From an economics point of view, the widely established relation between culture and money is difficult to prove due to a lack of appropriate information for substantiating this link.

In the following section, we employ a unique set of data to try and study cultural and financial dollarization among Uruguayan households and its determinants.

3. DETERMINANTS OF DOLLARIZATION OF HOUSEHOLDS IN URUGUAY

The household financial survey provides a unique set of data for understanding the scope and factors determining the dollarization of Uruguayan households. On the one hand, the data it provides on the composition of households' portfolios allows for studying factors associated to the financial dollarization of households. On the other hand, a group of specific questions allows for making a preliminary approximation of cultural dollarization. In fact, besides providing data on the composition of households' portfolios, the survey also includes the currency in which such wealth is reported. Below is a brief description of the dataset that enabled us to define the proxy variables for cultural dollarization used in this study.

3.1 Data Description

We use a cross-sectional database based on a combination of the second edition of the Financial Survey of Uruguayan Households (EFHU) conducted in 2013 and the 2012 Continuous Household Survey (ECH). The sample of households from the 2012 ECH is the one used in the 2013 EFHU, therefore making it possible to merge the two surveys. The EFHU was conducted during the second quarter of 2013, and 3,489 households were interviewed. Both surveys have nationwide coverage, meaning the sample is representative of the whole country.

For our objectives, it was advantageous to clean this database, eliminating households with highly inconsistent answers, as well as those without answers to questions on income, assets, and loans. Once the cleaning process had been completed in accordance with our interests, we were left with a sample of 2,993 households.

To assess whether eliminating observations could generate significant bias in the sample, we estimate the main statistical moments and mean of four variables that the majority of households gave answers about, and were highly relevant to our analysis: *percentage of bank savings in dollars, percentage of bank savings in Uruguayan pesos, expenditure on food, and household income.*[3] Comparing the moments of these variables between both samples shows that the average and

---

[3] Tables with descriptive data for these variables can be found in Annex 2.

median values of the cleaned sample are higher. The bias in these variables after eliminating observations is around 2%. This explains why most households with inconsistent or very few answers are the ones that do not possess any assets or liabilities and report very low or zero income.

The 2013 EFHU covers the largest amount of data possible with respect to the financial and economic realities of Uruguayan households. The survey was divided into the following sections:

- Housing and related loans

- Other properties and related loans

- Financial assets

- Nonmortgage loans

- Payment media

- Consumption and saving

- Insurance policies

- Income and employment history

- Household businesses

- Demographic characteristics

The study focuses on two dimensions, one financial and the other cultural. The financial dimension refers to the position of foreign currency in household assets, particularly bank savings. Cultural dollarization refers to the use of the dollar as a unit of account, even though it is not necessarily the dominant currency in the household.

3.1.1 Household Assets

Assets included in the survey are divided into real assets and financial assets. Real assets are housing, other properties, automobiles, motorcycles and other vehicles, livestock, jewelry, and household appliances. Household financial assets are mainly bank savings, although they also include other financial instruments, such as bonds, participation in investment funds, and stocks, among others. The tables in Annex 3 show the cultural dollarization of real assets, that is the proportion of answers expressed in dollars. Table 1 shows a summary of this information, and it can be seen how higher value assets are expressed in dollars to a greater extent.

Table 1

DOLLARIZATION OF REAL ASSETS, IN PERCENTAGES

Housing	95.44
Other properties	97.78
Automobiles	97.32
Motorcycles	77.05
Jewelry	72.73
Livestock	71.43
Household appliances	35.66

With respect to financial assets, we need to assess the two dimensions of dollarization: what proportion of financial assets are in dollars and what proportion of the valuation of financial savings is expressed in dollars, even though these are not necessarily dollar-denominated.

Table 2 shows the distribution of households according to the currency in which they hold their bank savings (zero if they are in pesos, and one if in dollars). Almost 70% of Uruguayan households with bank savings have amounts in dollars. Furthermore, savers represent 20% of households, meaning approximately 14% of all Uruguayan households have financial savings in dollars.

Table 2

HOUSEHOLDS IN THE SAMPLE WITH BANK SAVINGS IN DOLLARS
Number and percentage

Dummy variable for bank savings in dollar	Frequency	Percentage
0	162	30.06
1	377	69.94
Total	539	100.00

The share of respondents who report the value of their financial assets in dollars is 67.27% (zero if they answer in pesos, and one if in dollars; see Table 3). Joint analysis of tables 2 and 3 reveals that 377 households have deposits in dollars, while 407 report their bank savings in this currency.

BANK SAVINGS REPORTED BY CURRENCY
Number and percentage

	Frequency	*Percentages*
0	198	32.73
1	407	67.27
Total	605	100.00

This inconsistency leads us to the first way of estimating cultural dollarization. We elaborate a variable that measures the mismatch between the currency in which individuals report their savings and the currency in which they actually hold most of their savings. This variable takes the value one if the individuals report their savings in dollars and the share of their savings in Uruguayan pesos is 50% or higher, and zero if there is no mismatch. Table 4 shows that 11.57% report their savings in dollars despite them being mostly denominated in Uruguayan pesos.

Table 4

MISMATCH BETWEEN THE CURRENCY REPORTED AND DENOMINATION OF BANK SAVINGS
Number and percentage

Cultural dollarization	*Frequency*	*Percentages*
0	535	88.43
1	70	11.57
Total	605	100.00

3.1.2 Household Liabilities

If we focus on household liabilities, we see that close to 35% of Uruguayan households have some kind of loan (Table 5). Moreover, 7.78% of households report mortgage loans and 31.8% nonmortgage loans (Table 6).

HOUSEHOLDS WITH LOANS
Number and percentage

Dummy variable for households with loans	Frequency	Percentages
0	1,937	64.72
1	1,056	35.28
Total	2,993	100.00

HOUSEHOLDS WITH NONMORTGAGE DEBT
Number and percentage

Dummy variable for households with nonmortgage debt	Frequency	Percentages
0	2,041	68.19
1	952	31.81
Total	2,993	100.00

From a dollarization perspective, it is important to analyze nonmortgage loans because households with mortgage credit in dollars only represent 12% of households with mortgages, or less than 1% of households in the sample. Table 7 shows the dollarization of Uruguayan households' nonmortgage loans. It can be seen how the majority of household borrowing is in domestic currency. Slightly less than 8% of households have some proportion of their nonmortgage debt in dollars, equal to 2.75% of total households.

Table 7

DOLLARIZATION OF NONMORTGAGE DEBT

	Frequency	Percentages	Accumulated
0.00	980	92.80	92.80
2.53	1	0.09	92.90
2.60	1	0.09	92.99
4.76	1	0.09	93.09
5.41	1	0.09	93.18
6.35	1	0.09	93.28
7.52	1	0.09	93.37
27.25	1	0.09	93.47
42.11	1	0.09	93.56
55.00	1	0.09	93.66
57.14	1	0.09	93.75
87.72	1	0.09	93.84
88.40	1	0.09	93.94
88.89	1	0.09	94.03
89.55	1	0.09	94.13
91.07	1	0.09	94.22
94.70	1	0.09	94.32
94.74	1	0.09	94.41
95.24	1	0.09	94.51
97.46	1	0.09	94.60
98.08	1	0.09	94.70
98.50	1	0.09	94.79
98.61	1	0.09	94.89
98.76	1	0.09	94.98
99.75	1	0.09	95.08
100.00	52	4.92	100.00
Total	1,056	100.00	

If we consider financial flows of household income and expenditure, the percentage of households that use the dollar as their main currency is 8.82% (zero if the peso is the main currency, and one if it is the dollar; see Table 8).

Table 8

DOLLARIZATION OF HOUSEHOLD FINANCIAL FLOWS
Number of households and percentages

Dummy variable for household financial flows in dollars	Frequency	Percentages
0	2,729	91.18
1	264	8.82
Total	2,993	100.00

Considering the different measures of dollarization described above, it can be concluded that dollarization mainly takes place in the valuation and denomination of household assets, and to a lesser extent in liabilities and income and expenditure flows.

One hypothesis for the fact that Uruguayans value and hold assets in dollars despite not having any important inflows or loans in that currency, might be that households wish to maintain open positions in dollars to take advantage of an eventual depreciation in the domestic currency. Uruguay's history shows that real depreciations of the domestic currency are accompanied by sharp drops in real wages, meaning holding open positions in dollars is a way to hedge financially against the risk of falling wage income.

3.2 Financial and Cultural Dollarization and their Determinants

As an initial approach in pursuit of the factors that determine the dollarization of financial assets, we observe the interaction between different socioeconomic variables and the phenomenon we wish to explain. Table 9 illustrates the decision to have bank savings in dollars and income distribution. The number of households that have assets in dollars (when the variable takes the value 1) clearly increases

Table 9

DEPOSITS IN DOLLARS AND INCOME DISTRIBUTION
Number of households

Dummy variable for bank savings in dollars	Income quintiles					
	1	*2*	*3*	*4*	*5*	*Total*
0	9	22	32	48	51	162
1	18	16	30	84	229	377
Total	27	38	62	132	280	539

with income, even though the preference for holding assets in dollars is present at all income levels.

Table 10 shows the interaction between household decisions to have assets in dollars and education divided by years of formal education quintiles. The higher the formal education the greater the holdings of financial savings in dollars. It can be seen how years of education in the sample go from a minimum of 1 to a maximum of 20 years, meaning quintiles 4 and 5 correspond to households where the head has a tertiary education. Table 11 shows that among households with a university degree the proportion of those holding financial saving in dollars is 82.69%.

Table 10

DECISION TO HAVE BANK SAVINGS IN DOLLARS AND FORMAL EDUCATION

Number of households

Dummy variable for bank savings in dollars	Education quintiles					
	1	*2*	*3*	*4*	*5*	*Total*
0	18	23	33	35	53	162
1	25	22	81	59	190	377
Total	43	45	114	94	243	539

Table 11

**HOLDINGS OF BANK SAVINGS IN DOLLARS
AND UNIVERSITY DEGREE**

Percentages

Dummy variable for bank savings in dollars	Dummy variable for university degree		Total
	0	*1*	*Total*
0	35.25	17.31	30.06
1	64.75	82.69	69.94
Total	100.00	100.00	100.00

Table 12

DECISION TO HAVE BANK SAVINGS IN DOLLARS AND AGE

Dummy variable for bank savings in dollars	Age quintiles					Total
	1	*2*	*3*	*4*	*5*	*Total*
0	42.1	25.8	24.8	25.2	28.9	30.1
1	57.9	74.2	75.2	74.3	71.1	69.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

In Table 12 we can observe how age and the tendency to have bank savings in dollars (when the dummy variable takes the value of one) are positively related. This is linked to wealth, given that there is a positive relation between age and household wealth.

Our variable of interest for studying financial dollarization is *the level of dollarization of bank savings.* We choose savings as a study variable because it is the one that exhibits the greatest differences as compared to countries without dollarization, where saving is almost practically nondollarized. This differs from bank deposits because respondents are asked not to include their transaction account balances.

Figure 1 shows the distribution of the dollarization variable for bank savings. It shows that although it is a continuous variable between 0 and 100, the answers that accumulate higher probability for those who report having assets in dollars are 0, 50, and 500. For households that have bank savings in dollars, dollarization is high, reaching an average of 76%.

Figure 1

DOLLARIZATION OF BANK SAVINGS

Density

Percentage of bank savings denonimated in dollars

Density — Kernel density of dollarized bank savings
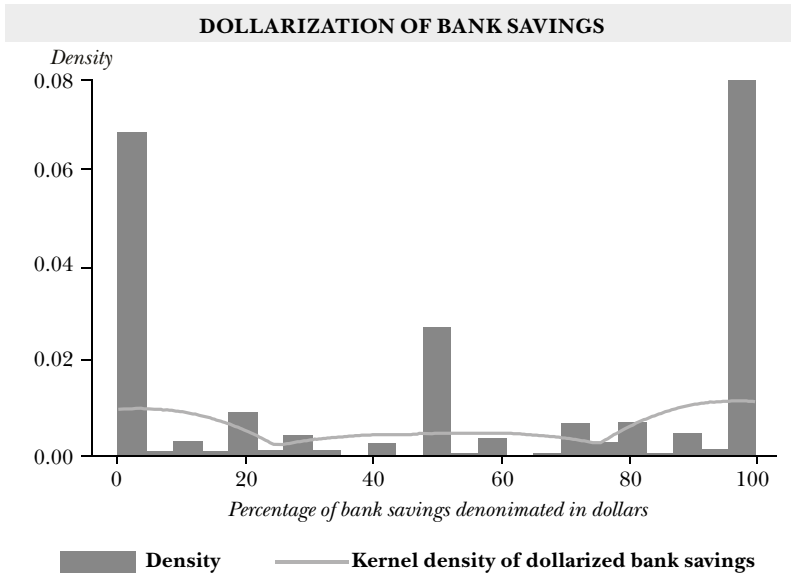
3.2.1 Estimation and Results of Financial Dollarization Determinants

Empirical analysis implies modelling the decision to have financial savings and the level of dollarization of said savings. To this end we use several main estimation methods. We firstly estimate using ordinary least squares (OLS) and instrumental variables (two-stage least squares, 2SLS). We focus on estimating a tobit model given that the dependent variable is truncated between 0 and 100. We also estimate a two-stage Heckman model, where in the first stage a probit model is estimated for the decision to have bank savings, and in the second a model for the level of dollarization of financial savings.

Table 13 shows the estimations for the d*eterminants of bank savings dollarization.* In accordance with the selection process for the variable

Table 13

DETERMINANTS FOR DOLLARIZATION OF BANK SAVINGS

	Ordinary least squares	Two-stage least squares	Tobit model with instrumental variables	Heckman model
Main				
Bank savings, in logs	0.663	−19.834	56.908[c]	3.834[c]
	(0.440)	(15.368)	(21.388)	(1.318)
Financial declared burden	−0.333[b]	−0.290	-0.896	−0.408[b]
	(0.152)	(0.340)	(0.943)	(0.180)
Transaction accounts	2.736[b]	7.579	−12.514	4.229[c]
	(1.146)	(4.772)	(11.166)	(1.422)
Income plus age, in logs	10.106[c]	28.774[b]		11.219[c]
	(2.274)	(13.901)		(2.467)
Constant	−76.864[c]	−165.309[b]	−313.383[b]	−126.131[c]
	(25.868)	(79.799)	(130.770)	(33.636)
Bank savings, in logs				
Financial declared burden			−0.001	
			(0.015)	
Transaction accounts			0.313[c]	
			(0.111)	
Total expenditure (−1)			0.443[c]	
			(0.146)	

Table 13 (cont.)

	Ordinary least squares	Two-stage least squares	Tobit model with instrumental variables	Heckman model
Log total income			0.332[b]	
			(0.161)	
Age of household head			0.014[b]	
			(0.007)	
Constant			-0.106	
			(1.929)	
Proxy variable for bank savings				
Bank savings, in logs				0.306[c]
				(0.012)
Financial declared burden				-0.019[c]
				(0.004)
Proxy variable for credit card				0.322[c]
				(0.108)
Transaction accounts				0.254[c]
				(0.031)

Main education				0.031[b]
				(0.013)
Income plus age, in logs				0.191[c]
				(0.060)
Constant				−4.585[c]
				(0.661)
Mills ratio				
λ				21.345[c]
				(7.957)
Observations	609	578	583	2,936
Uncensored observations			194	
Censored observations on the left			191	
Censored observations on the right			198	
P-value	1.32e−09	0.0199809	0.0113584	1.44e−07
R^2	0.0751962	.		
Adjusted R^2	0.0690716	.		

Note: [a] *p*-value <0.10, [b] *p*-value <0.05, [c] *p*-value <0.01

to be explained, a Heckman estimation should be the preferred specification. In this model, the inverse Mills ratio is significant at the 99% level, implying that the probit model for the *bank savings* selection variable is significant, and explains the differences between those who have and do not have bank savings accounts.

The two-stage tobit model is the specification that presents the greatest differences because only the size of bank deposits is significant for explaining dollarization. Deposit size is the endogenous variable in this specification. The insight from this is that savings deposits and the currency they are made in are jointly determined by other factors, such as the value of the foreign currency and the need to hedge against real wage shocks. To control for these two specifications that consider the truncated or limited aspect of the dependent variable, we also estimate the model by ordinary least squares and two-stage least squares.

Analysis of the estimated models suggests that the level of dollarization is mainly explained by the size of savings, household income linked to the age of the household head, and negatively by the burden of household indebtedness. That is, households with higher available income and larger bank balances are more dollarized.

In addition, there is a positive and significant correlation between having transaction accounts as well as savings accounts and the dollarization of deposits. In the same way as having a credit card, this variable functions as a variable for access to the financial system, as shown by the positive and significant coefficient in the selection equation for the estimated Heckman model. Moreover, we see that the education level of the household head is a factor that determines having savings in the financial system, but not the level of dollarization of such savings.

3.2.2 Estimation and Results of Cultural Dollarization Determinants

To explore *cultural dollarization,* we elaborate a variable that measures to what extent Uruguayan households value assets in dollars that are not necessarily denominated in that foreign currency. This variable is *the dollarization of assets excluding bank savings.*[4] We understand that,

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[4]   Note we do not use the mismatch between bank asset denomination and reporting currencies presented in Table 4 as a proxy variable because we would only have 70 positive observations.

in so far as the value of assets is more related to the domestic market than to the value of the foreign currency, reporting the value of those assets in dollars is a demonstration of cultural dollarization.[5]

We use a tobit model to estimate the determinants of cultural dollarization, given that the dependent variable is truncated above 100, and controlled by performing ordinary least squares and two-stage least squares estimations.

Table 14 shows the models estimated for cultural dollarization based on the dollarization of real assets. The best specification for this is the tobit model with the variable limited at 0 and at 100. As a control, the model was also estimated by OLS and 2SLS. In the estimation using instrumental variables (2SLS) the variable measuring nonreal estate assets was made endogenous.

Cultural dollarization is positively correlated to wealth, even when excluding households' most important real asset, which is housing. Households that are homeowners are more likely to value and denominate their assets in dollars. Furthermore, it can be seen that the interaction variables between age and education and between age and income are positively and significantly correlated with cultural dollarization. The youngest individuals appear less dollarized, probably because they have lower incomes.

Income, wealth, being a homeowner, and age are the main factors that determine the cultural dollarization of households in Uruguay. That is, those that are more inclined to measure their wealth in dollars. Meanwhile, the largest households are less dollarized, which is explained by the fact that households with higher numbers of members are less likely to be homeowners.

We interpret the relation between cultural dollarization and home ownership as an indication of the link between cultural dollarization and the pricing system. Our proxy variable for cultural dollarization is obviously already included in the pricing system because the majority of the assets that households were asked to value are highly dollarized by the pricing system. Prices of household appliances, jewelry, and livestock, among others, exhibit a significant level of dollarization in Uruguay (see Licandro, 2016). Housing prices are also dollarized. All in all, this dollarization of the pricing system can be observed for all high-value items, thereby generating a direct association between large values and the use of the dollar

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[5] In other countries the prices of these assets are reported in local currency.

Table 14

DETERMINANTS OF CULTURAL DOLLARIZATION

	Ordinary least squares	Two-stage least squares	Tobit model	Tobit model with instrumental variables
Main				
Non-real estate assets	8.940[c]	11.505[c]	15.431[c]	19.553[c]
	(0.500)	(1.795)	(0.822)	(2.809)
Dummy housing variable	39.048[c]	38.142[c]	56.877[c]	54.813[c]
	(1.355)	(1.609)	(2.186)	(2.565)
Age of household head	0.136[c]	0.215[b]	0.226[c]	0.396[c]
	(0.050)	(0.087)	(0.080)	(0.137)
Number of household members	-1.399[c]	-1.357[c]	-2.453[c]	-2.430[c]
	(0.417)	(0.428)	(0.675)	(0.678)
Education plus age, in logs	7.093[c]	6.802[c]	11.574[c]	9.822[c]
	(1.626)	(1.798)	(2.627)	(2.871)
Income plus age, in logs	2.855[c]	0.578	4.391[b]	0.388
	(1.068)	(1.993)	(1.704)	(3.112)
Constant	-111.266[c]	-108.017[c]	-230.208[c]	-215.141[c]
	(9.895)	(11.689)	(16.240)	(18.957)

Nonreal estate assets

Dummy housing variable	0.305[c]
	(0.051)
Age of household head	−0.039[c]
	(0.002)
Number of household members	−0.048[c]
	(0.016)
Education plus age, in logs	0.355[c]
	(0.059)
Income plus age, in logs	0.845[c]
	(0.050)
Total household income	−0.000[c]
	(0.000)
Value of all real assets	0.000[c]
	(0.000)
Dummy variable for married	0.540[c]
	(0.052)
Dummy variable for businesses	0.088
	(0.064)
Household income	0.000[a]
	(0.000)
Constant	−2.134[c]
	(0.470)

Table 14 (cont.)

	Ordinary least squares	Two-stage least squares	Tobit model	Tobit model with instrumental variables
Observations	2,774	2,637	2,774	2,774
Uncensored observations			1,710	1,710
Censored observations on the left			902	902
Censored observations on the right			162	162
Pvalue	0	0	0	1.1e−289
R^2	0.42257	0.42295		
Adjusted R^2	0.42132	0.42164		

Note: [a] $p$value <0.10, [b] $p$value <0.05, [c] $p$value <0.01

as tenure. These results support the hypothesis of Licandro (2016) as regards the role of the pricing system and public communication in the persistence of dollarization in Uruguay.

4. CONCLUSIONS

In this empirical study, we pursued the factors that determine the financial and cultural dollarization of households in Uruguay. We mainly focus on aspects such as the denomination currency of assets and liabilities, as well as households' income and expenditure flows. Besides analyzing the size of the share of household assets denominated in dollars, mostly bank savings, we also study factors associated with the fact that Uruguayan households think in dollars, even in cases where such behavior is unjustified from a financial point of view. We find that the level of dollarization of bank savings is mainly explained by the size of the savings and household wealth. In particular, the savings of female household heads display higher dollarization. We also find that our proxy variable for cultural dollarization is associated with wealth and home ownership. Other factors that influence cultural dollarization are age and years of formal education, which are positively and significantly correlated with the use of the dollar as a unit of account and asset valuation. Meanwhile, larger households are less culturally dollarized. We understand that the weight of real assets in wealth, and of these in dollarization and cultural dollarization, suggests that the dollarization of high-value assets prices in Uruguay (housing and automobiles) is a key factor explaining cultural dollarization. Moreover, all the factors reinforcing the idea that large amounts should be communicated in dollars would contribute to deepening cultural dollarization.
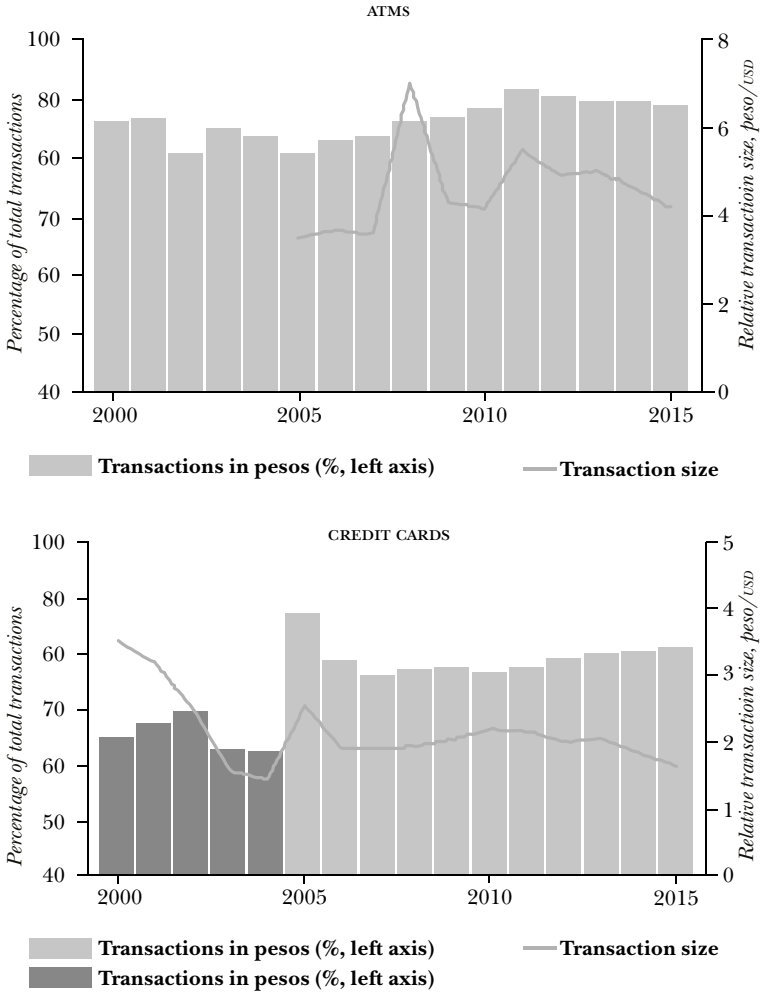
The results of this paper support those of Licandro (2016) in the sense that it demonstrates how the state should have a specific policy to combat cultural dollarization if it wishes to progress with the development of a domestic financial system in local currency that provides the necessary exchange and liquidity insurances for preserving financial stability. The most important measures requiring consideration are the complete de-dollarization of public communication and incentives, as well as Peru's experience in matters of de-dollarizing the pricing system already suggested in Licandro and Licandro (2004). This study proposes assigning a role to financial education and public communication policies.

