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Financial exclusion and financial literacy: Evidence from Mexico

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Abstract

This study seeks to contribute to the understanding of the underlying factors that can explain the high levels of financial exclusion that persist in Mexico, with focus on the role of financial literacy. Our analysis is based on the 2018 National Survey of Financial Inclusion in Mexico (ENIF). To address the potential endogeneity between financial inclusion and financial literacy we use an instrumental variable probit model. The findings reveal that low levels of financial literacy, socioeconomic vulnerabilities, personality traits, and lack of trust in financial institutions hamper financial inclusion in Mexico.

Keywords: financial inclusion; financial literacy; trust; personality traits.
JEL codes: G50, G51, G53, G41, J16.

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Introduction

Several research studies have shown that financial inclusion has a great potential to improve the lives of individuals and reduce socioeconomic gaps, especially for the most vulnerable groups (Deaton, 2017). At the macro level, greater participation of individuals in the formal financial market has beneficial and permanent effects on growth, inequality, and financial stability (Di Giannatale and Roa., 2019). Furthermore, financial inclusion might help to meet some of the Sustainable Development Goals, such as no poverty, zero hunger, gender equality, and inequality reduction. All of the above is achieved to the extent that financial inclusion promotes the formalization of informal economies, the of enhancing business opportunities, and the facilitation of payments and money transfers (Unlocking Public and for Poor, n.d).

This paper focuses on the importance of financial literacy in financial inclusion in Mexico. The hypothesis behind our analysis is that the lack of financial literacy, along with personality traits and socioeconomic variables, determine financial exclusion. As far as we know, a rigorous analysis – such as this one – of the different determinants of financial exclusion, as well as its potential relationships and causal effects has not yet been carried out in Mexico.

The relevance of our research ultimately resides in the fact that, despite the numerous financial inclusion and financial literacy interventions that have been implemented in Mexico, there are still low levels of both holdings and usage of financial products and services (Bruhn, M., and Love, I., 2014; Carabarín, M. et al., 2018; Lopez, 2020). For example, the gender gap in financial products holding is more than 7%, while the gap between the urban and rural population is 15%. Moreover, adults in Mexico present low levels of financial literacy: only one in three Mexican adults maintain a budget, and just half of them would know where to go if they have a problem related with their financial products (Demirgüç-Kunt et al., 2017); (CNBV-INEGI, 2018). In consequence, the potential benefits of the financial inclusion interventions are not being harnessed by the people who need them most.

Low access to formal financial services, as well as economic and social exclusion, especially within the poor rural population, the elderly, the indigenous population, and the women, are some of the biggest development challenges in Mexico (Pérez Velasco Pavón, 2014). In response to these problems, in 2019, the government launched the National Policy for Financial Inclusion, which establishes that the increase in financial inclusion and education is a way to reach financial health, while contributing to population welfare with a special focus on the vulnerable groups. One of the main objectives of this national policy is to promote financial literacy in the population, with a special focus on school-aged children and beneficiaries of social programs (Consejo Nacional de Educación Financiera, 2020).

Building on the above discussion, the present study seeks to contribute to the understanding of the underlying factors that could explain the high levels of financial exclusion that persist in Mexico, focusing on the role of financial literacy. Our analysis is based on the 2018 National Survey of Financial Inclusion in Mexico (ENIF).

The article is organized as follows. In the first section, we review the literature on the determinants of financial decision making and financial inclusion. Secondly, we present our unit of analysis and the descriptive statistics of our sample. In the third section, we present our empirical model and our econometric results. Finally, the fourth section outlines our principal conclusions and discuss our main results.

1.   Literature Review

Our work is related to several strands of literature. Firstly, it is related with the financial literacy literature, where this variable is found to be one of the main determinants of financial decisions. Financial literacy refers to 'people's ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions' (Lusardi and Mitchell., 2014). The empirical research has shown that significant benefits arise from having financial literacy in financial behaviors – such as saving for retirement, avoiding excessive debt, or repaying credit on time (Kaiser and Menkhoff, L., 2020); (Kaiser et al., 2020); (Yakoboski et al., 2020); (Lusardi et al., 2020); anxiety about life (Kadoya et al., 2018); financial distress (McCarthy, 2011); and financial well-being (Fu, 2020); (Ladha, T. et al., 2017). Empirical evidence also confirms that the level of financial literacy of the world population in general is very low, especially in low-income groups, women, and the elderly.

Of note is the fact that financial literacy seems to be more relevant when the financial decisions the individuals have to make are complex (Roa et al., 2019); (Roa, 2022). In the case of vulnerable populations with low levels of education, we expect financial literacy to play an important role in the individuals' decisions of holding formal financial products. In this sense, a group of studies based on national surveys have found that financial literacy has also proved to be one of the fundamental elements in promoting financial inclusion (Akileng, G. et al., 2018); (Kausel et al., 2016); (Di Giannatale and Roa., 2019); (Cardenas et al., 2020).