ANNEX

Annex 1. Figures

Figure A.1

GROWING PARTICIPATION OF URUGUAYAN PESOS IN TRANSACTIONS

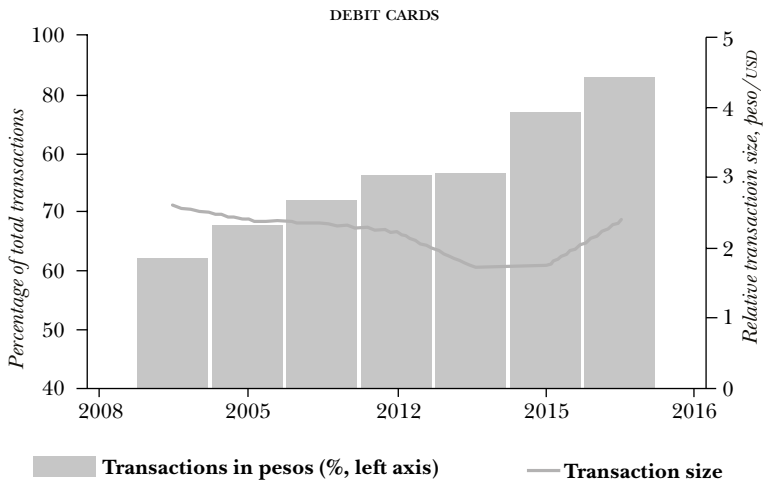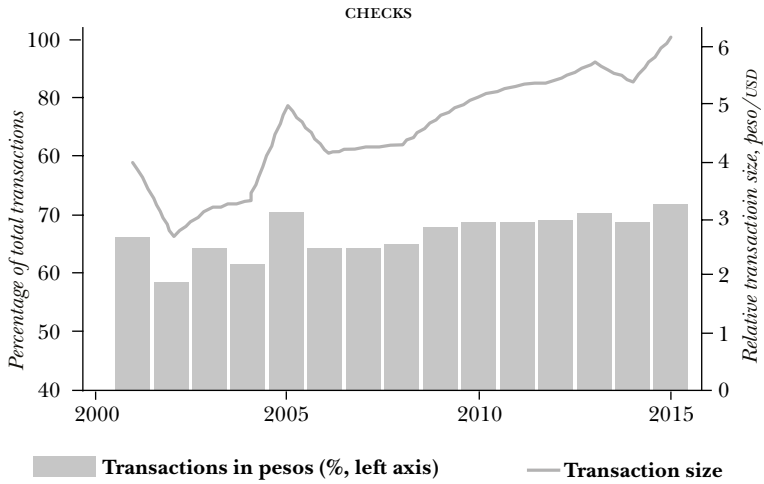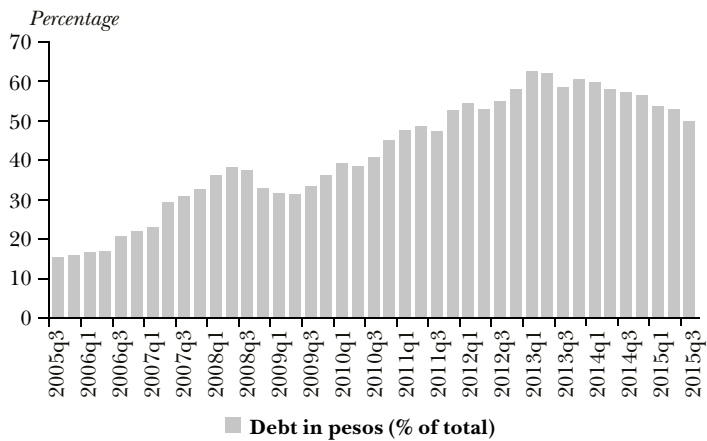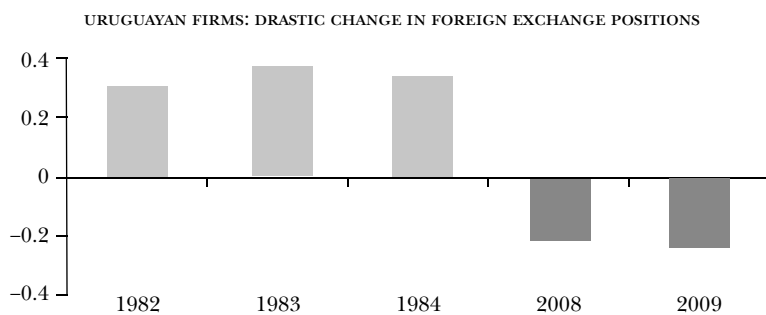Note: Data before 2004 do not include all credit card companies.

CHECKS

Transactions in pesos (%, left axis) — Transaction size

DEBIT CARDS

Transactions in pesos (%, left axis) — Transaction size

Figure A.2

PUBLIC DEBT DEDOLLARIZATION

Percentage

Debt in pesos (% of total)

Source: BCU.

Figure A.3

URUGUAYAN FIRMS: REDUCTION IN CURRENCY MISMATCHES

URUGUAYAN FIRMS: DRASTIC CHANGE IN FOREIGN EXCHANGE POSITIONS
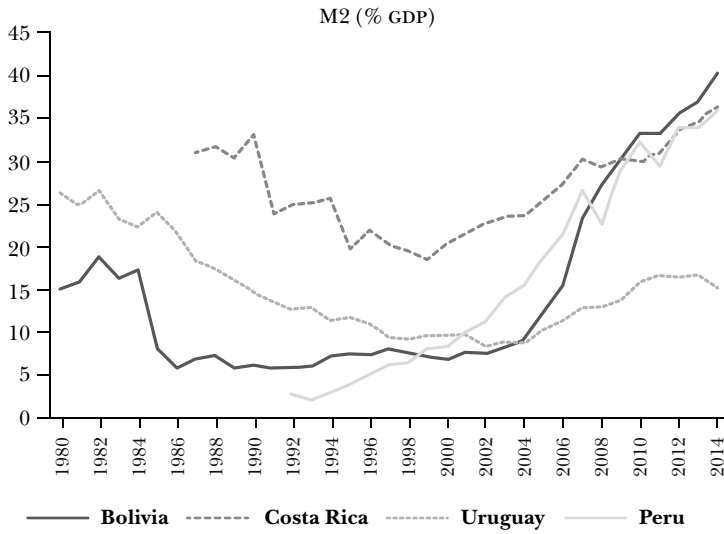

Source: INE.

**URUGUAY: MONETIZATION AND DOLLARIZATION
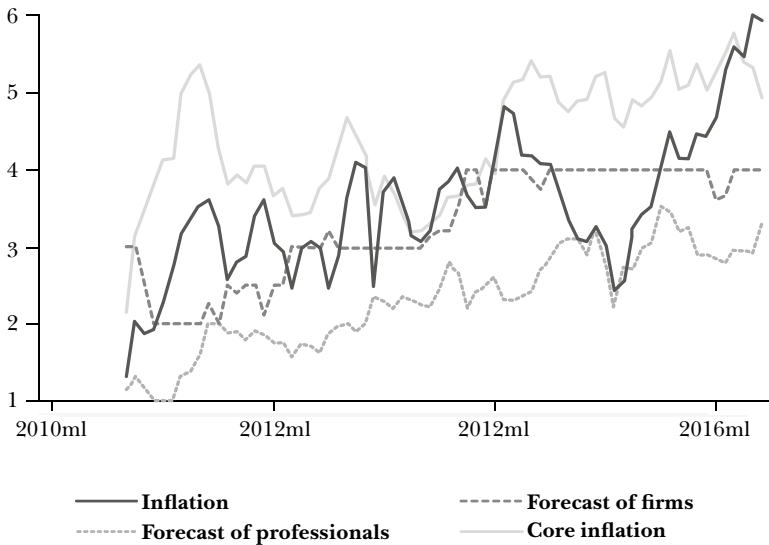OF DEPOSITS AND CREDITS**
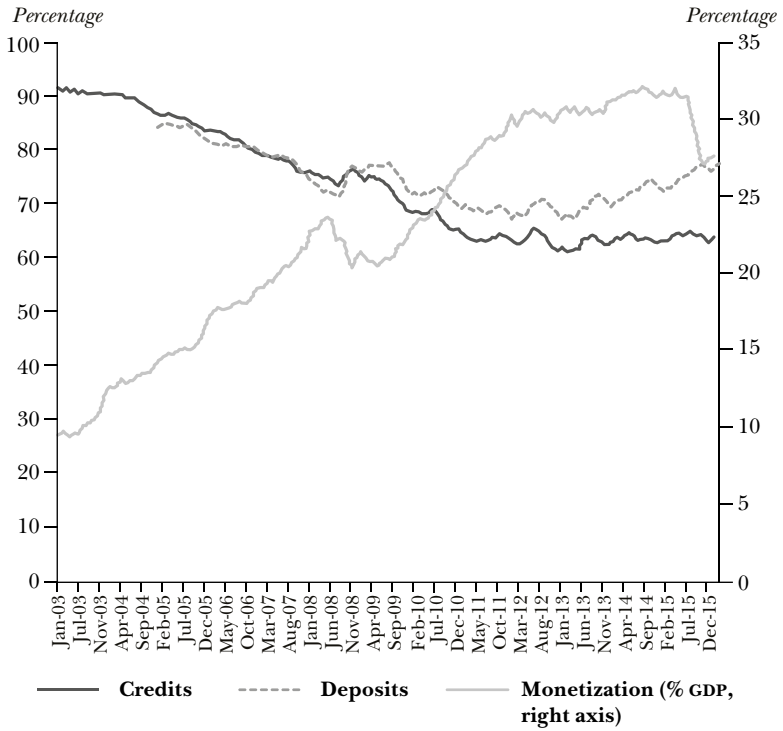
Source: BCU.

MONETIZATION IN SELECTED COUNTRIES

M2 (% GDP)

Source: Own calculations based on IMF data.

URUGUAY: DISACHORING OF INFLATION AND EXPECTATIONS

Source: Borraz and Orlik (2016).

Annex 2. Main Moments of the Complete sample and Filtered sample of Variables Reported by Respondents

DOLLARIZATION OF BANK SAVING		
	Complete sample	*Filtered sample*
Mean	50.276	51.094
Median	43.075	43.060
Standard deviation	42.909	42.980
Minimum	0	0
Maximum	100	100
Observations	689	616

WEIGHTING OF BANK SAVING		
	Complete sample	*Filtered sample*
Mean	42.429	43.300
Median	30	30
Standard deviation	42.934	43.150
Minimum	0	0
Maximum	100	100
Observations	688	616

EXPENDITURE ON FOOD		
	Complete sample	*Filtered sample*
Mean	11,678	11,865
Median	9,560	9,800
Standard deviation	8,335	8,367
Minimum	0	0
Maximum	80,000	80,000
Observations	3,264	2,844

REPORTED INCOME		
	Complete sample	*Filtered sample*
Mean	37,002	37,779
Median	28,900	29,600
Standard deviation	47,048.72	41,858.92
Minimum	0	0
Maximum	1,000,000	1,000,000
Observations	3,252	2,993

Annex 3. Dollarization of Respondents' Asset Valuation

	Dummy variable for housing valued in USD			Dummy variable for other real estate valued in USD	
	Frequency	*Percentage*		*Frequency*	*Percentage*
0	75	4.56	0	3	2.22
1	1,568	95.44	1	132	97.78
Total	1,643	100	Total	135	100

	Dummy variable for automobiles valued in USD			Dummy variable for motorcycles valued in USD	
	Frequency	*Percentage*		*Frequency*	*Percentage*
0	34	2.68	0	9	22.50
1	1,234	97.32	1	31	77.50
Total	1,268	100	Total	40	100

	Dummy variable for jewelry valued in USD			Dummy variable for livestock valued in USD	
	Frequency	*Percentage*		*Frequency*	*Percentage*
0	21	27.27	0	20	28.57
1	56	72.73	1	50	71.43
Total	77	100	Total	70	100

	Dummy variable for bank savings denominated in USD			Dummy variable for household appliances valued in USD	
	Frequency	*Percentage*		*Frequency*	*Percentage*
0	162	30.06	0	1,523	64.34
1	377	69.94	1	844	35.66
Total	539	100	Total	2,367	100

Note: Zero indicates valuation in pesos, and one in dollars.

Annex 4. Dollarization of Bank Savings Models

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Age of household head	2,993	52.794	16.225	8	101
Education of household head	2,993	10.599	4.117	1	20
Dummy variable for housing	2,993	0.566	0.496	0	1
Number of household members	2,993	3.006	1.635	1	15
Female	2,993	0.602	0.490	0	1
Dummy variable for married or in union	2,993	0.586	0.493	0	1
Household income	2,993	1,888.960	2,092.95	0	50,000
Total household income including flows from businesses	2,993	2,096.530	2,611.37	0	60,000
Total income, in logs	2,993	7.205	1.271	0	11.002
Value of all real assets	2,993	72,480.1	151,793	0	4.0e+06
Real assets, in logs	2,993	9.591	2.373	0	15.202
Real assets other than housing, in logs	2821	8.023	1.604	1.609	13.361
Total wealth, in logs	2785	9.876	2.211	1.609	16.309
Transaction accounts	2,993	0.987	1.325	0	12
Credit cards	2,993	1.451	1.732	0	20
Dummy variable for owning credit cards	2,993	0.630	0.483	0	1
Credit card debt	2,993	29.158	154.331	0	2,900
Reported financial restriction	2,993	10.992	20.117	0	105
Bank savings, in logs	475	8.878	1.606	1.504	12.707
Percentage of bank savings denominated in USD	619	51.053	43.040	0	100
Dollarization of real assets	2,993	61.878	44.152	0	100
Education plus income, in logs	2,936	9.609	1.104	4.652	13.567
Education plus age, in logs	2,993	6.178	0.506	3.091	7.305
Income plus age, in logs	2,936	11.258	0.834	7.920	15.319

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Effects of Different Financial Inclusion Interventions

Banking Correspondents and Financial Inclusion in Mexico

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Abstract

This paper assesses the impact of the banking correspondent model, a policy enacted to enable financial intermediaries to provide basic banking and payment services through third-party nonfinancial commercial establishments, on financial inclusion in Mexico. In particular, the study focuses on determining the effect of this policy on formal savings, measured as the number of active bank accounts and the total volume of bank deposits. To achieve this, we assemble a dataset that merges bank-correspondent level information with locational and operational data on banks in Mexico. We use this data with a difference in differences model using multiple time periods to determine whether the introduction of banking correspondents has boosted formal savings in Mexico by increasing the availability of financial services. Our results show a significant positive effect of the entrance of banking correspondents on both the volume of savings (in Mexican pesos) and the number of savings bank accounts. We do not find a differentiated effect for rural municipalities. We also find evidence of a spillover effect at a municipal level that suggested

that banks' deposits would be reduced if a correspondence relation in which they are not involved begins.

1. INTRODUCTION

There is an extensive literature that explores the impact of financial institutions on economic activity. Since Goldsmith's publication (1969) on the relation between financial structure and economic development, many studies have found that the development of markets that efficiently allocate financial resources within an economy has a positive causal effect on economic growth and other well-being indicators.[1] Consistent with these findings, financial inclusion has become a relevant topic over the last few years, since access to financial services has been found to increase economic growth. Recent evidence shows that countries with more deeply integrated financial systems experience accelerated economic growth and reduced income inequality and poverty rates (Beck et al., 2007). Also, there is evidence at the micro level that suggests that financial inclusion expands a household's ability to make different intertemporal choices and increases (reduces) its durable goods (temptation goods) expenditure (Banerjee et al., 2014). Furthermore, access to financial instruments has been seen to help alleviate unexpected situations such as disease and long periods of unemployment. Concurrently, access to credit may help the poor to obtain nonconventional outcomes of welfare measured by indicators related to the need for aid, lack of depression, trust, and female decision making (Angelucci et al., 2015).

However, market frictions often prevent access to financial services for households or firms that face higher transactional costs or are more informationally opaque. The most common examples of market frictions are lack of infrastructure, such as roads, bridges, or

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[1] Levine (2005) gives a thorough theoretical and empirical review on the link between finance and economic growth. Various empirical methods have been used to describe this question (for example, cross-country studies, panel, and time-series, among others), many of which are described in the aforementioned work.

electric power, and the disorganization of institutional frameworks. Such frictions often arise when economic downturns and financial crises cause a greater mistrust in the economy. These frictions are more prevalent in emerging economies with less developed financial markets and tend to limit disproportionally the access of small or young businesses and low-income households to these financial services. Since the supply of financial services is consequently inhibited from reaching its potential size, access to formal products is only available for a restricted segment of the population, namely the most developed economic areas. Excluded agents, in turn, tend to fulfill their need for financial services through informal mechanisms.

Despite recent improvements, Mexico still lags behind other similarly developed economies in most measures of financial development and inclusion, which makes addressing these problems a crucial task for boosting economic activity and reducing poverty. In particular, Mexico has low levels of financial inclusion compared to other developing economies. Demirgüç-Kunt et al. (2015) describe that only around 39% of the adult population in Mexico possess an account at a bank or other type of financial institution, which is still lower than the average of the Latin American and Caribbean region of approximately 51 percent.

According to the 2015 Mexican National Survey on Financial Inclusion (ENIF 2015), carried out in June 2015, 23.5% of all adults (between 18 and 70 years old) in Mexico do not have any savings, formal or informal. Approximately 15.1% of adults use only formal methods of savings; meanwhile, 32.5% only use informal methods. And, 28.9% of adults use both formal and informal instruments of savings. In addition, 56% of adults in Mexico do not have a bank account, of which only 14% are former users who have stopped using their accounts. That is, 42% of adults have never had a bank account. The same survey shows that 65% of the national adult population has saved cash in its home, and slightly more than 30% has saved money through a popular informal method called *tanda*.[2]

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[2] An informal savings club in which relatives, friends, and neighbors regularly contribute money to a pooled fund, and the member that receives the savings accumulated during the allotted time period is rotated or randomly determined. For example, the group may contribute to the

The absence or nonuse of formal saving methods is important since greater participation in these services closely correlates to a greater access to formal credit services. Consequently, all public policies that foster formal savings are of national interest because they encourage financial inclusion.

Unfortunately, in Mexico there is still a significant difference regarding wealth between urban and rural localities, which is reflected in access to formal savings. The Mexican case is characterized by its geographical disparities and insufficient economic opportunities in remote areas. On the one hand, banks face high fixed costs when opening new branch offices. This situation encourages banks to locate their branch offices close to urban areas to recover their investment quickly. On the other hand, geography dictates that people from remote areas have to travel long distances and pay high tariffs to obtain access to financial services. As we can imagine, this group of the population has to decide between paying for using formal financial services in addition to travel costs, or paying for using informal financial services. These circumstances bring higher incentives for using informal rather than formal services.

In order to facilitate access to basic financial services for households, Mexican legislation was changed to create a legal scheme that facilitates financial intermediaries in operating through banking correspondents–establishments such as retail or convenience stores, pharmacies, and supermarkets. Banking correspondents, an example of a broader term called *branchless banking*, is a business model in which the commercial establishment handles services itself, including cash withdrawals, deposit operations, loan and utility payments, and the payment of checks issued by the bank. The regulation was modified in December 2008[3] and operations began in November 2009. Since then, the number of banking correspondent units has surpassed the number of bank branches. Given their prevalence, it is likely that the banking correspondent model expanded access points to financial services for the Mexican population, thus increasing overall geographic coverage. This model could be a potential solution to the absence or disuse of financial services that are critical to expeditious economic growth and development. The presence of

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savings pool weekly, and give the accumulated savings to a random member of the group at the end of the week.

[3] Published in the *Diario Oficial de la Federación*, 12/04/2008.

banking correspondents could rapidly help formalize the demand for banking services, and thus help informal savers take their first step towards formal financial products.

In this paper, we aim to measure the impact of banking correspondents on savings, measured both as the number of active bank accounts and as the amount of total deposits in these accounts. The reasons for focusing on formal savings are the following: First, a formal savings account is normally a gateway to other types of formal financial products. As such, a formal savings account is a minimum requirement for financial inclusion. Second, saving is a fundamental tool for smoothing expenditure across time, and one that may bring large welfare benefits, particularly to low-income households (Mas and Siedek, 2008). Third, anyone can now easily open a savings account, as there are savings accounts that are not subject to any fee or minimal monthly balance. Finally, as we explained before, there is a distinct lack of financial inclusion in Mexico, and consequently evidence of a large latent demand for formal financial services.

Our empirical strategy relies on the fact that some of the retail stores used as banking correspondents have a large presence in Mexican territory. When banks sign a banking correspondent deal, banks register a discontinuous increase in their presence across different municipalities. The service becomes available immediately overnight, thus increasing the geographical coverage of formal financial services. For example, by July 2011, Oxxo (the largest retail stores chain in Mexico) signed its first correspondence deal with Santander, and the bank immediately obtained presence in 325 municipalities in a correspondence format. Moreover, the banks have different constraints in terms of capacity to sign deals and different preferences to sign them. This circumstance yields to heterogeneous effects of the correspondence service. In other words, the effect of signing a correspondence deal with the biggest correspondent is not the same as signing one with the smallest because of differences in the respective correspondent's geographical coverage level. In addition, the effect may vary depending on the characteristics of the location of the stores, namely if the establishment is located in a rural or urban area. In order to test whether this increase in access points has a significant effect on savings, we use a difference in differences model with multiple time periods to estimate the volume of savings and the number of active savings accounts in a given bank after it had contracted a new banking correspondent. To do this, we

construct a database with information on the dates of contracts for different banking correspondent deals and data on monthly savings on a bank-municipality level. Preliminary results showed a positive and significant effect of the entrance of banking correspondents on both the volume of savings and the number of savings accounts. Even though we account for the difference in characteristics of dissimilar municipalities, we do not find a differentiated effect for rural municipalities, where we would expect banking correspondents to have a larger impact. Finally, we find evidence of a possible spillover effect between banks. As a bank begins a new correspondence relation, the bank not only increases its savings but also reduces their competitors' volume of savings and bank accounts primarily due to a substitution effect among financial institutions. This spillover considerably reduces the initial calculated effect.

The structure of this document is the following: Section 2 contains a brief literature review of research relevant to this study. Section 3 describes the banking correspondent model and how this policy relates to branchless banking. Section 4 describes the evolution of banking correspondents in Mexico. Section 5 defines the econometric approach used in this study. Section 6 details the data collected for our model. Section 7 describes our preliminary results, and Section 8 contains the conclusion of the study.

2. LITERATURE REVIEW

There is a large empirical literature that studies the effect of access to financial services on well-being indicators, with most of the research focusing on microfinance institutions and rural banks. For example, Burgess and Pande (2005) find that the expansion of banking services into rural areas significantly reduced poverty. For the Mexican case, both Bruhn and Love (2014) and Ruiz (2013) study the sudden expansion of Banco Azteca and its impact on different economic outcomes. Grupo Elektra–one of the largest retailers in Mexico–suddenly opened a Banco Azteca branch in every one of their stores. More than 800 bank branches simultaneously appeared over the country. Bruhn and Love identify a significant impact of the introduction of Banco Azteca on the number of informal business owners, overall employment, and average income in the treated municipalities. Similarly, when evaluating the impact of the same

event, Ruiz (2013) finds that households in municipalities in which Banco Azteca is present are more likely to borrow from banks and less likely to borrow from pawnshops due to the appearance of the financial service.

In addition, Aportela (1999) measures the impact of the expansion of the public institution Patronato del Ahorro Nacional (Pahnal)[4] on savings, using the Mexican Income and Expenditures National Survey (ENIGH). He identifies a positive effect, where the Pahnal expansion increased the savings rate by around 3%-5%. The effect is even more prominent for the poorest households.

However, a significant gap still seems to exist in the literature on the impact of banking correspondents in Mexico.[5] In Latin America, most of the empirical literature on banking correspondents focuses on Brazil. Assunção (2013) estimates the average entry threshold, that is, the minimum population needed to obtain at least one banking correspondent or one bank branch in Brazil. He finds that the entry threshold for banking correspondents is practically zero, observing a banking correspondent in almost every municipality, whereas bank branches have an entry threshold of 8,000-9,000 people. Rodrigues-Loureiro et al. (2016) find that there is a negative correlation between the existence of banking correspondents and bank branches, hinting that banking correspondents might be substituting some of the functions of bank branches. Nonetheless, banking correspondents attend to a different sector of the population than bank branches, as they are present in municipalities where the average income is considerably lower.

For the Mexican case, two works evaluate the impact of banking correspondents on different economic outcomes. Peña and Vázquez (2012) show that banking correspondents do not have a significant effect on chosen measures of financial inclusion. Their analysis focuses on both savings (measured by a number of accounts and number of debit cards) and credit (via a number of credit cards) as measures of financial inclusion. However, they only analyze the years 2010 and

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[4] Pahnal later came to be Banco de Ahorro Nacional y Servicios Financieros (Bansefi). Its main goal was to promote savings and financial inclusion on a national level, specifically in low-income households.

[5] The banking correspondent model is not extremely common in the world. A broader term called *branchless banking* (mentioned in the following section) has been studied in more detail. See, for example, Ivatury and Mas (2008).

2011, the initial stage of the banking correspondents boom. Using a larger time frame and a different identification strategy, we aim to reevaluate the impact of the banking correspondents model. In addition, we will focus solely on formal savings measures.

Eisele and Villarreal (2015) find that the introduction of banking correspondents in Mexico might have had a positive effect on household income. However, they argue that their results are inconclusive because their study does not account for the fact that many households that use banking correspondents previously had access to financial services.
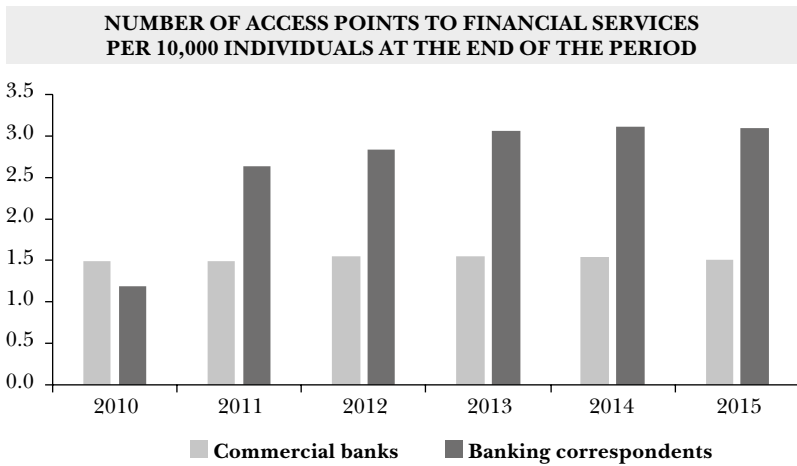
There are also studies of the physical distance between borrowers and lending banks and its effect on credit conditions. For example, Degryse and Ongena (2005) find evidence of spatial price discrimination, which grows larger as the distance between the lending bank and other potential competitors increases. This point could be relevant in the case of banking correspondents. As banking correspondents appear in different municipalities, market power, and thereby credit conditions, might change. Although not in the scope of this paper, it is important to consider market power changes as another possible impact, for example in the form of spillover effects.

3. BANKING CORRESPONDENTS IN MEXICO

The legal construct of banking correspondents has existed in Mexico since the end of 2009. From 2010 to 2011, the number of banking correspondents per 10,000 individuals increased considerably (from 1.2 to more than 2.5), while the number of banking branches has stayed at almost at the same level throughout all periods (Figure 1).[6] Figure 1 also shows that banking correspondent units' growth rate was almost zero from 2012 to 2016. Nonetheless, as seen in Figure 2, the number of bank-correspondent deals has grown steadily during this period. We observe that smaller banks most commonly adopted the banking correspondent model at first, but the participation of larger banks in this practice sharply increased in 2011 and has steadily grown since then. This means that more banks are operating

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[6]   Peña and Vazquez (2012) only observe the first two years of this figure.

**NUMBER OF ACCESS POINTS TO FINANCIAL SERVICES
PER 10,000 INDIVIDUALS AT THE END OF THE PERIOD**

Commercial banks   Banking correspondents

Source: CNBV Financial Inclusion Data.

through third-party retail agents, even if the number of physical access points has not increased significantly since 2012.

According to Comisión Nacional Bancaria y de Valores (National Banking and Securities Commission, CNBV) financial inclusion data for the first quarter of 2015, there were still 36.1% of municipalities (which only constitutes 4.3% of the total population) that did not have the presence of banking correspondents or bank branches. Conversely, the other 63.9% of municipalities (which constitutes 95.7% of the total population) have at least some means of access to financial services (banking correspondents or bank branches). It is important to note that 14% of all municipalities have banking correspondents as their sole access point, many of which are either rural or semi-rural.

From this perspective, it seems that banking correspondents have improved financial access to municipalities that bank branches alone would not have reached. In terms of usage, results from the ENIF show that banking correspondents usage increased considerably from 2012 to 2015 (Figure 3). The increase is even greater in rural areas, where more than 25% of the population reported that they had used a banking correspondent at least once in the last couple of months prior to the survey. Usage of ATMs also increased, though

Figure 2

EVOLUTION OF CORRESPONDENT-BANK RELATIONS

A. NUMBER OF *NEW* CORRESPONDENT-BANK RELATIONS

B. NUMBER OF *EXISTING* CORRESPONDENT-BANK RELATIONS

Figure 3

EVOLUTION OF CORRESPONDENT-BANK RELATIONS

A. USE OF BANK BRANCHES

B. USE OF ATMS

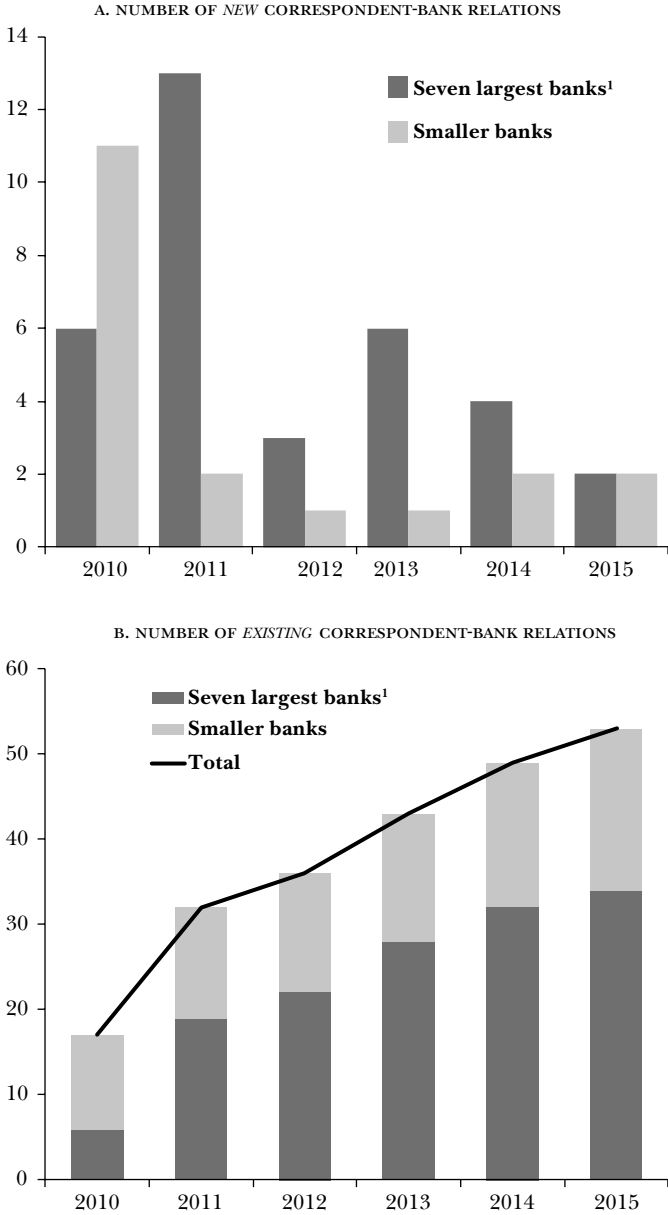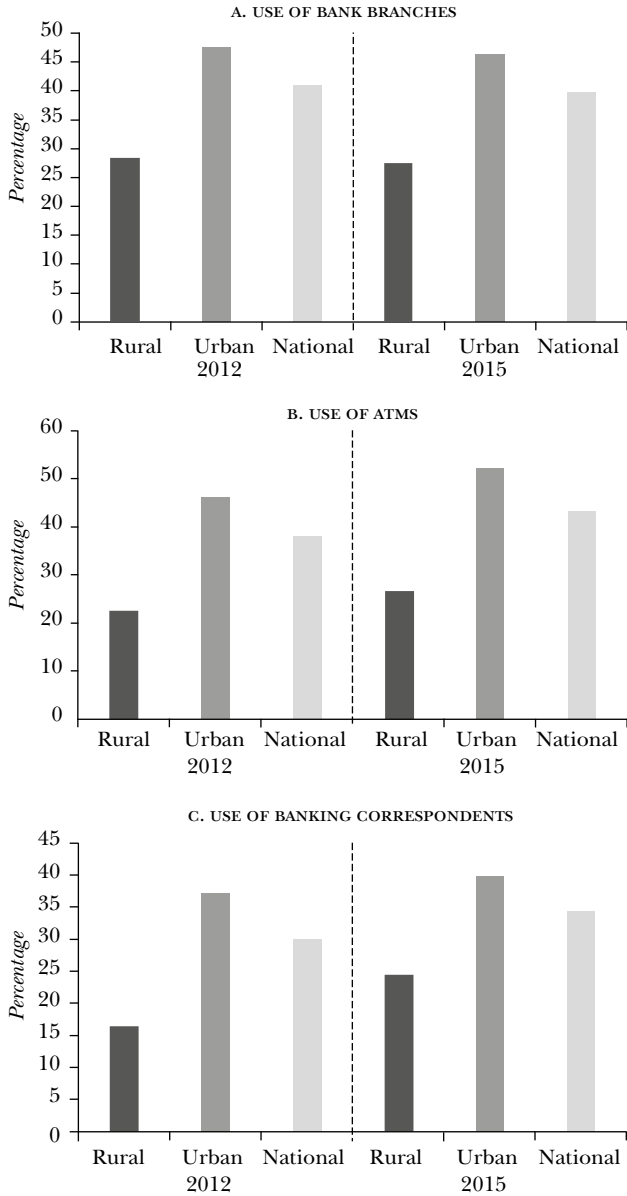C. USE OF BANKING CORRESPONDENTS

Source: National Survey on Financial Inclusion 2012 and 2015.

the most notable rise occurred in urban areas. It should also be noted that the use of bank branches decreased for the same period. As Rodrigues-Loureiro et al. (2016) describe for the Brazilian case, banking correspondents and ATMs might be substituting some of the functions of bank branches in Mexico. This is not necessarily detrimental to financial inclusion, as we already saw that banking correspondents are reaching smaller communities. One possible reading is that banks have found a way to reduce costs and still reach out to new customers by implementing the new banking correspondent model. It is important to mention that we consider ATMs as bank branches because of the difficulty in differentiating between them across the database.

In Figure 4, we plot the average of the difference in formal savings (both number of accounts and volume of bank deposits) between municipalities with the presence of an active banking correspondent and municipalities without correspondents. Figure 4 illustrates a possible impact of banking correspondents on financial inclusion. After signing a new banking correspondent deal, savings (measured both as a number of accounts and total balance) increase.

We have seen the growth, both in presence and usage, of banking correspondents in Mexico, but there are various purposes for which people choose to utilize certain correspondents. Since a distinct variability exists in the agreements established between each bank and its correspondents, the services each bank-correspondent pair offers customers will consequently vary and can limit the overall services available to each customer. For example, while anyone can open a bank account in Oxxo with Banamex,[7] customers cannot open an account with Bancomer, even if Oxxo offers other financial services for Bancomer. Similarly, the agreement that Bancomer has with 7-Eleven (another retail stores chain) is not the same as its agreement with Oxxo.[8] The full range of services that a banking correspondent can offer is the following: making deposits to bank accounts, making loan and services payments, making a cash withdrawal, opening

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[7] Banamex is a subsidiary of Citibank. Only Banamex offers a certain type of low risk bank account that allows monthly deposits of no more than 800 USD, approximately.

[8] Bancomer only allows Oxxo to process deposits and loan payments. In addition to these services, Bancomer allows 7-Eleven to process service payments.

Figure 4

**DIFFERENCES BETWEEN TREATED AND NON-TREATED MUNICIPALITIES
BEFORE AND AFTER SIGNING A NEW BANKING CORRESPONDENT DEAL**

AVERAGE DIFFERENCE OF NUMBER OF ACCOUNTS BETWEEN TREATED AND NON-TREATED
MUNICIPALITIES ACROSS BANKS (ONE YEAR BEFORE AND ONE YEAR AFTER)
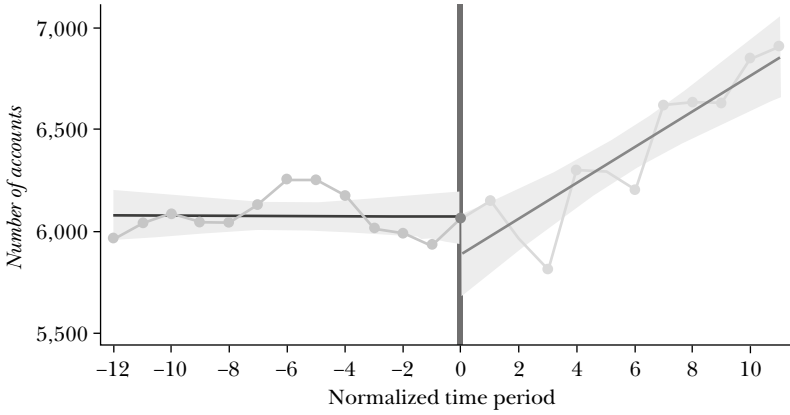
AVERAGE DIFFERENCE OF VOLUME OF SAVING BETWEEN TREATED AND NON-TREATED
MUNICIPALITIES ACROSS BANKS (ONE YEAR BEFORE AND ONE YEAR AFTER)

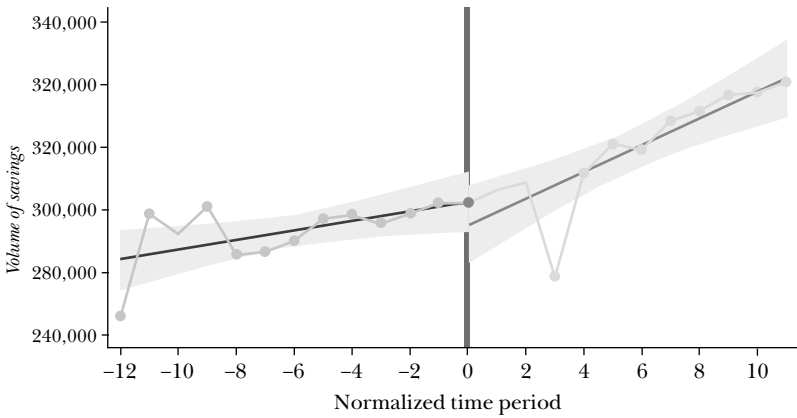low-risk bank accounts, collecting checks, and checking balance information. However, despite the fact that customers can have access to a full array of financial services, there is a maximum transaction limit for both payments and deposits. As such, we would expect higher usage of banking correspondents among households and lower usage among business enterprises. The variation[9] in the combination of services offered by each correspondent-bank pair is significant because this heterogeneity presents an obstacle for identifying the impact of banking correspondents, as correspondent agreements are not comparable with each other. Nonetheless, we account for potential agency problems by capturing the bank's identity.

On aggregate, almost all banking correspondents accept loan payments and deposits to bank accounts (personal or third party). These two are the most common types of transactions carried out by the banking correspondents (Figure 5). Interestingly, cash withdrawal is a service allowed only to very few banking correspondents, the main agent of which is Telecomm (the Mexican state-owned telegraph company[10]). Nonetheless, it is the third most popular service used in banking correspondents.

To observe the participation of each banking correspondent in the market, we see that Oxxo represents 60% of the total bank-correspondent branches (Figure 6). By bank-correspondent branches, we mean that we are counting a retail agent twice or more if it has double or multiple correspondence relations. Commercial establishments do not necessarily have an exclusive correspondent relation with just one bank. In the former example, Oxxo-Bancomer and Oxxo-Banamex are counted as two different bank-correspondent units, even if the business unit is the same.

In Mexico, Oxxo demonstrates the greatest participation in correspondent banking because they have the largest retail network and have multiple correspondent relations.[11] The next most prominent

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[9] For a full description of services allowed by each bank to their correspondents, see Table 2.18 of the National Report on Financial Inclusion 7 (Consejo Nacional de Inclusión Financiera, 2016)

[10] Telecomm not only provides telegraph services. Its infrastructure now also delivers the federal conditional cash transfer programs and other telecommunication services.

[11] According to Consejo Nacional de Inclusión Financiera (2016), Oxxo provides banking correspondence services to Banamex, BBVA Bancomer, Compartamos, Inbursa, Santander and Scotiabank.

**USE OF SERVICES PROVIDED BY BANKING CORRESPONDENTS,
TO NOVEMBER 2015**
Number of transactions
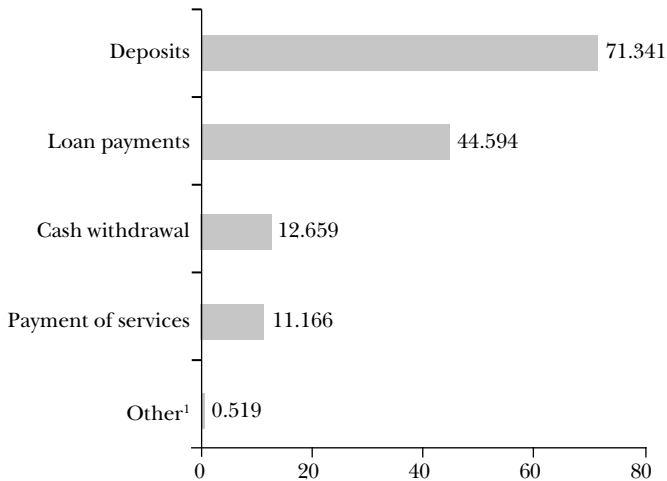
[1] Other services include opening savings accounts, check collection and balance information.
Source: CNBV.

participant is Telecomm, which has a similarly large retail network, presence in rural areas, and offers the cash withdrawal service.[12] Walmart, Soriana, Chedraui, and Coppel are supermarkets or retail stores, normally located in urban or metropolitan areas.[13]

As we can see, there exists an enormous heterogeneity across banking correspondents' agreements, which creates difficulties in addressing their impact on banking savings. The first dimension of heterogeneity is the spectrum of the establishments with which banks

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[12] According to Consejo Nacional de Inclusión Financiera (2016), Telecomm has a correspondent agreement with Afirme, Banamex, BBVA Bancomer, Banorte, HSBC, Inbursa, Santander and Scotiabank.

[13] According to Consejo Nacional de Inclusión Financiera (2016), Walmart provides banking correspondence services to American Express, Invex and Walmart Bank; Soriana to American Express, BBVA Bancomer, Banorte, HSBC, Invex, and Scotiabank; and Chedraui to American Express, Banamex, BBVA Bancomer, Banorte, HSBC, Invex, Scotiabank. Coppel only gives services to Bancoppel.

**USE OF SERVICES PROVIDED BY BANKING CORRESPONDENTS,
TO NOVEMBER 2015**
Percentages
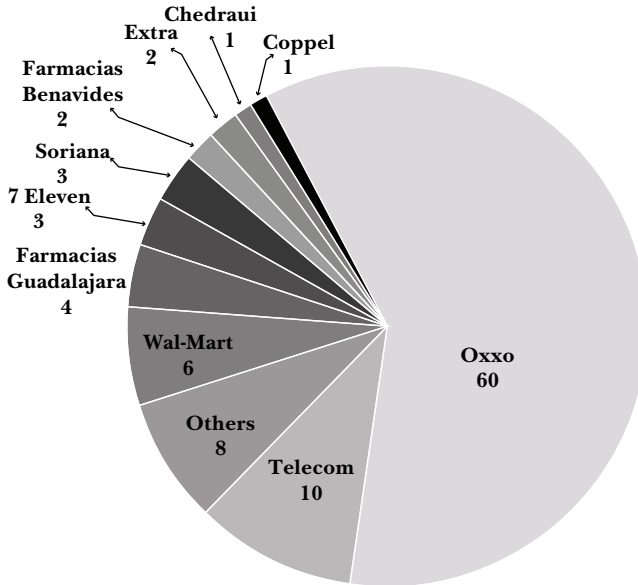
Source: CNBV Report on Banking Correspondents.

make banking correspondent deals. Some establishments prefer to place themselves in urban areas (as 7-Eleven and Chedraui) while others prefer rural areas (for example, Telecomm). Furthermore, there are banking correspondents like Walmart, which have even larger fixed costs than those of bank branches. Given the presence of bank's plans for expansion, each bank chooses whom to hire as a banking correspondent. After banks choose with whom to work, they then face a second decision: "What services should be included in the correspondence agreement?" This brings a second dimension of heterogeneity to bank-correspondent deals.

4. THEORETICAL CONSIDERATIONS ON BANKING CORRESPONDENTS

As described in Mas (2009), the banking correspondent model is only one particular example of branchless banking, where banking transactions are taken out from banking branches and put into non-banking retail agents. Other types of branchless banking are payment cards or mobile phone transactions. The fundamental aim of branchless banking is to lower transaction costs for both the provider and the potential user.

Building bank branches carry an inherently large fixed cost. Thus, bank branches are located in communities where a dense population guarantees a sufficiently large amount of daily transactions. As such, for communities where these criteria are not met (that is, poor and rural communities), the cost is transferred to the population, via traveling and queuing.

By using banking correspondents, banks use existing retail stores as their point of transaction origin, considerably lowering fixed costs to offer banking services. On the other side, customers' transaction costs are also lowered, as they do not have to travel or wait as long to use financial services. In addition, although we would expect banking correspondents to have a more prominent effect on rural areas, they can also have a positive impact on urban areas. Even where bank branches are easily accessible, the presence of banking correspondents can incentivize customers to shift lower-value transactions outside bank branches.

A new banking correspondent deal can be a win-win situation for the three parties involved. Customers have easy access to some financial services, banks attract new customers without incurring in large costs, and banking correspondents win directly through commissions per transaction and indirectly through higher customer traffic. However, Mas (2009) mentions two possible obstacles to banking correspondents achieving success. First, as the potential market per banking correspondent unit is relatively smaller, it is important to cater to as many customers as possible. This is a difficult endeavor for banking correspondents, as they need to attract new customers to a third-party financial institution. The correspondent scheme has to make banking correspondents attractive and profitable for offering these financial services. The second obstacle is that, as the number of customers served by banking correspondents is lower than that of

banking branches, the number of transactions per customer should be as high as possible to generate sufficient business for agents. As such, banking correspondents should offer a wide array of services: savings, credit disbursements and repayments, bill payment, collecting salaries and welfare payments, and remittances, among others. This, as we described in the previous section, has proven difficult in the Mexican case. Not all of the banking correspondents are able to supply the full range of financial services. Only recently were banking correspondents able to open bank accounts, a service still not standard for all correspondents.

5. DATA DESCRIPTION

5.1 Savings

The savings data we use in this paper comes from the CNBV Regulatory Reports. This report gives detailed information about the number and balance of all types of deposit accounts offered to the public. We use available data from April 2011 to February 2016. This report is particularly useful for our analysis, as it disaggregates the information on a bank-municipality level. For every type of product, we know how many accounts bank b has in a given municipality m at time t.

Essentially the banks offer three broad types of deposit accounts:

1) Low-risk current accounts. These can only be opened by natural persons and have a maximum monthly balance limit. Some of these accounts can now be opened with banking correspondents.

2) Conventional current accounts. These can be opened by natural or juridical persons. These types of accounts have a higher maximum limit or do not have one at all.

3) Term deposit accounts. These accounts are subject to a given term in the bank and to interest payments previously agreed.

The great majority of bank accounts is concentrated in conventional current accounts, both in number and average balance terms (Figure 7). In Table 1, we briefly describe savings in volume (or balance) and the number of accounts.

Figure 7

TYPES OF SAVINGS ACCOUNT IN MEXICO

A) NUMBER OF BANK ACCOUNTS. MILLIONS, YEARLY AVERAGE

B) BALANCE PER BANK ACCOUNT. THOUSANDS OF PESOS, YEARLY AVERAGE
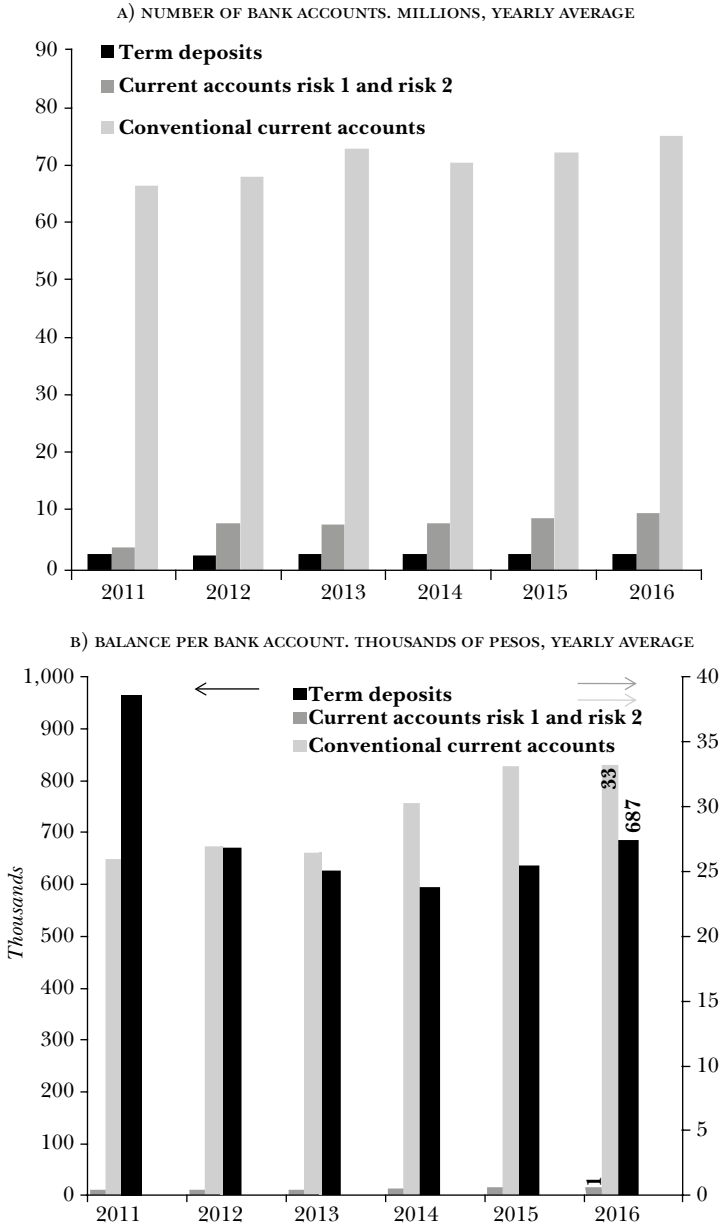
Source: R24 B-2421 Report.

Table 1

All banks	Full sample	
	Mean	Standard deviation
Total		
Savings balance by municipality	236,642	1,733,585
Number of accounts by municipality	10,687	66,716
Top seven banks		
Savings balance by municipality	315,477	2,096,402
Number of accounts by municipality	12,147	51,718
Rest of banks		
Savings balance by municipality	83,292	516,423
Number of accounts by municipality	7,847	88,848

As we explained before, we will study changes in the volume of savings and number of accounts. Our savings measure is the sum of all types of accounts, as all of them are saving instruments.

5.2 Business Location Information

An important aspect of our empirical strategy is the correct identification of municipalities with and without the presence of retail agents before they become banking correspondents. To do so, we use information from the National Statistics Directory of Economic Units (DENUE) published by the National Institute of Statistics and Geography (INEGI). This directory has location information on all the active commercial establishments in the Mexican territory.

Using the commercial or legal name of the establishments, we identify the biggest banking correspondent chains in Mexico: Oxxo, Wal-Mart, 7-Eleven, Telecomm, Farmacias Guadalajara, Farmacias Benavides, Coppel, Extra, Soriana, Radioshack, Chedraui, Diconsa supermarkets,[14] Comercial Mexicana, Sanborns, Farmacias ABC, and Suburbia. The aforementioned retailers cover more than 95% of the

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[14] We used a slightly different strategy to identify Diconsa supermarkets. We identified all the establishments that had the word *Diconsa* on their commercial or legal name. We then filtered them by type of commercial

**LOCATION OF BANK BRANCHES,
ATMS AND BANKING CORRESPONDENTS**
Banking correspondents and bank branches plus ATMs
February, 2016

$+$ **Bank branches and ATMs** $\times$ **Banking correspondents**
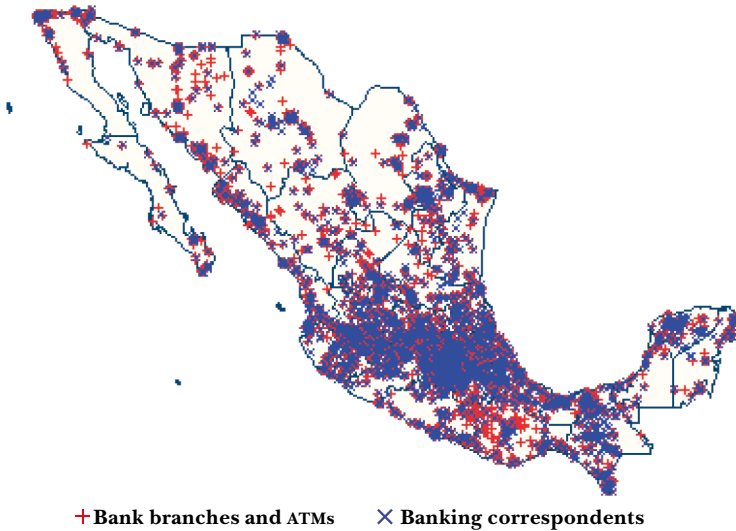
Source: DENUE.

banking correspondent units in Mexico. Using the same method, we also identify bank branches and ATMs for each bank. Although the DENUE only gives information on active establishments, they give a yearly date of incorporation starting from 2010. This coincides perfectly with the timing of the introduction of banking correspondents. Figure 8 shows how both branch offices (including ATMs) and banking correspondents are distributed all around the Mexican territory. The geographical distribution of banking correspondents seems to overlap that of bank branches and ATMs. By estimating the geodetic distance between a banking correspondent and the closest branch office (or ATM), we find that the average is less than one kilometer

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establishment and only kept those that fell into the supermarkets category.