Second, our article builds on diverse studies that assume that financial decisions are determined by non-cognitive characteristics or personality traits (Kausel et al., 2016); (Roa et al., 2019); (Roa et al., 2021); (Di Giannatale et al., 2020); (Roa, 2022). These studies suggest that there the presence or absence of certain personality traits – in particular, a propensity for planning and self-control – plays a role in explaining indebtedness and default, good management of finances, investment biases, holding an insurance, and savings. In Mexico, Di Giannatale et al. (2020) found that older individuals possessing higher levels of grit and a tendency toward short term (present bias) are more likely to show no delays in loan repayments.

Third, our study contributes to the literature on the role of trust in financial decisions, which states that the use of formal financial products and services is based essentially on trust in financial institutions. The studies of Guiso et al. (2004) and Zak and Knack. (2001) find that lack of trust in formal financial institutions is related to the lower use of formal financial instruments. The studies ofKast and Pomeranz (2014) in Chile and Bachas, P. et al. (2015) in Mexico suggest that producing trust plays a crucial role in encouraging people to increase formal savings.

Finally, it should be noted that most of the literature cited focus on correlational associations between financial literacy and financial decisions, and not on causal effects. Only some studies account for the causality, and in particular, for the potential endogeneity of financial literacy. Endogeneity can arise because financial literacy and financial decision-making are determined by the same set of variables, or because financial decisions affect financial knowledge. Trying to cope with endogeneity, few authors have implemented instrumental variables estimation to assess the impact of financial literacy on financial behavior (Lusardi and Mitchell., 2014). Instruments used for financial literacy include (i) the level of state expenditures on education in the United States, and whether financial education was taught (Lusardi and Mitchell, O. S., 2009); (ii) the exposure to a new educational voucher system in Chile (Behrman, J. R. and D. Bravo., 2012); and, (iii) the political attitudes at the regional level in Germany (Bucher-Koenen and Ziegelmeyer, M., 2010).

Some papers use exposure to financial information or exposure to peers/colleagues with higher/advanced financial knowledge as instruments (Van Rooij, M. et al., 2011); (Klapper et al., 2012); (Roa et al., 2019). The idea behind this type of instruments is explained by Klapper et al. (2012), who argue that: "The experience of others is not under the control of the respondent and is thus exogenous with respect to his or her actions, but respondents can learn from those around them, thus increasing their own literacy" (p.19). Therefore, the instrument is unrelated to the persons financial inclusion, but is related to the predictor financial literacy, and is not causally affected by the person's financial inclusion or literacy.

Specifically, Klapper et al. (2012) consider the number of public and private universities and the total number of newspapers in circulation as instruments. Van Rooij, M. et al. (2011) include financial experiences of parents. Meanwhile, Roa et al. (2019) take as instrument both the number of universities by region and questions related to the individual's exposure to sophisticated financial information – if the individual is aware of the concepts of deposit insurance funds, mutual funds, investments in the stock markets, and insurance products. These financial concepts are interpreted as sophisticated or advanced financial literacy since in the countries under study most of the population is not aware of them.

Following the same line of thought, in this paper we use the average of sophisticated financial knowledge of the people around the person as instruments. We use questions related to knowledge from a formal financial education course, knowledge of the concept of risk diversification, and the use of insurance products. Thus, our study can go beyond a descriptive or correlational analysis since the implementation of instrumental variables methodology allow us to make inferences regarding causality. Lastly, it is worth noting that while most of the studies in financial literacy and in personality traits that account for endogeneity analyze financial decision-making in developed economies, whereas our study is focused on a developing country. Specifically, we are interested in decisions related to using formal financial instruments, which is a major question in the country under study.

2.   Methods

2.1.   Data

The analysis of financial inclusion in our study is based on the ENIF 2018 database, designed and carried out by the National Institute of Statistics and Geography (INEGI) with the aim of generating information that allows to determine the level of participation, perception and literacy in financial matters of the Mexican population within an age range of 18 to 70 years. The ENIF data is representative at the national level, as well as for six regions and for localities with more than 15,000 inhabitants and localities with less than 15,000.

We constructed indicators that allow the measurement of the concepts involved in the study. Firstly, financial inclusion is measured through binary indexes that indicate whether a person holds a savings product, a credit, or a financial digital instrument (mobile banking) offered by a formal financial institution[1]. Secondly, following the literature on financial literacy, our Financial Literacy Index is measured as the number of corrects answers to four questions related to the concepts of simple interest, compound interest, risk diversification, and inflation. Table 1 displays the questions from ENIF that capture these concepts.

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[1]The formal savings indicator includes questions 5.4 and 5.5 from ENIF 2018 questionnaire; the formal credit indicator includes questions 6.3 and 6.4; the digital financial instrument includes question 5.23.