(approximately 825 meters), and the distance for the 50th percentile is around 300 meters.

By using information from CNBV, we can retrieve the date of the contract between a bank and a correspondent. As such, we can identify which of the aforementioned establishments start giving banking correspondent services for a specific bank on a specific date. In Table 2, we see the maximum number of banking correspondent deals by the institution (bank and retail chain). We see that the biggest banks and retail stores have the highest number of deals.

<div align="center">Table 2</div>

<div align="center">MAXIMUM NUMBER OF DEALS BY INSTITUTION</div>

Bank	Maximum number of deals with correspondents in the pPeriod	Correspondent	Maximum number of deals with banks in the period
BBVA Bancomer	11	Chedraui	8
Banamex	7	Oxxo	7
American Express	6	Soriana	7
HSBC	5	Walmart	5
Invex	5	Suburbia	5
Banorte	4	Seven Eleven	4
Inbursa	3	Farmacias Guadalajara	3
Santander	2	Extra	3
Scotiabank	2	Comercial Mexicana	3
Compartamos	2	Farmacias Benavides	2
Banco del Bajío	1	Farmacias ABC	2
Afirme	1	Telecomm	1
Monex	1	Coppel	1
BanCoppel	1	Radioshack	1
Consubanco	1	Diconsa	0
		Sanborns	0

6. EMPIRICAL METHODOLOGY

6.1 Basic Model

Our study aimed to quantify the effect of the implementation of the banking correspondent model on households in Mexico, primarily on their formal savings. We define formal savings as savings deposited in bank accounts, both in number and volume in Mexican pesos. The first step in our identification strategy relies on studying the effect that contracting a new banking correspondent relation has on savings for a given bank. As discussed above, we exploit the cross-municipality variation in banking correspondent units. Depending on the date of the agreement, establishments that, for example, were only convenience stores a few days before are now able to provide some basic financial services. Figure 4 illustrates the dynamics of savings, measured by both the number of accounts and the volume of savings, before and after signing a new banking correspondent deal. We identify the date of activation and assume that all the establishments become active banking correspondents after that date. Note that the difference between bank-municipalities pairs that were treated (i.e., a banking correspondent was activated) and those that were not increases after the date of treatment.

This variation allows us to use a difference in difference model with multiple time periods in the following form:

$$\ln\left(s_{b,m,t}+1\right)=\gamma_b+\theta_m+\tau_t+\delta\left(Num\,Corresp_{b,m,t}\right)+\beta_1\left(Bank\,Br_{b,m,t}\right)+$$
$$+\beta_2\left(Num\,Corresp_{b,m,t}*Bank\,Br_{b,m,t}\right)+\beta_3X_{m,t}+\varepsilon_{b,m,t},$$

where $s_{b,m,t}$ is a measure of savings (number of accounts or balance volume in Mexican pesos) in municipality m taken by bank b. On all of our estimations, we use two measures of savings: a log of the number of accounts plus 1 and a log of savings volume plus 1. These transformations allow us to include those bank-municipalities for which savings were zero at some point in time. In this specification, the variable of interest is the number of *active* correspondence relations that bank b has at time t in municipality m, $Num\,Corresp_{b,m,t}$. We identify only the number of commercial chains, not establishments, working as banking correspondents in that municipality m and for bank b. As bank b signs more banking correspondence deals, this

variable will have a heterogeneous effect on different municipalities depending on the presence of the banking correspondents and the presence of other deals. *Bank Br*$_{b,m,t}$ is a dummy variable indicating if there are bank branches of bank b in municipality m at time t. Finally, we include an interaction indicating the effect of the presence of different banking correspondence relations with the presence of at least one bank branch of bank b in municipality m at time t. This last interaction would indicate if the presence of bank branches boosts or dampens the presence of banking correspondents. As such, we do not expect a specific sign on β_2. $X_{m,t}$ is a vector of control variables that can help account for possible time-varying nonobserved characteristics between municipalities. In this vector, we include the number of retail store chains in municipality m at time t, whether they have a banking correspondent deal with bank b or not. This variable will help control for nonobserved infrastructure in the municipality, given by the presence of different convenience stores, supermarkets or pharmacies. We also include an interaction of the previous variable with the presence of bank branches at municipality m at time t. The interaction seeks to account for different effects of the number of chains over savings between municipalities with and without bank branches. γ_b, θ_m and τ_t are bank, municipality, and time fixed effects, respectively.

For our identification strategy to be valid, we need to assume that average differences in savings between the two groups of focus, bank-municipality pairs–with and without a banking correspondent–would have been the same before and after signing the banking correspondent deal. Trends should not be different for each of these groups. If the savings growth rate were to be greater for bank-municipality pairs with a soon to be banking correspondent *before* signing the banking correspondent deal, then we would be detecting a spurious positive effect. Additionally, to control for possible differences in bank growth rates we include a bank-specific time trend in our specification. Finally, we account for possible differences in bank- and time-fixed effects between those bank-municipality pairs with and without branch offices.

7. RESULTS

In the following subsections, we present our results on an aggregate level, discuss a potential spillover effect, and finally present the results disaggregated by the type of municipality (rural or urban).

7.1 Basic Model

First, we investigate the impact of the *number* of active banking correspondent *chains* with our entire sample. Table 3 shows results for the number of accounts and volume of savings, respectively. Column 1 shows only a basic estimation, without any of the aforementioned fixed effects. We see that for both the volume of savings and the number of savings accounts, there is a positive relation between banking correspondents and savings. As we would expect, the presence of bank branches is also positively correlated with savings. In column 2, we add the previously mentioned control variables for infrastructure. As expected, we observe higher savings in municipalities with a larger presence of potential banking correspondents (convenience stores, supermarkets, and pharmacies, among others). Note that the coefficient of interest is significantly lower when including these controls. As we now distinguish between the activation of banking correspondents and the presence of the commercial establishment, the effect is not overestimated, correcting for a possible omitted variable bias.

As we add the fixed effects, we see that the estimated impact of banking correspondents diminishes. Still, columns 3 and 4 indicate that the introduction of banking correspondents increases savings significantly in both the volume of savings and the number of savings accounts (around 30%).

Column 4 of Table 3, in terms of the number of accounts, indicates that the introduction of banking correspondents increases the number of savings accounts significantly in both municipalities with and without bank branches (10.1% and 33.3% respectively, as read in the marginal effects box). As we expected, the effect seems to be larger for those municipalities without bank branches, while both marginal effects remain positive. Likewise, in terms of the volume of bank deposits, column 4 of Table 3 shows that the introduction of banking correspondents increases the volume of savings significantly

Table 3
BASIC MODEL, BANK-MUNICIPALITY LEVEL RESULT

Coefficient
(standard error)

	ln(Number of accounts+1)				ln(Balances+1)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
A. Characteristics of the municipality in the last period								
Number of active correspondent chains at the municipality	3.171[a] (0.101)	1.650[a] (0.103)	0.319[a] (0.0712)	0.333[a] (0.0728)	4.179[a] (0.130)	2.021[a] (0.135)	0.292[a] (0.0956)	0.306[a] (0.0973)
Branch offices by bank	7.637[a] (0.0551)	6.737[a] (0.0822)	5.685[a] (0.155)	5.833[a] (0.158)	10.60[a] (0.0762)	9.330[a] (0.115)	7.884[a] (0.207)	7.942[a] (0.210)
Number of active correspondent chains at the municipality*branch offices by bank	-2.598[a] (0.102)	-1.270[a] (0.103)	-0.267[a] (0.0728)	-0.232[a] (0.0738)	-3.526[a] (0.131)	-1.640[a] (0.136)	-0.248[b] (0.0992)	-0.226[b] (0.1000)
B. Additional controls related to infrastructure								
Number of commercial chains at the municipality		0.685[a] (0.0269)	0.421[a] (0.0404)	0.376[a] (0.0429)		0.972[a] (0.0354)	0.536[a] (0.0551)	0.501[a] (0.0573)
Number of commercial chains at the municipality*branch offices by bank		-0.486[a] (0.0282)	-0.139[a] (0.0329)	-0.144[a] (0.0328)		-0.691[a] (0.0375)	-0.237[a] (0.0489)	-0.236[a] (0.0488)

C. Fixed effects controls

Time-fixed effects	No	No	Yes	No	Yes	No	Yes	Yes
Municipality-fixed effects	No	No	Yes	No	Yes	No	Yes	Yes
Bank-fixed effects	No	No	Yes	No	Yes	No	Yes	Yes
Bank-time trend-fixed effects	No	No	No	No	Yes	No	No	Yes
Branch offices*time-fixed effects	No	No	Yes	No	Yes	No	Yes	Yes
Branch offices*bank-fixed effects	No	No	Yes	No	Yes	No	Yes	Yes
R^2	0.722	0.752	0.940	0.947	0.702	0.734	0.946	0.951

Number of observations 416,068

Note: the coefficients of time-, bank-, municipality- and bank-time trend-fixed effects are not shown in this table. [a], [b], [c] indicate statistical significance at 1%, 5%, 10%. The model does not have a constant.

MARGINAL EFFECT OF THE PRESENCE OF AN ACTIVE CORRESPONDENT RELATION

	Municipalities with correspondent chains	
	Number of accounts	*Volume of savings*
With branch offices	0.101	0.08
Without branch offices	0.333	0.306

in both municipalities with and without bank branches, by 8% and 30.6% respectively.

These preliminary results suggest that the appearance of banking correspondents does have a positive and significant effect on savings. Nonetheless, in this specification, we are not considering two very important dimensions. First, the introduction of banking correspondents might have different impacts depending on the type of municipality. Second, banking correspondents might be experiencing a spillover effect between banks. That is, as new banking correspondents appear, customers might be changing from one bank to another. In the following subsections, we try to study these dimensions.

7.2 Rural vs. Urban

If we expect banking correspondents to have a positive impact on savings, there would be a greater effect on the communities in which access to financial services is more limited. According to INEGI, there are six types of municipalities depending on the population size: rural, in transition, semi-urban, urban, semi-metropolis, and metropolis. Based on these categories, we use a broader classification. We define rural as both rural and in transition municipalities. Urban aggregates all other classifications: urban, semi-urban, metropolis and semi-metropolis. Our database has information on 1,054 urban municipalities and 1,401 rural municipalities that account for 2,455 Mexican municipalities.

Table 4 shows the results of estimating the basic model in Section 6.1, while interacting the independent variables with a rural dummy variable. Contrary to what we might expect, we do not find a significantly greater effect of banking correspondents on rural municipalities than on urban municipalities. That is, although there is a significant effect on both rural and urban, there is no evidence of a heterogeneous effect between these different types of municipalities. Column 3 of Table 4 suggests that the introduction of banking correspondents increases the number of savings accounts in municipalities without bank branches for both rural and urban areas by 20.6%. This positive effect is also homogeneous between rural and urban municipalities (17.9%) in terms of the volume of savings (column 6 of Table 4 and the bottom box of marginal effects).

For urban municipalities with branch offices, the effect on the number of savings accounts is 3.5%, and 17.9% on volume of savings

(second column of the bottom box). However, in the case of rural municipalities with a presence of bank branches, we find that the marginal effect of banking correspondents is negative (shadowed). Since there is only a small number of rural municipalities with branch offices and correspondent chains, further analysis is necessary to assess that there was not, in fact, a negative impact on the presence of correspondent relations in these municipalities.

7.3 Spillover Effects

Finally, since our observation units are bank-municipality pairs, there may be other banks in the same municipality with new active correspondents. As a consequence, the bank's competition may be triggering a spillover effect on savings records. This effect is important in terms of financial inclusion. Banking correspondents might affect a bank level but not the aggregate level, as customers (already financially included) are simply changing their savings from one institution to another.

In this exercise, the explanatory variable varies slightly. We build a new variable, defined as the total number of active correspondent chains in municipality m, minus the number of correspondent chains working for bank b. If the number is too large, then there are many banking correspondents *not* working for bank b, and as such, we would expect its coefficient to be negative. We then proceed to estimate the model described in Section 6.1.

We report our findings in Table 5. In terms of the number of savings accounts, the activation of a new correspondent for another bank reduces the number of accounts by 10.8% if the municipality has bank branches, and by 26.8% if the municipality does not have branch offices. For the case of the volume of savings, the activation of a new correspondent for another bank reduces the volume of savings by 8.5% if the municipality has bank branches, and by 24% if the municipality does not have branch offices.

These results suggest that even though the positive effect of the activation of a correspondent is very strong, the negative effect of the activation of a competitor correspondent at the same municipality may considerably decrease this effect.

Table 4

RESULTS BY TYPE OF MUNICIPALITY

	Coefficient (standard error)					
	ln(Number of accounts+1)			ln(Balances+1)		
	(1)	(2)	(3)	(1)	(2)	(3)
A. Characteristics of the municipality in the last period						
Number of active correspondent chains	0.521[a]	0.170[b]	0.206[b]	0.570[a]	0.148	0.179[c]
	(0.0797)	(0.0798)	(0.0821)	(0.108)	(0.105)	(0.108)
Branch offices by bank	6.227[a]	5.815[a]	5.845[a]	8.442[a]	7.832[a]	7.812[a]
	(0.160)	(0.176)	(0.178)	(0.212)	(0.236)	(0.238)
Number of active correspondent chains*branch offices by bank	−0.477[a]	−0.185[b]	−0.171[b]	−0.499[a]	−0.173	−0.171
	(0.0816)	(0.0808)	(0.0821)	(0.110)	(0.108)	(0.109)
Rural*number of active correspondent chains*branch offices by bank	−0.112	0.0589	0.0393	−0.165	−0.0235	−0.0260
	(0.144)	(0.128)	(0.128)	(0.200)	(0.175)	(0.174)
Rural*branch offices by bank	−0.484[c]	−0.226	−0.192	−0.647[c]	−0.358	−0.354
	(0.248)	(0.226)	(0.226)	(0.334)	(0.305)	(0.305)
Rural*number of active correspondent chains*branch offices by bank	−0.660	−1.108[a]	−1.088[a]	−0.755	−1.448[a]	−1.403[a]
	(0.416)	(0.337)	(0.339)	(0.573)	(0.477)	(0.474)
B. Additional controls related to infrastructure						
Number of commercial chains in the municipality	0.459[a]	0.432[a]	0.406[a]	0.619[a]	0.561[a]	0.539[a]
	(0.0323)	(0.0411)	(0.0432)	(0.0456)	(0.0561)	(0.0580)
Number of commercial chains in the municipality*branch offices by bank	−0.115[a]	−0.144[a]	−0.147[a]	−0.212[a]	−0.241[a]	−0.238[a]
	(0.0335)	(0.0331)	(0.0330)	(0.0477)	(0.0494)	(0.0492)
Rural*number of commercial chains in the municipality	−0.0243	0.156[a]	0.163[a]	−0.0141	0.197[b]	0.195[b]
	(0.0789)	(0.0589)	(0.0591)	(0.103)	(0.0792)	(0.0783)

Rural*number of commercial chains in the municipality*branch offices by bank	0.242	0.424ᵇ	0.390ᵇ	0.355	0.611ᵃ	0.569ᵇ
	(0.180)	(0.166)	(0.166)	(0.235)	(0.231)	(0.227)
C. Fixed effects controls						
Time-fixed effects	No	Yes	Yes	No	Yes	Yes
Municipality-fixed effects	No	Yes	Yes	No	Yes	Yes
Bank-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-time trend fixed effects	No	No	Yes	No	No	Yes
Rural*time-fixed effects	No	Yes	Yes	No	Yes	Yes
Rural*municipality-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Rural*bank-fixed effects	No	Yes	No	No	Yes	Yes
Rural*bank-time trend fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R²	0.915	0.874	0.917	0.923	0.947	0.952
Number of observations	416,068					

Note: the coefficients of time-, bank-, municipality- and bank-time trend-fixed effects are not shown in this table.
ᵃ, ᵇ, ᶜ indicate statistical significance at 1%, 5%, 10%. The model does not have a constant.

MARGINAL EFFECT OF ACTIVATION OF THE CORRESPONDENT RELATION (calculated with results in the last column)

	Number of accounts		Volume of savings	
	Rural	*Urban*	*Rural*	*Urban*
With branch offices	−1.053	0.035	−1.224	0.179
Without branch offices	0.206	0.206	0.179	0.179

Table 5

SPILLOVER EFFECTS

	Coefficient (standard error)					
	ln(Number of accounts+1)			ln(Balances+1)		
	(1)	(2)	(3)	(1)	(2)	(3)
A. Characteristics of the municipality in the last period						
Total active correspondent chains -active correspondent chains for bank b	−1.648ᵃ	−0.142ᵇ	−0.268ᵃ	−2.231ᵃ	−0.133ᶜ	−0.240ᵃ
	(0.0831)	(0.0590)	(0.0649)	(0.113)	(0.0797)	(0.0868)
Branch offices for bank b	6.740ᵃ	5.602ᵃ	5.781ᵃ	9.342ᵃ	7.816ᵃ	7.915ᵃ
	(0.0820)	(0.156)	(0.161)	(0.114)	(0.207)	(0.213)
(Total active correspondent chains–active correspondent chains for bank b) *branch offices for bank b	1.276ᵃ	0.112ᶜ	0.160ᵇ	1.877ᵃ	0.109	0.155ᶜ
	(0.0839)	(0.0619)	(0.0650)	(0.114)	(0.0847)	(0.0881)
B. Additional controls related to infrastructure						
Number of correspondent chains in the municipality	1.699ᵃ	0.547ᵃ	0.555ᵃ	2.312ᵃ	0.652ᵃ	0.663ᵃ
	(0.0470)	(0.0428)	(0.0460)	(0.0628)	(0.0570)	(0.0598)
Number of correspondent chains in the municipality*branch offices for bank b	−1.262ᵃ	−0.232ᵃ	−0.256ᵃ	−1.802ᵃ	−0.325ᵃ	−0.345ᵃ
	(0.0481)	(0.0402)	(0.0413)	(0.0645)	(0.0552)	(0.0560)

	Coefficient (standard error)					
	ln(Number of accounts+1)			ln(Balances+1)		
	(1)	(2)	(3)	(1)	(2)	(3)
C. Fixed effects controls						
Time-fixed effects	No	Yes	Yes	No	Yes	Yes
Municipality-fixed effects	No	Yes	Yes	No	Yes	Yes
Bank fixed effects	No	Yes	Yes	No	Yes	Yes
Bank-time trend-fixed effects	No	No	Yes	No	No	Yes
Branch offices*time-fixed effects	No	Yes	Yes	No	Yes	Yes
Branch offices*bank-fixed effects	No	Yes	Yes	No	Yes	Yes
R²	0.755	0.940	0.947	0.738	0.946	0.951
Number of observations	416,068					

Note: the coefficients of time-, bank-, municipality- and bank-time trend-fixed effects are not shown in this table. [a], [b], [c] indicate statistical significance at 1%, 5%, 10%. The model does not have a constant.

MARGINAL EFFECT OF ACTIVATION OF THE CORRESPONDENT RELATION
(calculated with results in the last column)

	Number of accounts	Volume of savings
With branch offices	−0.108	−0.085
Without branch offices	−0.268	−0.240

7.4 Municipal-level Estimations

In our final exercise, we also considered an analysis at municipal level to observe the aggregate effects of the activation of the correspondent service. By using information on a municipal level, instead of bank-municipality, we can capture the spillover effect and determine if there is still a final increase in formal savings. To do so, we considered the following model:

$$\ln\left(\overline{s}_{m,t}+1\right)=\theta_m+\tau_t+\delta\left(Num\,Corresp_{m,t}\right)+\beta_1\left(PresBank\,Br_{m,t}\right)+$$
$$+\beta_2\left(Num\,Corresp_{m,t}*PresBank\,Br_{m,t}\right)+\beta_3 X_{m,t}+\beta_4 Z_{m,t}+\varepsilon_{m,t},$$

where $\overline{s}_{m,t}$ is also a measure of average savings of banks at the municipality m at time t. We use average savings by municipality because we want to study the effect on the average bank. $Num\,Corresp_{m,t}$ refers to the total number of banking correspondent *relations* at municipality m at time t, and $PresBank\,Br_{m,t}$ is a dummy variable that has a value of 1 if the municipality has the presence of at least one branch office of any bank and 0 otherwise. $X_{m,t}$ is the usual vector of control variables that includes the number of retail store chains at municipality m at time t. Additionally, we include a set of dummy variables indicating which banks report nonzero savings for municipality m. $Z_{m,t}$ is a vector of control variables related to the proportion of banks reporting either zero number of accounts or zero volume of savings, depending on each case. That is, $Z_{m,t}$, includes a variable that ranges from 0 to 1 and measures the proportion of nonreporting banks as well as the interactions with all the control variables considered for this specification. All other variables, namely the fixed effects, have the same definition of the basic model. Errors are clustered at a municipal level.

The results in Table 6 show that, on aggregate, banking correspondents do have a positive effect on the number of savings accounts. We estimate a 20% impact for municipalities *without* branch offices but only a 1% increase in municipalities *with* branch offices. In terms of the volume of savings, we do not see a statistically significant effect.

8. CONCLUSIONS

In this paper, we estimate the effect on the volume of savings and the number of active accounts for a given bank-municipality after it contracts a new banking correspondent relation through a difference in differences model with multiple time periods. We provide evidence that banking correspondents have had a positive effect on formal savings in Mexico, measured both by the number of accounts and volume of savings. This impact seems to be homogenous for both rural and urban areas, as we do not find a differentiated effect for rural municipalities. It is important to highlight that we cannot distinguish if this increase in formal savings is due to an increase in overall savings or just a shift from informal to formal services.

We also find that the impact of banking correspondents at a bank-municipality level is largely due to a spillover effect. Our results show that the activation of banking correspondent deals inside the municipality can have a negative impact on rival banks. Customers might be changing from one institution to another, depending on the activation of banking correspondents for other competing banks. This spillover is prominent, but there still seems to be a positive effect at the aggregate level. Finally, these findings contrast with those of Peña and Vázquez (2012), who do not find banking correspondents to have any effect on financial inclusion.

Table 6

MUNICIPAL-LEVEL RESULTS

	Coefficient (standard error)					
	ln[(Number of accounts / number of banks at the municipality)+1]			ln[(Savings / number of banks at the municipality)+1]		
	(1)	(2)	(3)	(1)	(2)	(3)
A. Characteristics of the municipality in the last period						
Number of active correspondent chains at the municipality	−1.159[a]	0.195[c]	0.206[c]	−1.951[a]	0.148	0.170
	(0.314)	(0.115)	(0.109)	(0.441)	(0.136)	(0.126)
Existence of branch offices	8.164[a]	2.166[a]	2.233[a]	11.50[a]	2.414[a]	2.532[a]
	(0.0380)	(0.0639)	(0.0639)	(0.0527)	(0.0839)	(0.0836)
Number of active correspondent chains at the municipality*existence of branch offices	1.164[a]	−0.285[b]	−0.193[c]	1.979[a]	−0.306[b]	−0.136
	(0.314)	(0.115)	(0.110)	(0.441)	(0.136)	(0.127)
B. Additional controls related to infrastructure						
Number of commercial chains at the municipality	4.984[a]	0.749[a]	0.738[a]	7.416[a]	0.931[a]	0.906[a]
	(0.141)	(0.0755)	(0.0753)	(0.205)	(0.0946)	(0.0940)
Number of commercial chains at the municipality*existence of branch offices	−4.798[a]	−0.507[a]	−0.633[a]	−7.280[a]	−0.635[a]	−0.856[a]
	(0.141)	(0.0767)	(0.0773)	(0.205)	(0.0964)	(0.0966)

C. Fixed effects controls

Time-fixed effects	No	Yes	Yes	No	Yes	Yes
Bank-fixed effects	No	Yes	Yes	No	Yes	Yes
State-fixed effects	No	Yes	Yes	No	Yes	Yes
Bank-time trend-fixed effects	No	No	Yes	No	No	Yes
D. Extra controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.703	0.956	0.958	0.666	0.958	0.961
Number of observations	209,792					

Note: the coefficients of time-, bank-, municipality- and bank-time trend-fixed effects are not shown in this table. [a], [b], [c] indicate statistical significance at 1%, 5%, 10%. The model does not have a constant. Extra controls are integrated by a dummy of the proportion of banks reporting zero accounts from the total of banks reporting a number of accounts at the municipality *m* and its respective interactions with all the characteristics of the municipality at that period.

MARGINAL EFFECT OF ACTIVATION OF THE CORRESPONDENT RELATION
AT MUNICIPALITIES WITH CORRESPONDENT CHAINS

	Effect on number of accounts	*Effect on volume of savings*
With branch offices	0.013	0
Without branch offices	0.206	–0

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Bank Account Ownership by Microentrepreneurs in Mexico

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Abstract

This paper evaluates the impact of a value-added tax (VAT) rate increase on bank account ownership by Mexican microentrepreneurs considering informality as the main channel of this effect. Using two rounds of a cross-section survey aimed at understanding financial inclusion in Mexico and a difference-in-difference strategy, results indicate that an increase in the VAT rate negatively affects the probability of microentrepreneurs having a bank account in northern municipalities where the tax rate increased from 11% to 16%. In particular, financial inclusion of microentrepreneurs at the northern border decreased to a statistically significant effect, whereas financial inclusion of formal and informal salaried workers at the northern border did not change, as their fiscal obligations remained the same with the VAT amendment.

Keywords: informal economy, tax legislation, microentrepreneurs, financial inclusion.

JEL classification: K34, L26, E26.

1. INTRODUCTION

There are abundant studies on the determinants and consequences of informality.[1] Multiple papers focus on the consequences of informal status on firms' outcomes, such as profits, productivity, employment, and investment. However, less extensive literature exists on the effects of informality on the financial inclusion of firms.[2] One characteristic that most of these studies share is that they primarily use credit access or credit use as measures of financial inclusion. Focusing on credit access or use is important since many firms achieve growth through loans.[3] However, savings account ownership or deposits are equally relevant, as each often acts as an entrance point to the use of other financial services such as banking credit.[4] Moreover, numerous studies regarding financial inclusion have established the benefits of owning a bank account. Specifically, having a bank account protects deposits against loss or theft, facilitates other financial transactions such as payments and money transfers, alleviates the establishment of creditworthiness, and promotes savings, asset, and wealth accumulation, among other benefits.[5] For these reasons, the present paper uses a natural experiment to examine the role of informality on a microentrepreneur's decision to own a bank account.

More specifically, this paper analyzes the effect of an increase in value-added tax (VAT) on the probability of having a bank account, considering informality as the main channel of this effect. We hypothesize that an increase in the VAT rate increases the benefits of being informal, which in turn decreases the probability that a microentrepreneur will have a bank account in order to avoid inspections. As De Paula and Scheinkman (2010) show, VAT has a role in

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[1] In this paper, informality refers to none or partial tax compliance.

[2] The most influential papers on this topic include the works of Monteiro and Assunção (2006), Dabla-Norris and Koeda (2008), Gatti and Honorati (2008), Fajnzylber et al. (2009), McKenzie and Sakho (2010), McCulloch et al. (2010), and De Mel et al. (2013).

[3] Massenot and Straub (2016) and Araujo and Rodrigues (2016).

[4] Botello Peñaloza (2015) shows that having a savings account significantly increases the probability of having credit.

[5] See, for example, Aportela (1999), Rhine and Greene (2006), Rhine et al. (2006), Dupas and Robinson (2013), Ashraf et al. (2010), and McKenzie and Woodruff (2008).

transmitting informality through its credit scheme. Therefore, when the VAT rate increases, prices of goods and services in the formal relative to the informal sector increase, and the demand for goods and services in the informal sector, where no VAT applies, increases as well. Under the hypothesis, this has a significant effect on both informal and formal microentrepreneurs. The income of informal firms increases, with the probability that these firms will open a bank account decreasing in order to keep undetected from the fiscal authority. For formal firms, the demand for goods and services without a formal invoice, where no VAT is applied, also increases. This income is not reported, neither for VAT purposes nor for revenue tax purposes. Therefore, to maintain consistency between income reported to the fiscal authority and income entered in the financial system, formal firms keep unreported income out of the financial system. As deposits decrease, the benefits of having a bank account are lower relative to the costs, to such an extent that formal microentrepreneurs that were previously indifferent to financial exclusion or inclusion are now less likely to have bank accounts.

The present paper relies on a difference-in-differences approach based on a legislation change that took place in Mexico in 2014. Before 2014, there were two different VAT rates: an 11% rate that applied to southern and northern border fringes and a 16% rate that applied to the rest of the country. In 2014, the rate that applied at the border fringes increased to 16%. This tax amendment represents a natural experiment to evaluate an exogenous increase in the benefits of being informal on the probability of owning a bank account by comparing microentrepreneurs located in areas affected by the tax amendment to microentrepreneurs in other locations, before and after the reform.

Using two rounds of the Financial Inclusion National Survey (ENIF), the results suggest that an increase in the VAT rate negatively affects the financial inclusion decision of microentrepreneurs. In particular, results indicate that the probability of having a bank account decreases for microentrepreneurs, but not for salaried workers, as they cannot credit VAT tax payments.

The organization of the paper is as follows. Section 2 gives a review of previous literature published on the subject in Mexico and other countries. Section 3 explains some of the characteristics and specific details of the fiscal reform that took place in 2014 to explain the identification strategy used in the paper. Section 4 introduces

the National Financial Inclusion Survey used for this study, together with definitions of certain variables and a summary of the statistics of the data. Section 5 includes a description of the methodology and Section 6 details the results. Section 7 articulates the concluding remarks and potential areas of study to pursue in the future.

2. LITERATURE REVIEW

From a microperspective, the most influential papers in economics that specifically address the effects of informality on financial inclusion outcomes include Monteiro and Assunção (2006), Dabla-Norris and Koeda (2008), Gatti and Honorati (2008), Fajnzylber et al. (2009), McKenzie and Sakho (2010), and De Mel et al. (2013). Monteiro and Assunção (2012) evaluated the impact of a Brazilian registration simplification and tax reduction program on the formality of firms and its consequences on investment and credit access. Using firm-level data from a survey, they found that the program increased the formalization of firms and had a positive, statistically significant effect of formality on investment and credit access using instrumental variables (IV) regression. In a study on the same Brazilian program using firm-level data from a nationally representative survey, Fajnzylber et al. (2009) found similar results–a positive and significant effect of the program on the levels of registration that subsequently led to an increase in revenues, employment, and profits, but not credit access. Their econometric strategy relied on regression discontinuity techniques. In addition, by using firm-level data from 26 economies and a fixed-effects estimation, Dabla-Norris and Koeda (2008), whose results relied on IV regressions to solve potential endogeneity issues, found that informality lowers the access and use of bank credit and increases the use of informal sources of credit. The study also found evidence that the negative relationship between informality and access to credit is stronger in countries with weak tax administrations and high tax compliance costs. Using firm-level data from a survey applied in 49 countries, Gatti and Honorati (2008) found that more tax compliance, defined as the percentage of sales that firms report to the tax authority, increases access to credit; the effect of this was statistically significant according to both ordinary least squares (OLS) and fixed effects (FE) estimates. Using survey data at the firm-level from Bolivia, McKenzie and Sakho (2010)

found large effects of formalization on the profits of firms; however, they also found that formalization did not have a significant effect on the use of trade credit or on the likelihood of having a bank loan. They based their measure of formality on the distance to the tax office: the closer the firm to the tax office, the more likely it was to be formal. Lastly, by means of an experiment implemented in Sri Lanka, De Mel et al. (2013) found that information and reimbursement of registration costs are only effective when bundled together. They also found that formalization increases profits, advertisement expenses, and the use of receipt books, although the likelihood of having a bank account or a bank loan did not increase.

The present paper contributes to this literature by exploring the effect of formalization on the probability of owning a bank account, as in De Mel et al. (2013), as opposed to its effect on credit use or credit access, which is a topic other academic papers have studied more thoroughly. Focusing on bank account ownership is important for two reasons. First, there are numerous benefits to owning a bank account. According to Aportela (1999), Rhine and Greene (2006), Rhine et al. (2006), McKenzie and Woodruff (2008), Ashraf et al. (2010), and Dupas and Robinson (2013), among others, having a bank account protects deposits against loss or theft, facilitates other financial transactions such as payments, purchases and money transfers, aids establishing credit-worthiness, and promotes savings, assets, and wealth accumulation. Second, as demonstrated by Botello Peñaloza (2015), having a bank account significantly increases the probability of obtaining a bank loan; in other words, having a bank account facilitates access to other financial services, crucial for growth, efficiency, and survival.

The present paper also makes an important contribution to the literature of financial inclusion. One of the most important stylized facts in the literature on financial inclusion is that lack of income is a main determinant of financial exclusion (see for example, Peña et al., 2014; Aguilar and Valles, 2015; Bosch et al., 2015; Vázquez, 2015; and Allen et al., 2016; among others). However, financial exclusion in Mexico among adults who receive earnings is high. According to my own calculations with ENIF (2015), 47.11% of adults between 18 and 65 years old who work and earn money do not have a bank account; probably because of this Mexico is well below the expected level of financial inclusion according to income per capita (Consejo Nacional de Inclusión Financiera, Conaif, 2016). Thus, because

lack of income does not completely explain the low levels of financial inclusion in Mexico, there must be additional factors that lead to Mexico's lack of financial inclusion.

Another critical determinant could be the informal sector, as previous literature has pointed out. For example, Aguilar and Valles (2015) demonstrated that Mexican households in which the head has a formal job were positively affected, increasing the amount of household savings. In addition, Vázquez (2015), using Mexican survey data, found that people with a formal job are more likely to have a bank account. Moreover, financial inclusion among salaried workers presents additional evidence in favor of this argument, according to the survey data used here. The percentage of formal salaried workers who do not have a bank account is only 21.07%; meanwhile, the percentage of informal salaried workers (i.e., those who do not have social security benefits) who do not have a bank account is 67.78 percent.

With respect to microentrepreneurs, the percentage of those without a bank account is 65.58%–very similar to workers in the informal labor market. Although informality could potentially be a critical determinant of financial exclusion among microentrepreneurs, proving this claim can be difficult because the decision to open a bank account and formality status are possibly endogenous. On the one hand, a microentrepreneur who owns a bank account is less likely to suffer money theft or loss and is more likely to save and accumulate wealth. The benefits of participating in the financial system thereby support the survival and growth of microentrepreneurs, increasing the likelihood of formalization as a result. On the other hand, a formal microentrepreneur is more likely to own a bank account because it is easier for formal firms to reap the benefits of the financial system, such as credit access, as they have official documents to prove income and collateral requirements.

Various econometric techniques can account for such endogeneity. One method is by means of an experiment design, as demonstrated in De Mel et al. (2013). Another possible approach is by using regression discontinuity as in Fajnzylber et al. (2009). One of the most frequently used methodologies is instrumental variable estimation, examples of which are illustrated in Monteiro and Assunção (2006), Dabla-Norris and Koeda (2008), McCulloch et al. (2010) and McKenzie and Sakho (2010). In contrast to previous literature, however, this paper relies on a difference-in-difference approach to identify

the effect of formality on bank account ownership among microentrepreneurs. This methodology best suits the natural experiment and survey data that I use in the paper. It provides data before and after the treatment, and an exogenous source of variation to specify treatment and control groups.

A key assumption in this paper is that fiscal authority crosschecks information from different sources, for example from the financial system to detect tax evasion, of which microentrepreneurs are aware. This is a plausible assumption, as developments in communications and data-gathering technologies allow different enforcement agencies to more effectively use information to detect illegal practices such as tax avoidance (see Catão et al., 2009). Moreover, since 2009, the Mexican fiscal authority has had access to information in the financial system by law, increasing the ability to detect tax evasion.

This paper also contributes to academia in terms of the characteristics of the natural experiment. In most previous papers, formality is defined in terms of tax registration (see Dabla-Norris and Koeda, 2008; Gatti and Honorati, 2008; McKenzie and Sakho, 2010; and De Mel et al., 2013). Focusing on tax registration changes is important, as previous literature has argued that registration burden could prevent firms from formalizing. However, another concern among firms deciding whether to formalize is tax payments. The only two papers that analyze a change in tax payments on credit access are Fajnzylber et al. (2009), and Monteiro and Assunção (2012). However, they cannot solely attribute their results to tax reduction since the program they analyzed also included registration simplification measures. In contrast, the present paper can focus not only on tax payment changes but also on a tax rate increase that augments the benefits of being informal. Finally, results from the present paper support the hypothesis studied by De Paula and Scheinkman (2010), which centers on the informality chain effects of VAT since the natural experiment is based on the VAT rate change.

3. IDENTIFICATION STRATEGY

3.1 2014 Fiscal Reform

At the end of 2013, the Mexican Congress approved various tax amendments, which went into effect on January 1, 2014. Such tax amendments

were aimed at boosting tax revenue. This reform included changes to income tax law (LISR) for businesses and individuals, excise tax law (LIEPS), Value Added Tax Law (LIVA), and to the federal tax code. For the purpose of this paper, however, the following tax amendments are the most important: With respect to VAT, operations conducted in the border fringes, which prior to the reform had an 11% VAT rate, are now subject to the general 16% rate as of 2014. In addition, financial institutions must still submit annual reports on cash deposits (except electronic money transfers) received by taxpayers in their financial accounts when the total amount exceeds 15,000 pesos per month. Before the reform, these obligations were included in the cash deposit law (LIDE), but are now included in the LISR.

Three characteristics of this reform will be important for identification strategy. First, the reform took place in 2014, which occurred in the timeframe between the two years from which the cross-section survey rounds used in this paper were taken. Therefore, the first round corresponds to the period before the reform was enacted, whereas the second round corresponds to the period after the reform occurred. Second, the amendments to the VAT Law provide location variation to identify the effect of an increase in VAT on the use of bank accounts by household businesses. Before the amendments to the VAT Law in 2014, the *border fringe*, for which VAT was 11%, was the whole territory of the states of Baja California, Baja California Sur, and Quintana Roo. In addition, it included a 20-kilometer fringe from the border of the states of Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas in the north, and a 20-kilometer fringe from the border of the states of Chiapas, Tabasco, and Campeche in the south. The law also specified that some specific localities of Sonora would also be considered as *border fringe* (see Figure 1). After the fiscal reform of 2014, the VAT rate increased from 11% to 16% in all these areas. Finally, the third important characteristic of the reform is that, at all times, financial institutions have an obligation to report cash operations to the fiscal authority, a mandate that did not change with the reform. This was key to tax on cash deposits collection, therefore signaling to banking sector users that this aspect of the law increased tax avoidance detection effectively. According to the central hypothesis described above, this is the reason why microentrepreneurs are more likely to keep their operations away from the financial system when the VAT tax rate increased.

Figure 1

ZONES AFFECTED BY THE 2014 VAT REFORM

Notes: The gray area and the dotted line correspond to the border fringes.
Source: Own. elaboration according to Value Added Tax Law.

3.2 Identification Strategy

This paper aims to evaluate the effect of an increase in the benefits of being informal, derived from a VAT rate increase, on financial inclusion (measured by bank account ownership) of microentrepreneurs.[6] The outcome variable takes value one if the individual possesses a bank account and value zero otherwise.

Since the VAT change occurred only in specific localities at the northern and southern border, I first used individuals in municipalities located within the 20-kilometer border fringe or those in

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[6]   In this paper, we are using the definition of financial inclusion use as stated by the National Banking and Securities Commission (CNBV): Financial inclusion consists of acquiring one or more formal financial products or services, such as a bank account, and the frequency with which they are used.

the states of Baja California, Baja California Sur, and Quintana Roo as the treatment group. Second, as robustness test estimations, I utilized the following treatment group definition: all individuals located in states along the borders. In other words, this group includes border localities both affected and not affected by the tax amendment, but in an affected border state. Although this second treatment group presumably has identification problems, the gains of using it are in terms of sample size were such that I was able to divide the sample in microentrepreneurs, formal salaried workers and informal salaried workers and show that only the former were affected by the VAT rate change. If people in a border state but not in the border fringe benefited from the preferential VAT rate by having their fiscal address in the border fringe while their commercial operations took place somewhere else, the treatment group based on border states is well specified. The control group in all cases is composed of all individuals in localities outside the states that had regions with a preferential VAT rate before 2014; that is, it only includes non-border states (see Figure 2).

Ideally, I would have liked to use panel data to observe the effect of the change in VAT rate from 11% to 16% on the same individuals to control for idiosyncratic characteristics that are otherwise omitted variables. Instead, the time dimension comes from the differing dates from which the two cross-section survey rounds used in this study were taken, the first of which took place before the tax reform (2012) and the second of which was conducted after the tax reform (2015). The underlying assumptions are: *1)* individuals in the treatment and control groups share the same aggregate shocks affecting their decision to have a bank account; *2)* there are common time trends across groups; and *3)* there are no systematic changes within groups. In order to ensure these assumptions hold, this study implements the following precautions: *1)* the estimation includes control variables to avoid possible cofounder effects; and *2)* the treatment group differentiates between northern and southern microentrepreneurs because significant observed and unobserved differences may exist between the north and south of Mexico.

In other words, results are based on a difference-in-difference strategy in which I compare individuals living in border fringe municipalities with individuals living in non-border states where the VAT rate did not change before and after the tax reform took place.

Figure 2

TREATMENT AND CONTROL GROUPS

TREATMENT GROUP AT THE MUNICIPAL LEVEL

TREATMENT GROUP AT THE STATE LEVEL

Notes: The dark gray area corresponds to the control group. It includes only non-border states. The light gray area and the dotted lines correspond to the treatment group defined at the municipal level or the state level.
Source: Own elaboration.

Then, I compare microentrepreneurs living in border states with microentrepreneurs living in non-border states.

As in most cases, some caveats apply. First, this paper focuses only on microentrepreneurs or household businesses, as it relies on a household survey. The term microentrepreneurs refers to self-employed individuals and business owners with one employee or more. Although in theory this definition includes all types of firms, data is most likely concentrated on smaller firms since households rather than firms are the units of observation. This bias may be insignificant, however, since smaller firms are more likely to be informal than bigger firms. Moreover, focusing on household businesses is valuable since numerous studies focus on understanding why microenterprises lack credit access and on this phenomenon's possible relation to the low productivity of small firms (McKenzie and Sakho, 2010; McCulloch et al., 2010). Another concern is that firm characteristics such as size or age, which are potentially important for determining the probability of owning a bank account, were not included in the estimation due to the design of the survey used in this study. Third, given that the treatment group consists of microentrepreneurs located in three whole states and the 20-kilometers-wide fringe of both the north and south border, there are very few observations in the sample from these areas. Therefore, results rely on two treatment group definitions, one at the municipality level and another at the state level. Since the latter is a less precise definition of the treatment group, the results obtained from this approach are useful for indicating the direction and significance of the effects on microentrepreneurs relative to salaried workers but are less accurate on magnitude.

4. DATA

4.1 National Financial Inclusion Survey

The data used in this paper comes from The National Financial Inclusion Survey (ENIF). The ENIF is a cross-section survey at the household level designed to obtain information regarding financial inclusion and its barriers in Mexico. In particular, it contains information about the use of and access to financial products and services by Mexicans. The Comisión Nacional Bancaria y de Valores

(banking and securities supervisor, CNBV) and the Instituto Nacional de Estadística y Geografía (national statistics agency, Inegi) implemented the two rounds of the survey used in this study in 2012 and 2015, each of which corresponds to a different cross-section. The population of interest is individuals aged between 18 and 70 years old that permanently reside in the national territory of Mexico. The gathered information is representative at the national level, by sex, and for localities, according to whether they have more or less than 15,000 inhabitants.

In the 2012 round, the date of each interview corresponds to a time between May 3 and May 31. In the 2015 round, the interviews took place between July 20 and August 28 <www.inegi.gob.mx>. In each survey, the number of observations is around 7,000 households, although main sections of the questionnaire correspond to specific household member. The 2015 questionnaire survey was a modified version of the one used in the previous round and aimed to collect information on subjects not previously studied. In particular, the survey includes questions related to property ownership and protection of financial users. When I compared both questionnaires, I also detected some changes to the order of the questions and to the sets of possible answers. In order to minimize the effect of inconsistent question design on my results, I attempted to keep definitions as similar as possible between both surveys.

In both surveys, the sample used for estimation corresponds to the adult population between 18 and 65 years old who work and receive a monetary income as either a salaried worker or a microentrepreneur. The intention is to focus only on those individuals who work and earn money. The sample size is 3,354 and 3,570 observations for the 2012 and 2015 rounds, respectively.

4.2 Definitions

In this paper, individuals with bank accounts are those who claimed to own either a savings account, checking account, fixed-term deposit account, payroll account, or investment fund account. Microentrepreneurs are those who identified themselves to be self-employed or business owners with one employee or more. Informal salaried workers are participants who answered that they were in employment during the last month and either have the right to medical attention at private institutions or at the Seguro Popular (government

insurance), do not have access to any medical attention service, or do not know. Formal salaried workers are defined as survey participants that claimed to be in employment during the previous month and have right to medical attention at Instituto Mexicano de Seguridad Social (IMSS), Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado (ISSSTE), Petróleos Mexicanos (Pemex), or Secretaría de la Defensa Nacional (Sedena).

4.3 Summary Statistics

Table 1 shows descriptive statistics on the observable characteristics of treated and non-treated individuals. Here, the treatment group is defined at the municipality level. Both groups are very similar with respect to age, number of children and elderly in the household, number of adults in the household, years of education, marital status, percentage of people uninterested in access to financial institutions, percentage of people who do not trust in financial institutions, and percentage of people who claim the bank branch is far away. However, the groups demonstrate apparent differences in earnings, percentage of men, percentage of people who are head of the household, percentage of people who are salaried workers, percentage of people who are microentrepreneurs, percentage of people who do not have the necessary documentation to have a bank account, and percentage of people who save informally. Interestingly, on average, the control group is poorer than the treatment group, and given that schooling is very similar between groups, this phenomenon seems to relate to the fact that the control group has fewer formal salaried workers, but a higher number of informal salaried workers and microentrepreneurs than the treatment group.

Table 1

SUMMARY STATISTICS FOR THE COMPLETE SAMPLE

	Treatment group (North and South fringe)	Treatment group (North fringe)	Treatment group (South fringe)	Control group
	Mean			
Age	37.7	38.2	36.4	38.1
Number of children and elderly in the household	1.2	1.2	1.1	1.4
Number of adults in the household	2.3	2.3	2.4	2.5
Years of education	10.0	10.0	9.9	9.9
	Percentage of the sample			
Men	58.37	58.35	58.43	53.39
Married	61.20	62.39	58.43	61.45
Head of the household	60.14	59.02	62.75	55.97
Formal salaried worker	49.76	50.08	49.02	38.08
Informal salaries worker	23.70	23.61	23.92	30.18
Business owner	26.53	26.31	27.06	31.74
State level labor market formality	42.31	42.46	41.97	30.70
State level poverty	32.89	30.89	37.54	47.02
Earnings of less than MXN 3,000	24.29	22.77	27.84	40.54
Earnings from MXN 3,000 to MXN 4,999	29.83	30.02	29.41	29.91

	Treatment group (North and South fringe)	Treatment group (North fringe)	Treatment group (South fringe)	Control group
		Percentage of the sample		
Earnings from MXN 5,000 to MXN 7,999	22.88	22.60	23.53	17.26
Earnings from MXN 8,000 to MXN 12,999	15.09	15.85	13.33	7.76
Earnings from MXN 13,000 to MXN 20,000	5.54	5.56	5.49	2.99
Earnings above MXN 20,000	2.36	3.20	0.39	1.54
Not interested in access to financial institutions	38.80	40.47	34.90	40.02
Do not trust in financial institutions	17.81	16.86	20.00	18.48
Do not have the necessary documentation	25.71	23.95	29.80	27.69
Do save informally	56.37	51.77	67.06	57.33
The bank is far away	1.89	1.69	2.35	1.76
Localities of 100,000 residents or more	59.43	54.97	69.80	46.83
Localities from 15,000 to 99,999 residents	18.28	23.10	7.06	16.72
Localities from 2,500 to 14,999 residents	10.97	10.62	11.76	16.56
Localities of less than 2,500 residents	11.32	11.30	11.37	19.89
N	848	593	255	4,420

Note: For 2012 the sample size is 3,354 observations and for 2015 the sample size is 3,570 observations. In this table, the treatment group is defined at the municipal level. North fringe includes Baja California, Baja California Sur and the 20-kilometer fringe from the border of Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas. South fringe includes Quintana Roo and the 20-kilometer fringe form the border of Chiapas, Tabasco, and Campeche. All other municipalities in the country are the control group. Earnings are deflated to make them comparable; May 2012=100.
Source: Own calculations with data from ENIF 2012 and 2015.

5. METHODOLOGY

5.1 Unconditional Analysis

As a first approximation of the data, Table 2 provides some statistics with respect to bank account ownership for the control and treatment groups. The control group is the row named non-border states. The other four rows refer to the treatment groups at the state level (named border states) and at the municipal level (named border fringe). Data in Table 2 shows the percentage of individuals with bank accounts for each of the aforementioned groups. At the border fringe, our main group of interest, the percentage of people with bank accounts increased 6.1 percentage points from 2012 to 2015. For non-border states, the percentage of people with bank account increased 8.6 percentage points between 2012 and 2015. Therefore, this unconditional analysis indicates that the new legislation regarding VAT decreased bank account ownership by 2.5 percentage points $(6.1 - 8.6 = -2.5)$ on average. When only considering microentrepreneurs, the VAT rate change reduced bank account ownership by 2.1 percentage points.

The only difference between border states and border fringe is that the former includes all individuals in states in which at least one municipality was affected by the VAT rate decrease, meaning treatment is at the state level. The main benefit of using this other definition of treatment is that the sample size is greater, which is useful for estimations based on granular groups of interest. According to this other treatment group, the VAT tax rate increased bank account ownership by 0.36 percentage points on average and decreased bank account ownership by an average of nine percentage points among microentrepreneurs.

5.2 Difference-in-differences

The results from Table 2 could be the result of differences in terms of characteristics between treatment and control groups. To account for such variations, I run the following difference-in-difference equation with OLS:[7]

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[7] In other words, I estimate a linear probability model since the difference-in-differences straightforward interpretation using a linear model does not hold in a non-linear model like the probit or logit models.

Table 2

PERCENTAGE OF INDIVIDUALS WITH BANK ACCOUNT

	2012				2015			
	Total	Formal-salaried	Informal-salaried	Micro-entrepreneurs	Total	Formal-salaried	Informal-salaried	Micro-entrepreneurs
Non-border states	42.27	73.70	22.12	26.42	50.92	78.84	30.36	35.94
N	2,134	772	624	738	2,286	893	728	665
Border states N	47.38	74.75	24.91	30.73	56.39	79.06	36.42	31.25
	1,220	499	285	436	1,284	640	324	320
Border fringe N	50.76	76.47	25.25	30.00	56.86	79.11	32.14	37.39
	396	187	99	110	452	225	112	115
North border Fringe N	55.40	81.48	25.35	36.11	54.60	74.03	32.47	39.29
	278	135	71	72	315	154	77	84
South border Fringe N	39.83	63.46	25.00	18.42	62.04	90.14	31.43	32.26
	118	52	28	38	137	71	35	31

Note: Border fringe refers to the treatment group based on municipalities that were affected by the VAT rate change; it includes those at the north and the south. Non-border states refer to the control group.
Source: Own calculations with data from ENIF 2012 and 2015.

$$\boxed{1}\quad P\left(Y_{ims}=1\right)=Z_{im}\beta+\delta_1 Northern_{im}+\delta_2 Southern_{im}+$$
$$+\delta_3 D2015_i+\delta_4 D2015_i * Northern_{im}+$$
$$+\delta_5 D2015_i * Southern_{im}+\theta_s+\varepsilon_{is}.$$

Y_{ims} is equal to 1 if person i who lives in municipality m and state s has a bank account, zero otherwise. Z_{im} is a vector of control variables that includes the demographic characteristics of the individual (age, age squared, years of schooling, sex, marital status, head of household indicator, real income) and the characteristics of the household (number of children and elderly in the household, number of adults in the household). It also includes the self-reported barriers to enter the financial system (informal savings indicator, not interested in financial system indicator, no trust in financial institutions indicator, do not have the necessary documentation indicator, the bank branch is far away indicator). Finally, it includes the characteristics of the municipality m (locality size indicator, state level labor market formality, and state level poverty). $Northern_{im}$ is equal to one if person i lives in a northern border municipality m, zero otherwise. $Southern_{im}$ is equal to 1 if person i resides in a southern border municipality m, zero otherwise. Finally, $D2015_i$ is equal to 1 if person i was interviewed in 2015; and θ_s is a vector of state fixed effects.

The coefficients of interest are δ_4 and δ_5. I expect these coefficients to be negative and significant. That is, the probability of having a bank account decreased after the 2014 Fiscal Reform, but only in the municipalities that experienced a change in the VAT rate.

To check that only microentrepreneurs decreased their likelihood of having a bank account due to the reform, running the same regression but dividing the sample into formal salaried workers, informal salaried workers, and microentrepreneurs would have been optimal for this study's purposes. However, this was not possible due to sample size limitations. Therefore, I chose to run same regression as in Equation 1, but used the definition of the treatment group at the state level as follows.

$$\boxed{2}\quad P\left(Y_{is}=1\right)=Z_i\beta+\delta_1 Northern_i+\delta_2 Southern_i+\delta_3 D2015_i+$$
$$+\delta_4 D2015_i * Northern_i+\delta_5 D2015_i * Southern_i+\theta_s+\varepsilon_{is}.$$

In this case, subscript i refers to the individual and s refers to the state the individual lives in. Definitions of variables are the same as above.

In both specifications 1 and 2, state indicators and locality size indicators proxy for the costs of opening a bank account which in principle could be different according to location (Allen et al., 2016). In addition, both specifications control for the level of formality in the labor market (i.e., share of labor force registered at IMSS per state) and for the level of poverty (i.e., share of the population who lives in poverty per state). These controls are important, as various government programs have improved financial inclusion of populations in poverty and in the informal labor market during the period of analysis. Furthermore, at the individual level, it is essential to control for income, sex, education, and age, as Allen et al. (2016) found that there are important differences in financial inclusion related to these characteristics. It is also critical to control for marital status since married persons are less likely to have a bank account if their partners own one. Finally, following this argument, whether the individual is head of the household or not is important because heads of households are usually also the main earners of the family and, therefore perhaps more likely to have a bank account. It is also possible that individuals self-exclude from the financial system. According to Allen et al. (2016), those who do not have a bank account usually say that they do not have the necessary documentation to open an account, or claim that banks are too expensive and untrustworthy. I try to control for these self-reported barriers to financial inclusion by using the responses recorded in the survey with respect to other indicators of financial inclusion, such as credit use, ATM use, and bank branch use, among others.

To check that only microentrepreneurs decreased their likelihood of having a bank account due to the reform, I first provide evidence that both definitions of treatment group yield similar results (although the treatment group defined at the state level may have identification problems). Then I run the same regression as in Equation 2 but divide the sample into formal salaried workers, informal salaried workers, and microentrepreneurs.
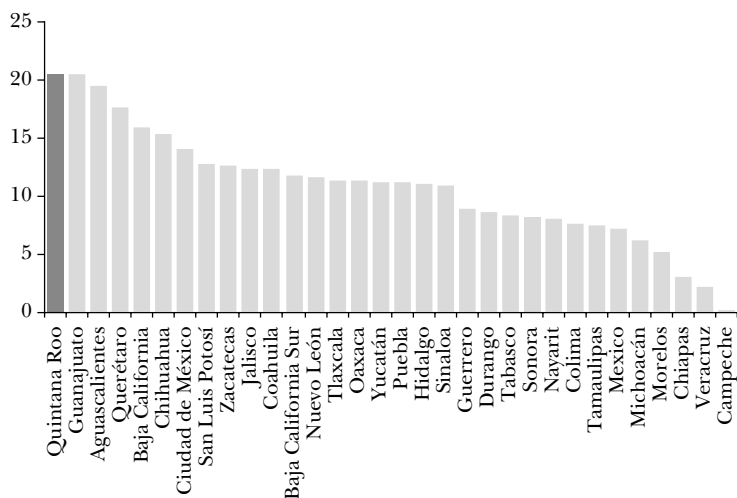
6. RESULTS

6.1 Difference-in-Differences Results Using Different Treatment Group Definitions

Column 2 of Table 3 shows the results from estimating Equation 1 in which the definition of the treatment group is at the municipality level, meaning only municipalities in which the VAT rate changed are included in the treatment group. Since these estimates use the whole sample, indicator variables for whether the individual is a microentrepreneur or an informal salaried worker are included as control variables. According to the results, residing in a northern border locality after the reform decreases the probability of having a bank account by nine percentage points, the effect of which is statistically significant at the 5% level.

For individuals residing in a southern border state, the probability of having a bank account is positive and significant after the tax amendment (the coefficient is 0.125 and significant at the 5% level). This last result is not as expected, which could be due to differences between the treatment group in southern border localities and the control group with respect to other observed and unobserved characteristics for which I did not control in the estimation. More research on this issue is necessary to understand what could be confounding the results. One key issue in the data is that when considering the treatment group at a municipality level in the southern border, we have very few observations from the states of Chiapas, Tabasco, and Campeche. This is because of the fact that there are no major cities on the 20-kilometer border fringe of these states, and that this zone mainly consists of biosphere reserves. As a result, the treatment group for the south considered in this exercise tends to represent only the whole state of Quintana Roo, which is the state with the highest growth in the number of workers in the formal sector from 2012 and 2015 (see Figure 3). Given the fact that by law the salary of workers should be paid in payroll bank accounts, the formalization of workers implies an increase in the number of people with bank accounts. Hence, this positive effect of job formalization could have compensated for the potential negative result of a VAT increase on holding a bank account in the southern fringe.

Figure 3
GROWTH RATE OF WORKERS IN THE FORMAL SECTOR, 2012-2015

Note: The number of formal workers refers to the number of registered people at IMSS.
Source: INEGI.

The northern border result is consistent with the hypothesis that individuals living in municipalities in the northern border were less likely to have a bank account after the VAT rate increased from 11% to 16%, compared to the control group in which the VAT rate did not change. The hypothesis claims that as the VAT rate increased, the demand for goods and services in the informal sector, where no VAT is charged, also increased. In such circumstances, partial tax compliance increases among microentrepreneurs and, given that fiscal authority has access to financial system information, bank account ownership is more likely to decrease. To prove that such an effect only occurs among microentrepreneurs and not among formal or informal salaried workers (because salaried workers cannot credit VAT payments), it is necessary to run this regression for each of these groups separately.

Continuing with the results in Column 2 of Table 3, the probability of having a bank account is 33.6 percentage points lower for microentrepreneurs than for formal salaried workers. In addition, this probability is 38 percentage points lower for informal salaried workers than for formal salaried workers. Both effects are statistically significant at the 1% level. The probability of having a bank

account significantly increases by 6.5 percentage points for women relative to men in which the estimate is significant at the 1% level. Given that the sample was restricted to adults who work and earn money, this may be related to unobserved characteristics of women who self-select into employment that is related to participation in the financial system.[8] Additionally, the probability of owning a bank account increases 3.3 percentage points for household heads, with the coefficient being statistically significant at the 5% level. According to the results, one more year of schooling increases the probability of owning a bank account by 1.7 percentage points with the coefficient statistically significant at the 1% level. Relative to income, all income brackets have positive coefficients significant at the 1% level. The effect on financial inclusion is more prevalent at a higher level of income, with the exception of the last income bracket. Earning between 13,000 real pesos and 20,000 real pesos increases the probability of owning a bank account by 28.1 percentage points compared to individuals who earn less than 3,000 pesos. In contrast, earning between 3,000 real pesos and 5,000 real pesos increases the probability of owning a bank account by only 5.5 percentage points. Unexpectedly, variables related to self-reported barriers of entering into the financial system have a positive and significant effect on the probability of having a bank account.

Column 3 of Table 3 shows the results from estimating Equation 2, where the definition of the treatment group is at the state level; that is, observations located in states where at least one municipality was affected by the VAT rate change are included in the treatment group. According to these results, the probability of having a bank account is 4.7 percentage points lower after the tax amendment in affected states, the effect of which is statistically significant at the 5% level. Comparing this result to the one obtained in column 2, we cannot reject the null hypothesis that they are the same. In fact, t-tests for each variable comparing estimates in columns 2 and 3 show that estimated coefficients are similar, except for the interaction term $I(t = 2015)_{it} * Southern_{is}$. This is evidence that, in this case, results using the broader treatment group yields more similar results than the narrower treatment group.

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[8]   Another potential explanation is that between 2012 and 2015, women participating in welfare programs now participated in the financial system, as many transfers were paid through bank accounts. However, the estimation includes poverty level indicators to control for such effect.

Table 3

	Treatment defined at the municipal level	Treatment defined at the state level
ORDINARY LEAST SQUARES RESULTS		
I(t=2015)	0.065[c]	0.054[c]
	(0.030, 0.101)	(0.021, 0.087)
Northern	−0.134	−0.127
	(−0.368, 0.100)	(−0.329, 0.0759)
Southern	−0.309[c]	−0.274[a]
	(−0.528, −0.089)	(−0.592, 0.043)
I(t=2015)*Northern	−0.090[b]	−0.047[b]
	(−0.162, −0.02)	(−0.095, −0.0007)
I(t=2015)*Southern	0.125[b]	0.022
	(0.018, 0.231)	(−0.039, 0.084)
Microentrepreneur	−0.336[c]	−0.346[c]
	(−0.369, −0.304)	(−0.375, −0.318)
Informal salaried worker	−0.380[c]	−0.381[c]
	(−0.412, −0.348)	(−0.409, −0.353)
Women	0.065[c]	0.073[c]
	(0.039, 0.093)	(0.050, 0.096)
Age	−0.003	−0.003
	(−0.010, 0.004)	(−0.009, 0.003)
Age-squared	0.00004	0.00004
	(−4.4E−05, 1E−04)	(−2.6E−05, 0.0001)
Married	−0.0000330	0.00346
	(−0.025, 0.025)	(−0.018, 0.025)
Head of household	0.0331[b]	0.0322[b]
	(0.004, 0.062)	(0.007, 0.057)
Years of education	0.0170[c]	0.0165[c]
	(0.014, 0.020)	(0.014, 0.020)
Earnings from MXN 3,000 to MXN 4,999	0.0554[c]	0.0526[c]
	(0.024, 0.087)	(0.025, 0.080)

Earnings from MXN 5,000 to MXN 7,999	0.114[c] (0.076, 0.153)	0.126[c] (0.093, 0.159)
Earnings from MXN 8,000 to MXN 12,999	0.227[c] (0.182, 0.273)	0.220[c] (0.180, 0.260)
Earnings from MXN 13,000 to MXN 20,000	0.281[c] (0.221, 0.342)	0.287[c] (0.236, 0.338)
Earnings above MXN 20,000	0.251[c] (0.166, 0.337)	0.252[c] (0.182, 0.323)
Number of children and elderly	−0.003 (−0.0134, 0.007)	−0.002 (−0.011, 0.006)
Number of adults in the household	0.004 (−0.0054, 0.014)	−0.001 (−0.010, 0.007)
Not interested in financial system	0.042[c] (0.0192, 0.067)	0.042[c] (0.022, 0.063)
Do not trust in financial institutions	0.119[c] (0.089, 0.150)	0.112[c] (0.085, 0.138)
Do not have the required documents	−0.008 (−0.0346, 0.017)	−0.009 (−0.032, 0.013)
Informal savings	0.045[c] (0.022, 0.070)	0.037[c] (0.016, 0.058)
Bank branch is far away	0.049 (−0.0273, 0.127)	0.020 (−0.043, 0.084)
Constant	0.939[c] (0.323, 1.56)	0.656[b] (0.097, 1.21)
N	5,268	6,924
R^2	0.318	0.317
State fixed effects	Yes	Yes
Locality size indicators	Yes	Yes
Formality and poverty indicators	Yes	Yes

Note: [a] $p<0.1$, [b] $p<0.05$, [c] $p<0.01$. The 95% confidence interval is in parentheses.
Source: Own calculations with data from ENIF 2012 and 2015.

Table 4

ORDINARY LEAST SQUARES RESULTS BY GROUPS OF INTEREST

	All	Formal salaried	Informal salaried	Micro-entrepreneur
I(t=2015)	0.0542[c]	0.0303	0.0431	0.0768[b]
	(0.0169)	(0.0276)	(0.0305)	(0.0315)
Northern	−0.127	−0.133	0.0424	−0.164
	(0.103)	(0.149)	(0.215)	(0.199)
Southern	−0.274[a]	−0.225	−0.00370	−0.426
	(0.162)	(0.238)	(0.338)	(0.307)
I(t=2015)*Northern	−0.0479[b]	−0.0249	−0.0391	−0.124[b]
	(0.0240)	(0.0351)	(0.0506)	(0.0482)
I(t=2015)*Southern	0.0225	0.0768	0.0346	−0.0273
	(0.0315)	(0.0500)	(0.0634)	(0.0557)
Microentrepreneur	−0.346[c]			
	(0.0143)			
Informal salaried	−0.381[c]			
	(0.0142)			
Women	0.0732[c]	0.0313[a]	0.105[c]	0.113[c]
	(0.0118)	(0.0178)	(0.0228)	(0.0224)
Age	−0.00339	−0.00210	0.00865	−0.0135[b]
	(0.00302)	(0.00493)	(0.00551)	(0.00600)
Age-squared	0.0000470	0.0000131	−0.0000860	0.000170[b]
	(0.0000373)	(0.0000614)	(0.0000718)	(0.0000697)
Married	0.00346	0.0126	−0.00648	0.00433
	(0.0111)	(0.0169)	(0.0208)	(0.0214)
Head of household	0.0322[b]	0.0189	0.0207	0.0516[b]
	(0.0128)	(0.0196)	(0.0250)	(0.0233)
Years of education	0.0165[c]	0.0127[c]	0.0190[c]	0.0183[c]
	(0.00150)	(0.00236)	(0.00290)	(0.00266)
Earnings from MXN 3,000 to MXN 4,999	0.0526[c]	0.0980[c]	0.00538	0.0661[b]
	(0.0141)	(0.0274)	(0.0227)	(0.0260)
Earnings from MXN 5,000 to MXN 7,999	0.126[c]	0.172[c]	0.0789[b]	0.134[c]
	(0.0171)	(0.0287)	(0.0342)	(0.0338)

Earnings from MXN 8,000 to MXN 12,999	0.220[c]	0.260[c]	0.186[c]	0.234[c]
	(0.0204)	(0.0300)	(0.0575)	(0.0476)
Earnings from MXN 13,000 to MXN 20,000	0.287[c]	0.275[c]	0.580[c]	0.374[c]
	(0.0259)	(0.0337)	(0.0785)	(0.0610)
Earnings above MXN 20,000	0.252[c]	0.242[c]	0.280	0.350[c]
	(0.0360)	(0.0441)	(0.179)	(0.0699)
Number of children and elderly	−0.00225	−0.00627	0.00840	−0.00609
	(0.00445)	(0.00743)	(0.00844)	(0.00755)
Number of adults in the household	−0.00178	−0.00400	0.00409	−0.00698
	(0.00435)	(0.00710)	(0.00835)	(0.00758)
Not interested in financial system	0.0422[c]	0.0359[b]	0.0747[c]	0.0207
	(0.0105)	(0.0154)	(0.0209)	(0.0203)
Do not trust in financial institutions	0.112[c]	0.0876[c]	0.139[c]	0.133[c]
	(0.0136)	(0.0166)	(0.0327)	(0.0298)
Do not have the required documents	−0.00969	0.00849	−0.00757	−0.0163
	(0.0115)	(0.0181)	(0.0218)	(0.0209)
Informal savings	0.0370[c]	0.0241	0.0475[b]	0.0407[b]
	(0.0107)	(0.0162)	(0.0205)	(0.0197)
Bank branch is far away	0.0207	0.126[b]	0.0141	−0.0523
	(0.0325)	(0.0528)	(0.0727)	(0.0486)
Constant	0.656[b]	0.640	−0.612	0.887[a]
	(0.285)	(0.415)	(0.586)	(0.539)
N	6,924	2,852	1,913	2,159
R²	0.32	0.13	0.14	0.17
State fixed effects	Yes	Yes	Yes	Yes
Locality size indicator	Yes	Yes	Yes	Yes
Formality and poverty indicators	Yes	Yes	Yes	Yes

Note: a $p<0.1$, b $p<0.05$, c $p<0.01$. The 95% confidence interval is in parentheses.
Source: Own calculations with data from ENIF 2012 and 2015.

6.2 Who Is Less Likely to Have a Bank Account?

Given that the results are not statistically different for treatment groups defined at the municipal level or state level, I use the latter to estimate Equation 2 for formal salaried workers, informal salaried workers, and microentrepreneurs separately. Continuing with the main hypothesis of the present paper, the increase in the VAT rate only affects the decision of having a bank account by microentrepreneurs because the fiscal obligations of salaried workers did not change with the VAT rate increase. In contrast, both formal and informal microentrepreneurs are more likely to stay out of the financial system when the VAT rate increases, and given that the risk of tax evasion detection is greater when the fiscal authority cross-checks fiscal obligations with information from banking institutions. Table 4 shows the results of estimating Equation 2 for the whole sample (same results as in Table 3, column 3), and for formal salaried workers, informal salaried workers, and microentrepreneurs respectively. The results indicate that among microentrepreneurs residing in a northern border state there was a decrease in the probability of having a bank account by 12.4 percentage points after the reform, significant at the 5% level. For formal and informal salaried workers, the effect is similarly negative but not statistically significant. In this case, the effect of the tax amendment on individuals with residence in a southern state is not statistically significant for any of the groups of interest. With respect to all other regressors, results are very similar to previous estimations with the exception of age, which produced statistically significant results for microentrepreneurs, and the indicator for those "not interested in the financial system," which did not have statistically significant results for microentrepreneurs.

6.3 Placebo Test

As a robustness check to rule out the possibility of spurious results, I drop all treated states and keep only non-border states. I then randomly assign these states into treatment and control groups. I redo estimates using Equation 2 for the whole sample, restricting it to microentrepreneurs respectively. As shown in Table 5, the interaction term of interest is not statistically significant in any of the two columns.

PLACEBO TEST ORDINARY LEAST SQUARE RESULTS

	All	*Microentrepreneur*
I(t=2015)	0.0642[c]	0.0804[b]
	(0.0205)	(0.0391)
Placebo	−0.155	−0.103
	(0.148)	(0.283)
I(t=2015)*placebo	−0.00439	−0.00754
	(0.0260)	(0.0495)
Business owner	−0.337[c]	
	(0.0181)	
Salaried-informal worker	−0.377[c]	
	(0.0179)	
Woman	0.0710[c]	0.103[c]
	(0.0150)	(0.0287)
N	4,420	1,403
R²	0.31	0.16
State fixed effects	Yes	Yes
Other controls	Yes	Yes

Note: [a]p<0.10 [b]p<0.05 [c]p<0.01. Robust standard errors are in parentheses. Treatment group is defined at the state level.
Source: Own calculations with data from ENIF 2012 and 2015.

7. CONCLUSIONS

This paper analyzes the effect of an increase in VAT on the probability of having a bank account by microentrepreneurs. It relies on a difference-in-difference approach based on a legislation change that took place in Mexico in 2014. This tax amendment represents a natural experiment to evaluate an exogenous increase in the benefits of being informal on the probability of owning a bank account by comparing microentrepreneurs located in areas affected by the tax amendment to microentrepreneurs in other locations, before and after the reform. The hypothesis is that an increase in the VAT rate increases the benefits of being informal, which in turn decreases the probability that microentrepreneurs will open a bank account to avoid inspections. The results suggest that an increase in the VAT

rate negatively affects the financial inclusion decision of microentrepreneurs. More precisely, the probability of having a bank account decreased 9.1 percentage points after the reform took place for individuals who resided in a northern border municipality. Due to sample size limitations, we define the treatment group at the state level and redo the estimation for formal salaried workers, informal salaried workers, and microentrepreneurs separately. Results indicate that the probability of having a bank account decreases for microentrepreneurs in which the effect is statistically significant at the 5% level. Moreover, the probability of owning a bank account for both formal salaried workers and informal salaried workers did not significantly change because of the VAT rate increase.

The previous literature argues that small informal firms are the ones with the lower probability of having a bank account. Further research can aim to definitively prove or disprove this claim by measuring the size of microenterprises by income or by dividing them between those who have employees and those who do not. The ENIF 2015 can also provide further evidence about the main hypothesis of this paper by verifying that entrepreneurs are more likely to have canceled their bank account in the past than other groups. A third potential topic for future study is research on whether the location of an individual in a northern or southern border state would affect the ease with which that person could obtain benefits from the financial system. For example, an explanation for the fact that northern states were affected differently to southern states could be that opening an account in the USA enables individuals to more easily obtain benefits from the financial system than opening an account in Guatemala.

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Determinants of Households' Default Probability in Uruguay

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Abstract

This paper estimates models on the default probability of households in Uruguay considering sociodemographic and financial characteristics using data obtained from the second edition of the Household Financial Survey and the Continuous Household Survey. It studies the differences between the nonmortgage credit and credit card segments. Household income, the relation between income and expenditure, and the age of the household head are significant for explaining default probability in all the segments, while the education of the household head is only relevant for the nonmortgage credit segment. Furthermore, we apply the results of the model to assess the impact on household debt default by the obligation to pay salaries through electronic media introduced by the Financial Inclusion Law. According to the results, having a bank account increases the number of households with nonmortgage and credit card debt. However, in the former segment the group of households that take out nonmortgage credit is riskier and the debt default rate rises, while in the credit card segment the debt default rate remains at the same level.

Keywords: financial stability, Uruguay, financial survey, indebtedness.
JEL classification: G19, G01, C5.

1. INTRODUCTION

Determining the individual and financial characteristics of households that make a statistically significant contribution to the probability of debt default is important for monitoring credit risks and their impact on financial stability. The aim of this study is to estimate models that explain households' debt default based on their demographic and financial characteristics and considering different credit segments. For this purpose, it employs data for Uruguay taken from the second edition of the Household Financial Survey (EFHU2) conducted in 2013 by the Economics Department, Social Sciences Faculty, Universidad de la República, and the Continuous Household Survey (ECH) conducted by the Instituto Nacional de Estadística, de Uruguay (INE) during 2012. This information was used to create a nationally representative database of 3,490 households. The results obtained show that factors determining debt default differ according to the credit segment studied. For instance, education is only significant when considering the nonmortgage credit segment, and income ceases to be significant when considering delinquency on credit card payments. Meanwhile, the relevant sociodemographic variables are those referring to individuals with most knowledge of a household's financial matters, the reference person[1] according to the EFHU2, and not the individual that makes the significant contribution in terms of income.

Models on the default probability of households in Uruguay allow for forecasting their behavior and vulnerability to macroeconomic conditions, as well as assessing the policies that affect debt default probability. The Financial Inclusion Law (No. 19210) of April 29, 2014, imposes the payment of salaries through electronic media. As one application of the models estimated, a forecast was made for the impact of the said measure on debt delinquency and therefore on the default rate of the financial system as a whole.

According to the results, having a bank account increases the number of households with nonmortgage credit and credit cards. However, in the former segment the household group using nonmortgage

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[1] The reference person (RP) is the person in a household who is most familiar with the economy of all its members. It is the individual who is in charge of financial matters and is familiar with expenses, income, assets, and investments, among others.

credit is riskier and the credit default rate increases, while in the credit card segment the default rate remains unchanged, given that the group using them has the same average risk as that for credit cards before the reform.

The paper is organized as follows. Section 2 presents a review of the literature on the determinants of household debt default. Section 3 briefly describes the data and variables used in the models. Section 4 describes the methodology employed for estimating the debt default probability models. Section 5 presents the results of the model estimations. Section 6 performs an assessment, based on the models developed in the previous sections, of the impact of the obligation to pay salaries via electronic media established in the Financial Inclusion Law on debt default rates among households. Finally, Section 7 presents some final remarks.

2. LITERATURE REVIEW

The literature on the determinants of household debt default includes a set of empirical works that study the relation between the sociodemographic and financial characteristics of households and their debt default using data from household financial surveys. The aforementioned studies include that presented by Costa (2012) that estimates, employing logit models, a probability of default for households which depends on their economic and sociodemographic characteristics, as well as taking into account the existence of shocks that adversely affected their financial situation. To do this, the study uses data from Portugal's household finance and consumption survey and finds a higher probability of debt default for households with lower levels of income and wealth and higher levels of expenditure. The probability of default is also higher for households with children and whose reference person is unemployed or has a lower than tertiary education. Recent adverse changes in the financial situation of households also have a positive and significant correlation with debt default probability. We identify the same outcomes for Uruguay in terms of income and the relation between income and expenditure. The probability of debt default is lower if the household head is in formal employment or retired than if they are unemployed or in informal employment.

Meanwhile, Alfaro et al. (2010) use the Household Financial Survey of Chile to estimate probit models in pursuit of personal and financial characteristics that have an impact on the average probability of household debt default. They study mortgage and consumer default separately given that, as mortgage debt is guaranteed by the real estate as collateral, it can be assumed that households' behavior differs for these two types of debt. According to the results, the variables of income and access to the banking system are significant for both types of loan, while the sex and marital status of the household head are not significant. On the other hand, although education, the number of individuals within the household that contribute to the total family income, age, and financial burden are not significant for mortgage credit, they are for consumer credit. They do not find any evidence that the loan-to-value ratio is significant for mortgage debt. It is not possible to perform an analysis of the mortgage market in this paper, given the few defaults observed in that segment. Furthermore, unlike the estimation for Chile, the sex of the household head and whether they live with their partner are significant. Meanwhile, the financial burden is significant for the credit card segment, but not for the nonmortgage credit segment, although only in the conditional probability models.

For the unconditional probability estimation, Alfaro et al. (2010) use a first stage equation for the probability of a household having debt and a second stage to estimate the unconditional probability, adding the logistic transformation of the probability of debt default estimated in the first stage as a dependent variable. To analyze default probability in Uruguay, we estimate the bias-corrected (heckprobit) models proposed by Van de Ven and Vann Praag (1981). The unconditional probability model is corrected by the fact that debt default is only observed for households with debt. This methodology is proposed for analyzing the probability of debt default by Baum (2006), considering a selection model with a binary variable that takes the value of one if the individual has a loan and zero if not. This is also used by Valdés (2016) to analyze the determinants that influence the ownership and usage of debit and credit cards. Larrañaga and Olivari (2005) employ a heckprobit estimation to study the determinants of whether an individual has a debt considering a binary selection variable that indicates when an individual has a university degree.

Fuenzalida and Ruiz-Tagle (2009) adopt another approach to analyze households' financial vulnerability. They measure the risks of indebtedness among households under different unemployment scenarios, defining debt at risk as that of households with financial burden to income ratios of between 50% and 70% and a negative financial margin, that is, total expenditure is more than 20% higher than the household's income. They find that the main source of fragility among households is the loss of income, particularly employment income. The authors use panel data survival analysis for different aggregate unemployment levels to estimate the probability of employment at the individual level, taking into account sociodemographic characteristics and calculating the impact on aggregate debt at risk among households.

Iregui et al. (2016) study the determinants of the probability of a household being delinquent on at least one of its loans in Colombia based on data obtained from the Colombian Longitudinal Survey of the Universidad de los Andes. The paper presents logit estimations for a sample of households with loans and for a sample of households with loans whose head is also in employment. According to the results, if the head is male, the probability of a household being delinquent on at least one loan increases for urban areas. Meanwhile, this probability decreases for households with higher levels of income or whose head lives with their partner. They find that the higher the number of household members, the greater the probability of a household being delinquent on its debt. In the estimations performed for Uruguay, we find evidence to support the fact a larger number of household members increases the probability of default and that households whose head is male have a greater debt default probability in the nonmortgage credit segment in the conditional probability model.

One of the most important studies on Uruguay is that of Mello and Ponce (2014) who study the determinants of households' indebtedness using data from the Uruguayan Household Survey and the Continuous Household Survey of 2012. They analyze households' borrowing decisions using probit and logit estimations and conclude that variables related to having access to financial services, particularly those that take into account a prior relation with the bank and the use of credit and debit cards as payment media, have the largest impact on a family's borrowing decisions. Other variables related to income distribution, the household head's employment status and

having bank savings also have a significant influence on the probability of taking out a loan. In the same paper, the authors study the characteristics that best explain levels of indebtedness among households and the determinants of their financial burden.

Finally, also for the case of Uruguay, Borraz and González (2015) analyze financial risk in the country, simulating a negative income shock similar to the one in 2002, and using data from the Uruguayan financial survey. They find the risk is modest because, although a shock with such characteristics increases the number of households with a financial burden above 0.75 by 175%, this group only represents 10% of the population.

3. DATA AND VARIABLES

3.1 Data

Two databases were used in this paper: the 2012 Continuous Household Survey (ECH) conducted by the National Statistics Institute of Uruguay (INE), and the second edition of the Financial Survey of Uruguayan Households (EFHU2) conducted by the Department of Economics, Faculty of Social Sciences, Universidad de la República in 2013. The EFHU gathers information that describes the composition of households' asset and liability portfolios and includes data on real assets and related debts, nonmortgage loans, businesses owned by the household, income and employment history, financial assets, payment media, insurance policies and personal income plans, and consumption and saving. Given the type of data they collect, there is usually a high proportion of nonresponses in economic and financial surveys. The pattern of missing data is generally not random, meaning that making estimations only using households for which data is available tends to generate bias in the estimation. One of the features of the second edition of the EFHU is its treatment of nonresponses. For the missing data, it uses a stochastic multiple imputation approach with ten imputations and 100 iterations, whose aim is to recreate the distribution of variables with missing data. A detailed description of the method employed is presented in the document "Methodology of the 2014 Financial Survey of Uruguayan Households (EFHU2) and User Guide" (Decon, 2016).

The EFHU is used to analyze the probability of default among households with data available on a total of 3,490 households. Non-mortgage loans and credit cards are considered separately. Non-mortgage debt includes debt a household has with banks, financial companies and commercial establishments, family, friends, money-lenders, and automotive companies, etc. This category includes personal loans the household took out for their business and excludes credit card debt, debts to the state and debts from real estate purchases. Credit card debt includes credit from credit cards issued by commercial banks, cooperatives, and consumer loans companies. It does not consider the mortgage credit segment given the reduced level of delinquency observed in that type of debt.[2]

3.2 Variables

The variables used for specifying the models and the expected relation, according to the literature, between them and debt default probability are presented below.

3.2.1 Dependent Variables

Nonmortgage debt default: A household is considered to be in nonmortgage debt default if it is paying some nonmortgage loan and declares itself delinquent in its payments. Nonmortgage debt encompasses all loans the household has except credit card debt, loans from the state, and debt from purchasing, constructing, or remodeling real estate.

Credit card debt is considered separately from nonmortgage credit given that 38% of the population has credit cards, but do not have nonmortgage credit. Moreover, the importance of nonbank card operators in the Uruguayan market should also be pointed out. 45% of cards are issued by nonbank operators (Banco Central del Uruguay, 2016).

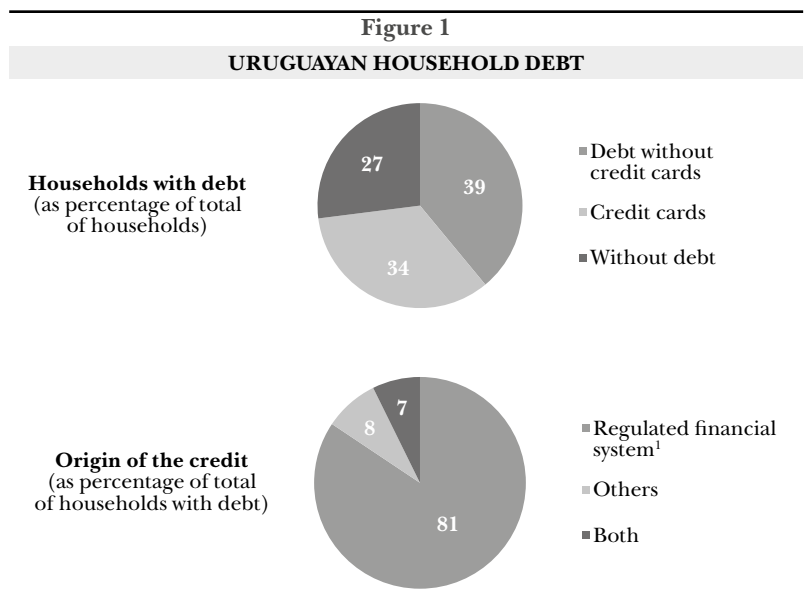We consider two default situations for the credit card segment:

1) *Credit card default in the broad sense:* A household has defaulted on a credit card in the broad sense if any member of the household has fallen into to delinquency with credit card payments during the last year.

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[2] A total of 11 mortgages in arrears were observed, representing 10% of the all households with this type of debt.

2) *Credit card default in the strict sense:* A household has defaulted on a credit card in the strict sense if any member of the household has fallen into delinquency with credit card payments during the last year and said delinquency was for more than three months.

Separation into these categories is possible using information from the EFHU, while default in the broad sense is a transitory delay in payment, default in the strict sense responds to more permanent delinquency.

In the sample, 73% of households has some type of debt. When credit card debt is excluded, this figure falls to 39%[3]. The 81% of the debt (excluding credit cards) is granted by institutions regulated by the central bank, while 8% of the households obtain credit from institutions not regulated by the central bank, as well as from friends, private individuals, or family members (Figure 1).

Figure 1

URUGUAYAN HOUSEHOLD DEBT

Households with debt
(as percentage of total of households)

27 · 39 · 34

■ Debt without credit cards

■ Credit cards

■ Without debt

Origin of the credit
(as percentage of total of households with debt)

7 · 8 · 81

■ Regulated financial system[1]

■ Others

■ Both

[1] Regulated financial system: banks, financial entities, savings and credit unions.
Source: own elaboration using the EFHU database.

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[3]   The Annex shows the breakdown by credit segment (Table 1).

The 18% of the households which have some debt are delinquent on their payments. If we consider credit card default in the strict sense, this figure decreases to 7%. Out of the households with mortgage debt, 4% are delinquent in their payments. In the nonmortgage credit segment delinquency is 10%, while in credit cards it is 17%, and 3% when considering default in the broad sense and strict sense, respectively.

3.2.2 Independent Variables

Households' sociodemographic and financial characteristics were employed to specify the models. The characteristics included in the models are those which according to the literature and other previous empirical studies influence the probability of default among households.[4]

Sociodemographic variables refer to the household head. Two definitions are used for household head which are tested alternatively. First, the head is considered as the individual who is most familiar with the economy of all members of the household, that is, the person in charge of financial matters with knowledge of expenditures, income, assets, investments and is the reference person according to the EFHU. Second, the household head is considered as the individual who makes the greatest contribution to household income. In this case, the sociodemographic characteristics are obtained from the ECH. For financial variables, such as income, information is included for all household members.

3.2.3 Sociodemographic Variables

Sociodemographic variables include sex, whether the household head lives with their partner, their age, education, and whether they are in formal employment or are retired, the proportion of workers among all the household members, the number of household members, and whether there are children in the household.

Sex: Incorporated through a binary variable that takes the value of one if the household head is a man, or zero if is a woman.

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[4] Characteristics linked to the loans were not included because 20% of households in the sample have more than one loan with different features as regards term, interest rate and denomination currency, among others.

The relation between sex and debt repayment is not conclusive in the literature. D'Espallier et al. (2009) identify three causes that explain why women are less likely to default on their debt. First, women are more conservative and cautious in their investment strategies which translates into better debt repayment. Second, women are more restricted in their access to different credit channels and they therefore have a stronger incentive to repay and ensure continued access to financing. Finally, women are more responsive to coercive enforcement methods applied by institutions. Lower geographical and employment mobility among women also increases the effectiveness of institutions' collection efforts. The empirical results are not conclusive. Marrez and Schmit (2009), and Ormazabal (2014) find evidence to support that women are less likely to fall into delinquency. Meanwhile, Alfaro et al. (2010) do not find sex to be statistically significant as a determinant of the default probability for consumer and mortgage credit.

Cohabitation: A binary variable is included that is equal to one if the household head lives with their partner, and zero otherwise.

According to the literature, if the marital status of the household head is married or living with their partner the probability of debt default is lower. The reason behind this effect is that such households are less sensitive to income shocks given that they tend to have two incomes. Alfaro et al. (2010) do not find evidence to support this relation. Özdemir and Boran (2004) find a statistically significant and negative relation between debt default and the debtor being married.

Age: Age (in years) of the household head.[5]

Age is a demographic variable that is usually included as a determinant of debt default. The literature states that default probability is possibly higher when the household head is younger, becoming lower as age increases. Individuals make more investments in their youth, they also have greater expenses and lower incomes (Alfaro et al., 2010). To analyze the impact of age on the probability of default a variable representing the age of the household head is included.

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[5] The relationship between default probability and age is linear. Models are estimated that include age squared, but the relationship is not statistically significant and for that reason only age is represented in the models. Meanwhile, the relation between indebtedness and age is quadratic.

Level of education: A binary variable is used that is equal to one if the individual has completed a bachelor's or higher university degree, and zero otherwise.[6]

According to the literature, the level of education of the reference person in the household has a significant and negative effect on debt default probability because more educated individuals have a greater ability to make decisions on their financial situation. Moreover, education is positively correlated with income, which reduces the probability of debt default. Costa (2010) finds evidence to support this relation. Alfaro et al. (2010) find that education is only a significant determinant of mortgage debt default and is not significant for nonmortgage debt.

Proportion of household members in employment: The proportion of household members with paying jobs is used as an explicative variable.

The larger the proportion of family members with paying jobs, the less sensitive the household is to income shocks, meaning their probability of debt default should be lower. Alfaro et al. (2010) find a significant relation between the proportion of household members with paying jobs and debt default probability, but with an opposite sign. They explain this relation based on job security and the motivation behind the number of people working in a household. On the one hand, households belonging to the lowest income quintiles are those with less education and therefore access to less qualified jobs and more vulnerable to changes in macroeconomic conditions. People belonging to higher income quintiles tend to be better educated and have access to more qualified and stable jobs. These results are demonstrated by Fuenzalinda and Ruiz-Tagle (2009). Lower income households with more vulnerable job sources might have greater incentives for more members of the household to work than richer households. Furthermore, the fact that a larger number of members work does not imply that a household has a higher income. This is true if the income earned by households with more members

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[6] No information is available on the number of years in education as a continuous variable given that data contained in the EFHU is an ordinal variable for different levels of education. Different levels of education are tested and that of bachelor's or higher degree is reported because it is statistically significant.

in paying jobs are on average lower than the income generated by households with less members in employment.

Household members: Number of household members.

A variable used to characterize the structure of a household. The literature generally finds a positive and significant relation between the number of household members and debt default.

Children: A binary variable that takes the value of one if the household head's children live at home, and zero otherwise.

Costa (2010) finds evidence that households with children living in them have a higher probability of debt default than those whose members are all adults. The study we elaborate for Uruguay only considers whether any of the household head's children are living at home regardless of their age.

Formal employment: A binary variable that takes the value of one if the household head is an employee and makes pension contributions.

Formality is associated with a more stable employment situation. It should be expected that being formal reduces a household's debt default probability.

Retired: A binary variable that takes the value of one if the household head is retired or receives a pension.

Just as with formal employees who have a stable monthly income, it should be expected that being retired or a pensioner reduces a household's debt default probability.

The omitted group is composed of households in which the head is unemployed or in formal employment.

3.2.4 Household Financial Variables

Financial variables include income, the financial burden of the household, the relation between expenditures and income earned by the household, and the type of institution or individual that grants them credit.

Income: To analyze the impact of income on default probability, the log of monthly household income obtained from the ECH is included.

Most empirical works find a significant and negative relation between income and the probability of debt default among households, Costa (2010), Alfaro et al. (2010), Ormazabal (2014).

Financial burden: A binary variable is included that takes the value of one if a household declares it spends more than 75% of its income on loan repayments, and zero otherwise.

According to Alfaro et al. (2010), borrowers will avoid default-ing on their debt as long as they have sufficient income to cover the repayments. They test different thresholds of the financial burden declared by households, finally selecting one at 75% because it is sta-tistically significant. This threshold is also used by Fuenzalinda and Ruiz-Tagle (2009), who define households with a financial burden of more than 75% of their income as those with a high financial bur-den. It is to be expected that households with a high financial burden have a greater probability of defaulting on their debt.

Relation between household expenditure and income: A binary variable that adopts the value of one if a household's expenditures are higher than its income, and zero otherwise.

A household might find it difficult to repay their debt because the expenses it incurs are higher than the income it earns. Households with expenditures higher than their income are expected to have a greater probability of defaulting on their debt.

Number of credit cards: The number of credit cards a household has. Used for the credit card segment.

Considers all the credit cards a household has. If a relation exists between the number of credit cards and default probability it should be positive. A larger number of credit cards implies more debt or contingent debt for the household.

Regulated sector: A binary variable that is equal to one if at least one of the loans is granted by an institution regulated by the central bank, and zero otherwise.

This variable is included in the model estimated for each credit segment in order to determine whether the probability of debt de-fault is higher or lower for loans granted by the financial system reg-ulated by the central bank as compared to loans from other sources.

Banking sector: A binary variable that is equal to one if all the loans are granted by the banking sector, and zero otherwise.

This variable is included in the model estimated for the regulat-ed sector in order to determine whether there are any differences between the banking sector and other financial institutions regu-lated by the central bank.

Table 1 shows the descriptive statistics used in the estimations.

Table 1

DESCRIPTIVE STATISTICS

Variable	Observations	Mean	Standard deviation	Min	Max
Nonmortgage debt	3,490	0.341	0.474	0	1
Nonmortgage debt default	1,191	0.102	0.303	0	1
Credit card	3,490	0.615	0.487	0	1
Card default	2,146	0.169	0.375	0	1
Card default (strict sense)	2,146	0.025	0.157	0	1
Male	3,490	0.360	0.480	0	1
Cohabits	3,490	0.573	0.495	0	1
Age	3,489	51.578	16.470	17	100
University	3,490	0.210	0.407	0	1
Log (income)	3,489	10.408	0.743	7.31	13.64
Proportion of workers	3,490	0.566	0.339	0	1
Members	3,490	3.003	1.663	1	15
Children in the household	3,490	0.551	0.497	0	1
Expenditures higher than income	3,483	0.148	0.355	0	1
High financial burden	3,442	0.035	0.185	0	1
Formal employment	3,490	0.458	0.498	0	1
Retired	3,490	0.229	0.420	0	1
Unemployed or informal employment	3,490	0.313	0.464	0	1
Regulated sector	3,490	0.301	0.459	0	1
Banking sector	1,051	0.532	0.499	0	1
Number of credit cards	3,490	1.405	1.713	0	20

Source: EFHU2 and ECH.

4. METHODOLOGY

We propose two models to explain household debt default, one conditional on having debt and another unconditional on having debt. The conditional model explains the determinants of default for households that have debt, while the unconditional model allows for obtaining the determinants of default for all households in the sample when it is considered there might be selection bias. In this case, selection bias can be determined because the decision of the household to have debt and not pay it is not independent. We test for this in the nonmortgage credit segment and that of credit card default in the broad sense.

All the estimations use household weights, so the results are nationally representative. These weights can be found in the EFHU database.

4.1 Conditional Estimation

A probit model is estimated for the credit card and nonmortgage debt segments. The aim is to be able to determine which financial and demographic characteristics are significant for each segment, as well as analyze whether there are differences in the variables explaining default among said segments.

Two models are specified for each segment. The first model refers to all the households that have at least one loan in that segment, adding the regulated sector as an independent variable in order to determine whether the debt default probability is different according to the type of institution or individual granting a loan. The second model only considers households in which at least one loan is granted by the regulated financial system.

$$\text{Model } \Pr\left(y_i \middle| x_i = 1\right) = F\left(Z_i \beta\right),$$

where, y_i is a binary variable that takes the value of one if household i is not up to date on its debt payments and zero if it is;[7] x_i is a binary

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[7] For the credit card segment two definitions of default are considered and two models are estimated. The first of them defines household default in the broad sense as when any member of the household has fallen into delinquency on credit card payments during the last year. In the second we define that a household is delinquent in the strict sense if such payments are more than three months overdue.

variable that is equal to one if household i has a debt in the credit segment being analyzed; Z_i is a vector of independent sociodemographic and financial variables including the regulated sector variable. The number of credit cards is included as an explicative variable in the models for the credit card segment. And F is the standard cumulative distribution function.

4.2 Unconditional Estimation

To estimate the probability of default by unconditional credit segment the information from all the households in the sample is used to estimate a heckprobit model.

This estimation is important given the selection bias that might exist in the conditional models towards households with debt if their decision to have debt and default on it are related. In this case we can say that selection bias exists and the estimation used to determine the effects of model variables should be the unconditional one, or the estimations will be biased.

In light of the above, we estimate three models: a model for the nonmortgage credit segment, another for credit card default in the strict sense, and a model for credit default in the broad sense.

To estimate the unconditional probability, we define y_{1i} as a dichotomous variable that takes the value of one if the household is delinquent in its debt repayments, and zero if not. We also define y_{2i} as a dichotomous variable that takes the value of one if the household has debt in the credit segment being analyzed and zero if it does not.

$$y_{1i} = \begin{cases} 1 \text{ if } y_{1i}^* > 0 \text{ and } y_{2i} = 1 \\ 0 \text{ if } y_{1i}^* \leq 0 \text{ and } y_{2i} = 1 \\ \text{there are no observations if } y_{2i} = 0 \end{cases}.$$

where y_{1i}^* is a latent variable for the debt payment decision of the household. Selection takes place in this model and we observe y_{1i} if $y_{2i}=1$. The selection equation is written as follows:

$$y_{2i} = \begin{cases} 1 \text{ if } y_{2i}^* \geq 0 \\ 0 \text{ if } y_{2i}^* \leq 0 \end{cases}$$

where y_{2i}^* is a latent variable on the decision to acquire a loan or have a credit card for the credit segment. Following Mello and Ponce (2014) the decision for requesting a loan is theoretically derived from the maximization of some utility function which depends on credit. A household contracts debt if the utility of consumption financed with debt exceeds the cost of such financing.

The equations for the latent variables in this model are:

$$y_{1i}^* = x_i \beta + v_{1i} ,$$

$$y_{2i}^* = z_i \beta + v_{2i} .$$

It assumed that the vector (v_{1i}, v_{2i}) has bivariate normal distribution with mean $(0, 0)$ variance $(1, 1)$ and correlation ρ.

The selection equation determines the probability of a household contracting nonmortgage or credit card debt and is estimated based on some of the variables suggested by the model presented in Mello and Ponce (2014). To correctly identify the model there should be at least one variable in the selection equation that is not present in the original equation. In the models presented, this binary variable takes the value of one if the household has a bank account, and zero otherwise. The exclusion variable, having a bank account, is a variable of access to the financial system and is positively and significantly correlated with a household having debt (Mello and Ponce, 2014). However, there is no relation between having a bank account and a household's decision to pay its debt.

$$\text{Selection equation} \quad \Pr\left(y_{2i}\right) = F\left(C_i \beta\right),$$

where $F(\cdot)$ is the standard cumulative distribution function; y_{2i} is a binary variable that is equal to one if household i has a debt in segment i, and zero otherwise; and C_i is a vector of regressors that includes a group of binary variables that indicate whether a household has a bank account, if there are children in the household, if the head has a bachelor's or higher degree, and if the head is in formal employment or retired. Moreover, age, age squared, the number of members, and the log of household income are added as regressors.

We test with all the independent variables used for the probability of debt default and only those that are significant for explaining the

probability that a household has nonmortgage or credit card debt, using a backward selection approach [8] that eliminates the regressors with a p-value higher than 0.1, are left in the selection equation. Furthermore, a binary variable is added that identifies households with a bank account.

Given that the aim is to assess the effects of default probability on credit granted by the regulated financial system in the nonmortgage credit segment, only households with loans from regulated institutions are considered.

Because the assumption of normality is strong and the effects of the parameters in the decision to acquire debt might be non-linear with the decision not to pay it, Alfaro et al. (2010) propose an alternative method. They define the effect of the first stage (decision to have debt) on the second stage (debt default decision) of household i as the logistic transformation of the probability of an individual having a debt $G_i=g(PX_i)$, where g is the logistic transformation and PX_i is the probability that $y_{2i}=1$. Furthermore, the standard errors are adjusted by a bootstrapping procedure with 2,000 replications.

The same estimation proposed by Alfaro et al. (2010) is carried out to compare the results with the heckprobit estimation. The results, which are presented in the Table A.3, show that the logistic transformation and its second-degree polynomial are not significant in the models estimated.

5. RESULTS

5.1 Conditional Probability of Default Model for the Nonmortgage Credit Segment

Two conditional probability models are estimated. The first considers total nonmortgage credit and the regulated sector variable is added as a control. A second model is then estimated that only considers households with at least one loan granted by a regulated

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[8] Backward selection of variables estimates a model with all the regressors of interest and then eliminates those that are least significant, starting with the one with the highest p value. This method uses the *stepwise [, options]* Stata command to select variables and the level of significance established for the estimations is 0.10. In this way, the method eliminates all the variables with a p above 0.10.

financial institution and the probability of default on nonmortgage debt is estimated. The banking sector variable is added to the second model as a control. The results are shown in Table 2.

The sociodemographic variables that are significant in the conditional probability model include age, sex, type of employment of the household head, whether they live with their partner, and the number of household members. The probability of mortgage credit default is less for households where the household head lives with their partner and where the household head is older. Meanwhile, if the household head is male or the household has more members the probability of debt default is greater. If the household head is in formal employment or retired the probability of default is less than for households where the head is unemployed or in informal employment.

Among the financial variables, income and the relation between current expenditures and income are significant. In households where current expenses are higher than the income the probability of debt default is larger. The higher the income of a household the less likely it is to default on its debt. If the household has at least one loan granted by the regulated sector, the probability of debt default is also higher. The latter result is related to the fact that besides banks the regulated sector also encompasses financial companies and savings and credit cooperatives, which have a higher default rate than banking institutions.

This is supported by the model estimated for default on nonmortgage credit granted by the regulated sector where a binary variable is added (banking sector) that takes the value of one if all a household's loans are from the banking sector, and zero otherwise. The variable is significant with a negative sign, meaning that if the credit is granted by the banking system the probability of default is lower than if it is granted by other types of regulated institutions. The estimated average probability of default in the conditional nonmortgage credit segment is 9.5%, while the estimated average default for loans granted by the banking system is 3.4 percent.

When the household head is considered as the member making the largest contribution to household income, variables such as living with a partner, and variables linked to employment status and sex cease to be significant. This result provides evidence to support the fact that the important sociodemographic characteristics are those that refer to who actually makes the household's financial decisions

Table 2

MODELS CONDITIONAL ON HAVING NONMORTGAGE DEBT

Dependent variable	Credit default		Regulated sector credit default	
	(a)	*(b)*	*(a)*	*(b)*
Male	0.363[b]	0.373[a]	0.323[b]	0.326[b]
	(0.146)	(0.142)	(0.154)	(0.150)
Cohabits	−0.259[b]	−0.269[b]	−0.170	
	(0.133)	(0.133)	(0.139)	
Age	−0.024[a]	−0.023[a]	−0.021	−0.021[a]
	(0.005)	(0.005)	(0.006)	(0.005)
University	−0.282		−0.297	
	(0.223)		(0.246)	
Log(income)	−0.2134[b]	−0.202[b]	−0.180	−0.183[b]
	(0.108)	(0.093)	(0.116)	(0.098)
Proportion of workers	0.255		0.132	
	(0.270)		(0.287)	
Members	0.096[b]	0.070[b]	0.075	
	(0.047)	(0.039)	(0.051)	
Children	−0.069		−0.153	
	(0.168)		(0.183)	

Expenditure > income	0.539[a]	0.563[a]	0.509[a]	0.536[a]
	(0.132)	(0.131)	(0.140)	(0.141)
Financial burden > 75%	0.195			
	(0.201)			
Formal employee	−0.552[a]	−0.577[a]	−0.506[a]	−0.549[a]
	(0.146)	(0.147)	(0.150)	(0.151)
Retired	−0.524[b]	−0.576[b]	−0.527[b]	−0.548[b]
	(0.225)	(0.237)	(0.245)	(0.256)
Regulated sector	0.640[a]	0.663[a]		
	(0.223)	(0.222)		
Banking sector			−0.649[a]	−0.678[a]
			(0.154)	(0.152)
Constant	1.193	1.194	1.734	1.896[a]
	(1.009)	(0.998)	(1.103)	(1.047)
Observations	1,125	1,125	1,006	1,006
Pseudo R²	0.1836	0.1762	0.1727	0.1992
Log pseudo-likelihood	−96,784.21	−97,657.14	−91,883.32	−88,944.707

Notes: standard errors in parenthesis. [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.10$ // (a) model with all variables of interest (b) model with a backward selection of independent variables for a p-value of less than 0.10.

Table 3

CONDITIONAL MODELS FOR CREDIT CARDS

Dependent variable	Credit card default, broad sense		Credit card default, strict sense	
	(a)	(b)	(a)	(b)
Male	−0.0005		0.143	
	(0.083)		(0.142)	
Cohabits	−0.076		−0.054	
	(0.087)		(0.153)	
Age	−0.014[a]	−0.015[b]	−0.0213[a]	−0.021[a]
	(0.003)	(0.003)	(0.005)	(0.004)
University	−0.013		−0.280	
	(0.093)		(0.185)	
Log(income)	−0.123[c]	−0.125[b]	−0.192[c]	−0.298[a]
	(0.067)	(0.063)	(0.114)	(0.109)
Proportion of workers	0.0268		−0.252	
	(0.147)		(0.272)	
Members	0.114[a]	0.086[a]	0.045	
	(0.035)	(0.027)	(0.053)	
Children	−0.105		−0.215	
	(0.100)		(0.158)	

Expenditure>income	0.632ᵃ (0.103)	0.637ᵃ (0.103)	0.793ᵃ (0.160)	0.831ᵃ (0.15)
Financial burden > 75%	0.354ᵇ (0.180)	0.347ᶜ (0.180)	0.1758703 (0.263)	
Formal employee	−0.024 (0.097)		−0.146 (0.295)	
Retired	−0.069 (0.160)		−0.025 (0.158)	
Number of credit cards	0.067ᵃ (0.0234)	0.068ᵃ (0.023)	−0.040 (0.055)	
Constant	0.45 (0.67)	0.523 (0.657)	1.12 (1.158)	1.93 (1.188)
Observations	2,072	2,072	2,072	2,072
Pseudo R²	0.0849	0.0833	0.1541	0.1377
Log pseudo likelihood	−274,496.33	−274,987.29	−74,174.24	−75,610.25

Notes: standard errors in parenthesis. ᵃ $p < 0.01$, ᵇ $p < 0.05$, ᶜ $p < 0.10$. (a) denotes a model with all variables of interest and (b) a model with a backward selection of independent variables for a *p*-value of less than 0.10.

and not to who participates most in income generation. The results of the models estimated for this definition of household head are presented in Table A.2 in the Annex.

5.2 Conditional Probability of Default Model for the Credit Card Segment

In the credit card segment, household default probability models are estimated for two types of delinquency. The dependent variable in the first model is a binary variable that takes the value of one if a household declares that any of its members fell into delinquency with a credit card during the last year. In the second model, we define that a household is in default in the strict sense if said delinquency is longer than three months. The number of credit cards a household has is added as an independent variable. The results are presented in Table 3.

We find a negative and statistically significant relation between the age of the household head and the probability of falling into delinquency with a credit card. Sex, or whether the household head has a university education or lives with their partner, are not significant for this credit segment. Moreover, the higher a household's income, the lower the probability of it being delinquent with a credit card. Households with a larger number of members have a higher probability of being overdue with credit card payments. Households with higher expenditures than income or with a financial burden greater than 75% of its income are also more likely to default on credit card payments. The number of credit cards a household has is significant and positively correlated to the probability of default on repayments of at least one credit card.

When we consider the probability of being delinquent in credit card payments for more than three months, the age of the household head is statistically significant. The older the household head, the lower the probability of being delinquent for more than three months in credit card payments. The higher the household income, the lower the probability of being delinquent for more than three months in credit card payments. The number of members, number of credit cards, and financial burden are not significant variables for explaining delinquency of longer than three months. Once again, the relation between current expenditures and income is significant. Households with current expenditures above their income are more

likely to fall into delinquency with credit card payments for three months or more than households with expenditures lower than or equal to their income.

5.3 Comparison between Segments

The characteristics that determine household debt default therefore differ by credit segment. In the nonmortgage credit segment, some sociodemographic variables referring to the individual who administers the household's finances, whether they live with their partner, their age, sex, and if they are in formal employment or retired, as well as other household linked variables, such as number of members, are significant. Meanwhile, in the credit card segment, only the age of the household head and number of members are significant sociodemographic variables.

Differences are also observed among the financial variables. The relation between households' current expenditures and income is significant for all credit segments. This result is evidence in favor of the *ability-to-pay* theory on debt default in which households will avoid not paying their debt as long as their income is sufficient to cover the payments.

The financial burden is only significant for the credit card segment and for delinquency in payments in the broad sense. Variables associated with the employment status of the household head are only significant in the nonmortgage credit segment. Income, on the other hand, is significant in all the credit segments and for all default definitions.

5.4 Unconditional Probability Models

5.4.1 Nonmortgage Credit

The results of the unconditional default probability model for the segment of nonmortgage credit granted by the regulated financial are presented in Table 4.

The results obtained from the selection equation of the non-mortgage credit default model indicate that having a bank account increases the probability of having a nonmortgage loan granted by the regulated financial sector. Meanwhile, households with more members or with children of the household head living in them are more likely to have this type of debt. If the head has a bachelor's or

higher degree the probability of the household having nonmortgage debt is lower.

With respect to the age of the household head, there is a life-cycle effect through which as age increases the probability of having nonmortgage debt grows, but at a decreasing rate. Higher income households are more likely to have nonmortgage debt. If the household head is retired or in formal employment, the probability that the household has nonmortgage debt is greater than for those where the head is in informal employment or unemployed.[9]

The Wald test shows that there is a significant correlation between the error terms and it is therefore appropriate to use a heckprobit model to obtain the unconditional probability of nonmortgage debt default.

In this specification, the probability of the household defaulting on its mortgage debt is higher if the head is male. The older the household head the less likely it is not to pay its debt. The cohabitation variable ceases to be significant in the unconditional model. However, the *university* variable is significant and negative in that model. The higher the income of the household, the less likely it is to default on its debt. Households with a larger number of members or with expenditures above their income have a higher probability of debt default. Finally, being retired is not significant in the unconditional model, while the household head being in formal employment reduces the probability of debt default.

5.4.1 Credit Cards

An unconditional probability model is estimated for the credit card segment in the broad sense and in the strict sense. The results are presented in Table 4. Besides the variables considered previously, these models also include the number of credit cards a household has as an independent variable in the main equation.

According to the selection equation, having a bank account,[10] and the household head having children, being in formal employment,

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[9]   These results are similar to those obtained by Mello and Ponce (2014) in their study on the determinants of debt default among Uruguayan households. However, they use a survey (prior) different from the EFHU.

[10] It is not necessary to have a bank account in Uruguay in order to have a credit card. In the sample, the 36% of households that own a credit card does not have a bank account.

and having a bachelor's or higher degree increase the probability of owning a credit card. The probability is also higher in older age, although it then declines. Higher income households are also more likely to have a credit card.

In the unconditional probability model for credit card default in the strict sense, the Wald test does not reject the null hypothesis that the probability of credit card debt default and that of having a credit card are independent. Hence, the estimation for credit card default in the strict sense is used without considering selection bias.

When we consider credit card default in the broad sense, we cannot reject the hypothesis that they are independent and we therefore use the unconditional probability model.

According to the results obtained, the older the household head, the more likely they are to fall into delinquency with their credit cards. Households with more members have a greater probability of credit card default. If the household head is in formal employment the probability of credit card default decreases. If household expenditures are higher than income the probability of falling into delinquency with credit card payments is greater. Finally, households with a larger number of credit cards are more likely to be overdue in their payments of at least one of them.

5.5 Household Risk

The household default probability estimated can be used as a measure of household risk. We perform a test for difference of means in the estimated probability of nonmortgage debt default considering, on the one hand, households that have at least one loan granted by the regulated financial sector and, on the other, those who do not have nonmortgage debt in the regulated sector.[11] The results are shown in Table 5. According to the test for difference of means, households with a nonmortgage debt in the regulated system have a different and slightly higher mean than households that do not have a nonmortgage debt in the regulated system.

If, on the other hand, we consider households with nonmortgage credit in the banking sector and nonmortgage credit in other institutions from the regulated sector, we observe that the former have

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[11] In other words, those that have all their debt in the unregulated sector or those without debt.

Table 4

UNCONDITIONAL PROBABILITY MODELS

Dependent variable	Regulated nonmortgage credit default	Credit card default, broad sense	Credit card default, strict sense
Male	0.292[b]	0.007	0.157
	(0.116)	(0.077)	(0.148)
Cohabit	−0.163	−0.069	−0.039
	(0.101)	(0.079)	(0.209)
Age	−0.016[a]	−0.013[a]	−0.021[a]
	(0.004)	(0.003)	(0.01)
University	−0.35[b]	0.049	−0.268
	(0.181)	(0.089)	(1.489)
Log (income)	−0.221[b]	0.043	−0.152
	(0.089)	(0.068)	(3.387)
Proportion of workers	0.212	−0.001	−0.252
	(0.204)	(0.134)	(0.549)
Members	0.104[a]	0.0799[b]	0.039
	(0.040)	(0.034)	(0.402)
Children	0.085	−0.038	−0.219
	(0.126)	(0.093)	(1.127)

	Nonmortgage debt in the regulated sector	Credit card, broad sense	Credit card, strict sense
Expenditure>income	0.464 [a]	0.584 [a]	0.806 [a]
	(0.098)	(0.099)	(0.291)
Financial burden > 75%	0.097	0.329	0.251
	(0.15)	(0.161)	(0.461)
Formal employee	−0.213 [c]	−0.200 [b]	−0.015
	(0.121)	(0.089)	(3.853)
Retired	−0.2515	−0.030	−0.122
	(0.187)	(0.142)	(1.064)
Number of credit cards		0.069 [a]	−0.035
		(0.022)	(0.12)
Constant	0.6215452	−1.613002	0.587
	(0.828)	(0.7)	(42.94)
Selection equation			
Bank account	0.216 [a]	0.533 [a]	0.517 [a]
	(0.057)	(0.059)	(0.094)
Members	0.05 [b]	−0.03	−0.031
	(0.021)	(0.022)	(0.023)
University	−0.232 [a]	0.275 [a]	0.285 [b]
	(0.075)	(0.083)	(0.125)

	Nonmortgage debt in the regulated sector	Credit card, broad sense	Credit card, strict sense
Age	0.0292[a]	0.0261[a]	0.03
	(0.009)	(0.01)	(0.033)
Age²	−0.0003[a]	−0.0003[a]	−0.0003
	(0.0001)	(0.0001)	(0.0003)
Formal employee	0.273[a]	0.52[a]	0.514[a]
	(0.067)	(0.067)	(0.092)
Retired	0.409[a]	0.154[c]	0.158
	(0.095)	(0.093)	(0.113)
Children	0.173[b]	0.127[c]	0.126
	(0.071)	(0.073)	(0.100)
Log income	−0.078[b]	0.423[a]	0.428[a]
	(0.041)	(0.043)	(0.0652)
Constant	−0.911[c]	−5.14[a]	−5.262
	(0.445)	(0.477)	(0.515)[a]
ρ	4.834[b]	0.788[a]	0.135
	(2.092)	(0.302916)	(12.826)
Wald test ($\rho=0$) $\chi^2(1)=$	5.34	6.76	0
Prob > $\chi^2 =$	0.0209	0.0093	0.9916
Observations	3,464	3,452	3,452
Censored observations	2,438	1,343	1,343
Uncensored observations	1,026	2,109	2,109

Notes: standard errors in parenthesis. [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.10$.

TEST FOR DIFFERENCE OF MEANS BETWEEN HOUSEHOLDS THAT HAVE CREDIT IN THE REGULATED SECTOR AND THOSE THAT DO NOT

Group	Observations	Mean	Standard error	Standard deviation	[95% confidence interval]	
Without nonmortgage debt in the regulated sector	2,407	0.030	0.0007	0.0358	0.03	0.0315
With nonmortgage debt in the regulated sector	1,026	0.033	0.0012	0.0342	0.03	0.0352

Difference = mean (without debt) − mean (with debt)

H_0: difference=0

H_1: difference<0 p value=0.0088

H_1: difference≠0 p value=0.0175

H_1: difference>0 p value= 0.9912

an estimated average probability that is statistically significant and lower than the latter (Table 6).

Finally, we consider the probability of credit card default estimated as a measure of household risk. A difference of means test is performed for the probability of credit card default in the broad sense, considering on one side households that have credit cards and on the other those who do not. The results are presented in Table 7.

According to the difference of means test, households with at least one credit card have an estimated mean probability of debt default different from and higher than those that do not have a credit card.

Table 6

TEST FOR DIFFERENCE OF MEANS BETWEEN HOUSEHOLDS WITH CREDIT IN THE BANKING SECTOR AND THOSE THAT HAVE IT WITH OTHER INSTITUTIONS FROM THE REGULATED SECTOR

Group	Observations	Mean	Standard error	Standard deviation	[95% confidence interval]	
Nonmortgage debt in other institutions from the regulated sector	479	0.0405	0.0018	0.0386	0.0371	0.04
Nonmortgage debt in the banking sector	547	0.0266	0.0012	0.0283	0.0242	0.03

Difference = mean (without debt) − mean (with debt)

H_0: difference=0

H_1: difference<0 p value=1

H_1: difference≠0 p value=0.000

H_1: difference>0 p value= 0.000

Table 7

TEST FOR DIFFERENCE OF MEANS BETWEEN HOUSEHOLDS WITH CREDIT CARDS AND THOSE WITHOUT THEM

Grupo	Observations	Mean	Standard error	Standard deviation	[95% confidence interval]	
Households without credit card	1,324	0.0815	0.002	0.0736	0.0775	0.09
Households with credit card	2,109	0.124	0.0019	0.0879	0.1203	0.13

Difference = mean (without debt) −mean (with debt)

H_0: difference=0

H_1: difference<0 p value=0.000

H_1: difference≠0 p value=0.00

H_1: difference>0 p value= 1

6. APPLICATION: IMPACT OF THE FINANCIAL INCLUSION LAW ON HOUSEHOLD DEFAULT

The purpose of this section is to project the possible impact of the Financial Inclusion Law on household debt default by applying the models estimated. In particular, the study focuses on the impact of the measure enforced by the Law that establishes the obligation to pay dependent employees' wages through electronic payment media. Article 10 of the Financial Inclusion Law (19.210) stipulates that "payment of salaries and all other money items dependent employees are entitled to receive, whoever their employer might be, must be credited to an account at financial intermediation institutions or in an electronic money instrument at institutions offering such services." As of October 2016, all workers must collect their earnings through electronic media. However, they may agree with the paying party to continue receiving their earnings through different media than that set out by the Law, including cash, until April 30, 2017.

To perform the projection for the models estimated, we first identify the households with at least one dependent worker and without a bank account. We then assume that those workers open a bank account once the Financial Inclusion Law comes into force. Finally, using the models estimated in Section 5, a prediction is made for the probability of those households requesting credit and falling into delinquency on their debt according to their sociodemographic and financial characteristics. The projection is made for the nonmortgage credit and credit cards segment.

From the EFHU, 50% of the households do not have bank accounts, and out of those households 57% have at least one member who is a dependent worker. Once the Financial Inclusion Law comes into effect, the households that have at least one member who is a dependent worker should be expected to open a bank account.

According to the unconditional probability estimations performed for the cards and nonmortgage credit segment, in the selection equation, having a bank account increases the probability of having a debt or a credit card. The existence of a prior link to the bank, such as a bank account, makes the individual, who was previously unknown to the bank, a potential credit customer. Mello and Ponce (2014) find a positive and statistically significant relation between having a bank account and having a loan with the financial sector in Uruguay.

We proceed as follows. For households that have at least one member with a paying job, a value of 1 is imputed for the binary variable that represents having a bank account. Next, the probability of this household having a nonmortgage loan or access to a credit card is estimated with the model presented for unconditional probability.

To be able to determine the threshold probability based on which it is considered that a household does decide to have a loan or a credit card we select the value that maximizes the Youden index. This index is used as a summary measure of the ROC[12] curve and defines criteria for selecting an optimal threshold probability of debt or credit card (Fluss et al., 2005).

$$IY = \max_{c} \left\{ Se(c) + Sp(c) - 1 \right\}$$

where $Se(c)$ is the ratio of true positives or sensitivity and $Sp(c)$ is the ratio of true negatives. In this case, $Se(c)$ is the percentage of households classified as having nonmortgage or credit card debt if the household in the sample has a debt or a credit card and $Sp(c)$ is the percentage of households classified as not having nonmortgage debt or credit card if the household in the sample does not have debt or credit card. The index can go from 0 to 1, where a value close to 1 means the selected threshold is very effective for separating both populations and a value of 0 means it is not.

Based on the unconditional probability models, threshold c is established as the value that maximizes the joint probability of true positive and true negative ratios. Next, the probability that a household has debt or not is estimated using unconditional models. Finally, if the probability of the household having debt is greater than the established threshold, 1 is imputed to the debt variable[13] for that household, and the probability of the household defaulting on that debt is estimated. The thresholds obtained are shown in Table 8.

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[12] The signal detection theory uses ROC (Receiver Operating Characteristics) curves to make a graphic representation of sensitivity versus specificity for a binary classifier system according to variations in the discrimination threshold.

[13] To perform the exercise, it is assumed that households above the threshold will have access to credit and the loan is granted to them.

Table 8

THRESHOLDS

Classification (Pr > c)	Threshold c
Nonmortgage debt	0.288936
Nonmortgage debt default	0.028952
Credit card	0.647420
Credit card default	0.155079

6.1 Nonmortgage Debt

The average probability of having nonmortgage debt increases from 30% to 33% when considering salaried employees' obligation to have a bank account.

Out of the households that have at least one salaried employee and do not have a bank account before the reform, 34% had nonmortgage debt. After the reform, and considering the imputed threshold, this percentage increases to 86%. To determine whether this group of households (with a least one member who is a salaried employee, and who did not have a bank account or loan prior to the reform, and then when they have a bank account decide to request a loan) has a probability of debt default significantly different from the group of individuals that had a bank account before the reform or who did not have a bank account but do not decide to take out a loan, we perform a test for difference of means. As can be seen in Table 9, the difference is statistically significant and higher for those new households that obtain credit after opening a bank account. The average probability of default for them is equal to 4%, a figure slightly above the average unconditional probability for the sample as a whole.

Table 9

DIFFERENCE OF MEANS TEST ON THE DEFAULT PROBABILITY FOR THE NEW GROUP ACCESSING CREDIT

Group	Observations	Mean	Standard error	Standard deviation	[95% confidence interval]	
Other households	2,968	0.0264	0.0006	0.0346	0.025	0.028
With nonmortgage debt due to Financial Inclusion Law	2,109	0.124	0.0019	0.0879	0.12	0.128

Difference = Mean (without debt) −mean (with debt)

H_0 = Difference=0

H_1 = Difference< 0 p value=0.000

H_1 = Difference ≠0 p value=0.000

H_1 = Difference > 0 p value=1

Table 10

DESCRIPTIVE STATISTICS BY GROUP

Variable	With nonmortgage credit due to the financial inclusion law	Other households
Age	49	52
Income	30,626.5	33,514.7
Members	3.77	2.88
Expenditures higher than income	0.1663158	0.1449468
University	0.210084	0.2398806
Formal employee	0.4054622	0.4661579

Table 10 shows some descriptive statistics for variables that are statistically significant in the nonmortgage debt default probability model for the group of households without a bank account, with at least one salaried employee among their members and that incur debt once they have a bank account, and for the remaining households.

As can be seen, households without a bank account, with at least one salaried employee among their members and that incur debt once they have opened a bank account after the Financial Inclusion Law, on average have a younger household head. The average income of these households in Colombian pesos is lower, and they have a higher average number of members. Moreover, the proportion of households whose expenditures surpass their income is larger among this group, while the proportion of households whose head holds a bachelor's or higher degree is smaller. Finally, the proportion of households whose head is in formal employment is also lower.

For households that have a higher probability of incurring debt than the estimated threshold, the value one is imputed for the nonmortgage debt variable, and the probability of default on the nonmortgage credit granted by the formal financial sector is estimated. Households with a mortgage debt default probability above the defined threshold are considered not to pay their debt. The proportion of unpaid nonmortgage debt shifts to approximately 15%, representing an increase of around four percentage points in the default rate for this type of loan.

6.2 Credit Cards

According to data from the EFHU, 61% of households have at least one credit card. Out of the households that do not have a bank account but have at least one member with a paying job, 51% have credit cards.

Following Youden index criteria, a threshold is determined above which households have a credit card. The proportion of households without a bank account and with at least one member with a paying job that have credit cards after opening a bank account increases by up to 82 percent.

If the probability of having a credit card surpasses the threshold, the household is therefore imputed to have a credit card, and we estimate the probability of it falling into delinquency with its payments (in the broad sense). The average default probability, in the broad

sense, of those that obtain a credit card is similar to the average for the sample as a whole and equal to 14.5 percent.

We perform a test for difference of means between this group of households, which we call "group with at least one member with a paying job, without a bank account before the reform and that once they have opened a bank account decide to have at least one credit card," and the rest of the sample. The group of households that obtain credit cards after the Financial Inclusion Law does not have a default probability (in the broad sense) statistically different from the rest of the sample. The results are presented in Table 11.

Table 11

DIFFERENCE OF MEANS TEST FOR THE PROBABILITY OF CREDIT CARD DEFAULT IN THE BROAD SENSE

Group	Observations	Mean	Standard error	Standard deviation	[95% confidence interval]	
Other households	3,145	0.1433	0.0019	0.106	0.14	0.147
With credit card due to the Financial Inclusion Law	288	0.1454	0.0057	0.0967	0.134	0.16

Difference = Mean (without debt) −mean (with debt)

H_0 = Difference=0

H_1 = Difference<0 p value=0.3475

H_1 = Difference ≠0 p value=0.7491

H_1 = Difference>0 p value= 0.6255

7. FINAL REMARKS

In this paper, we estimate models for Uruguayan households' default probability in different credit segments. The results of the variables that are statistically significant differ according to the credit segment considered. However, the age of the household head and the relation between household expenditure and income are significant

in all the segments. Income is also important in explaining household default in all the segments except falling into delinquency with credit card payments (in the broad sense) when the model estimated is corrected for selection bias.

Furthermore, the sociodemographic variables of importance are those referring to the person with most knowledge of the household's financial matters, the reference person according to the EFHU and not the person who makes the greatest contribution in terms of income.

Having models on the probability of default among Uruguayan households enables different studies to be carried out on household behavior, their vulnerability to macroeconomic conditions and to assess policies that have an impact on debt default. This paper extends the use of the models by presenting an assessment of the Financial Inclusion Law and the effect of the obligation to pay salaries through electronic media on debt default, and thereby on total delinquency in the system.

The models estimated lay the foundations for future works to analyze the relation between credit constraints and the probability of household debt default as a measure of household credit risk, and study the effects of an income shock on household debt default. Furthermore, using data from the EFHU, it is possible to analyze the determinants of default on loans based on their characteristics.

ANNEX

Table A.1	
BREAKDOWN BY CREDIT SEGMENT Percentage of all households with debt	
Exclusively mortgage debt	1
Exclusively nonmortgage debt	15
Exclusively credit cards	47
Mortgage debt and credit cards	6
Nonmortgage debt and credit cards	28
Mortgage and nonmortgage debt	1
Credit cards, mortgage debt, and nonmortgage debt	4

Source: Author's calculations based on data from the EFHU.

MODELS FOR NONMORTGAGE CREDIT
Household head as the largest contributor to household income

Dependent variable	Nonmortgage credit default	Regulated nonmortgage credit default
Male	0.054	0.091
	(0.137)	(0.144)
Cohabits	0.023	0.076
	(0.146)	(0.154)
Age	−0.015[a]	−0.013[a]
	(0.005)	(0.005)
University	−0.312	−0.196
	(0.304)	(0.336)
Log(income)	−0.258[b]	−0.257[b]
	(0.114)	(0.123)
Proportion of workers	0.353	0.258
	(0.259)	(0.277)
Members	0.138[a]	0.122[a]
	(0.043)	(0.047)
Children	−0.069	−0.128
	(0.167)	(0.179)
Expenditure>income	0.500[a]	0.453[a]
	(0.127)	(0.137)
Financial burden > 75%	0.060	−0.059
	(0.185)	(0.217)
Formal employee	−0.148	−0.137
	(0.165)	(0.171)
Banking sector		−0.701[a]
		(0.143)
Regulated sector	0.608[a]	
	(0.222)	
Constant	0.769	1.608
	(1.060)	(1.162)
Observations	1,150	1,027
Pseudo R²	0.1158	0.1513
Log pseudo-likelihood	−105,977	−95,216.382

Notes: standard errors in parenthesis. [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.10$.

TWO-STAGE ESTIMATIONS FOLLOWING THE METHODOLOGY PROPOSED BY ALFARO ET AL. (2010)

Dependent variable	Nonmortgage debt default (broad sense)	Card default
Male	0.252[c]	−0.057
	(0.132)	(0.145)
Cohabits	−0.261[b]	0.053
	(0.13)	(0.149)
Age	−0.016[a]	−0.021[a]
	(0.005)	(0.006)
University	−0.494[c]	−0.332[c]
	(0.263)	(0.199)
Log(income)	−0.276[b]	−0.175
	(0.107)	(0.195)
Proportion of workers	0.421[c]	−0.317
	(0.247)	(0.29)
Members	0.133[a]	0.036
	(0.05)	(0.062)
Children	0.392[c]	−0.264
	(0.208)	(0.176)
Expenditure>income	0.605[b]	0.797[a]
	(0.121)	(0.157)
Financial burden > 75%	0.165	0.37
	(0.188)	(0.273)
Formal employment	−0.09	−0.052
	(0.239)	(0.329)
Retired	−0.117	−0.044
	(0.29)	(0.21)
Number of credit cards		−0.028
		(0.065)
G(px)	−0.455	−0.084
	(0.581)	(0.186)
G(px)^2	0.17	0.102
	(0.251)	(0.248)
Constant	0.899	0.938
	(1.053)	(1.935)
Observations	1,149	1,026
Simulations	2,000	2,000

Bootstrapped standard errors in parenthesis. [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.10$.

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