Table 1: *Questions used for constructing the Financial Literacy Index*

Panel A: Financial inclusion	
Formal savings	Do you have a payroll, savings or pension account or card at any bank or financial institution? Do you have an account or card in a bank or financial institution where you receive government support?
Formal credit	Do you have a loan you took out from a bank, a department store, or another formal financial institution? Do you have a loan you took out from FONACOT, INFONAVIT, FOVISSSTE or another formal financial institution[2]?
Digital financial instrument	Do you have mobile banking services for any of your bank accounts?
Panel B: Financial literacy	
Simple interest	If you lend 25 pesos to a friend and the following week your friend returns the 25 pesos, how much interest did your friend pay?
Compound interest	If you have 100 pesos in a savings account with an interest rate of 2% per year and you do not make any deposits or withdrawals, how much would you have in your account at the end of five years, including earned interest?
Inflation	If someone gives you 1,000 pesos, but you have to wait a year to spend it, and in that year, inflation is 5%, could you buy more, the same or less than you can buy today?
Risk diversification	It is better to save money in two or more ways or places than in just one. True or false.

It is worth noting that the four questions included in the financial literacy index follow the principles stated by Lusardi and Mitchell. (2014): simplicity, relevance, brevity, and capacity to differentiate financial knowledge to permit comparisons across people. The construction of our measure of financial literacy as the number of correct answers to the four questions is consistent with previous literature (for example, Klapper et al. (2012); Nicolini et al. (2013); Borden, L. M. et al. (2008); Servon and Kaestner (2008)).

Besides those two indexes, we constructed personality traits' indexes. Specifically, we developed an indicator of tendency to plan with questions related to the realization and fulfillment of a family budget and the establishment of long-term savings goals. Also, self-control was measured with a question related to the consideration of purchases before making them, while temporal preferences were measured with a question related to the preference for the present with respect to the future.

2.2. Summary statistics

In Table 2 we sum up the descriptive statistics for each variable. Almost half of the population has at least a formal savings instrument, but less than a half hold a formal credit and a digital financial instrument. Regarding financial literacy, close to half of the people answered correctly 3 out of 4 questions, reflecting a good level of financial knowledge of the Mexican population compared with other Latin American countries (Roa et al., 2019); (Cardenas et al., 2020).

Notably, in Mexico more than a quarter of people only finished primary school or has no education at all. For the employed population, the highest proportion has a monthly income below 5000 Mexican pesos (257 US dollars), and less than a half has fixed income. The lack of trust in financial institutions is a reason for not having some formal financial instrument for 21% of people. Only 10% of the population

Table 2: *Descriptive statistics*

Variable	Measurement unit	Observations	Mean	Std. Dev.
Formal savings	Proportion	12,446	0.47	0.499
Formal credit	Proportion	12,446	0.31	0.463
Digital financial instruments	Proportion	5,366	0.27	0.442
Financial literacy (correct answers)		12,446		
0			0.02	0.12
1			0.07	0.26
2			0.28	0.45
3			0.44	0.50
4			0.19	0.39
Female	Proportion	12,446	0.53	0.499
Age	Years	12,446	40	14.227
Education		12,439		
No education	Proportion		0.04	0.195
Primary	Proportion		0.22	0.416
High school	Proportion	0.44	0.496	
Professional	Proportion		0.30	0.459
Occupational status		12,446		
Employee	Proportion		0.44	0.496
Self-employed/laborer	Proportion		0.23	0.421
Employer	Proportion		0.01	0.112
Unemployed	Proportion		0.04	0.205
Student/Unpaid family worker	Proportion		0.07	0.247
Homemaker	Proportion		0.18	0.384
Retired/Permanently disabled	Proportion		0.03	0.176
Monthly income (MXN)[1,2]		7,849		
Up to 1,499	Proportion		0.08	0.265
1,500 - 4,999	Proportion		0.40	0.490
5,000 - 9,999	Proportion		0.34	0.472
10,000 - 14,999	Proportion		0.11	0.309
15,000 - 25,000	Proportion		0.06	0.229
More than 25,000	Proportion		0.02	0.129
Pay frequency[1]		7,774		
Weekly	Proportion		0.57	0.495
Fortnightly	Proportion		0.16	0.368
Monthly	Proportion		0.26	0.440
Yearly	Proportion		0.00	0.052
Fixed income[1]	Proportion	7,774	0.45	0.498
Who makes HH budget decisions				
Decides alone	Proportion	12,446	0.24	0.430
Decides with someone else	Proportion	12,446	0.65	0.476
Does not decide	Proportion	12,446	0.10	0.304
Owns real estate	Proportion	12,446	0.46	0.498
Lack of trust	Proportion	12,446	0.21	0.409
Urban	Proportion	12,446	0.65	0.477

Source: Own preparation.

[1] Income variables are available only for employed population.

[2] On December 2018, the exchange rate between US dollar and Mexican peso was 19.4478 MXN=1 US dollar.

reported not having any participation in the household budgetary decision-making process.
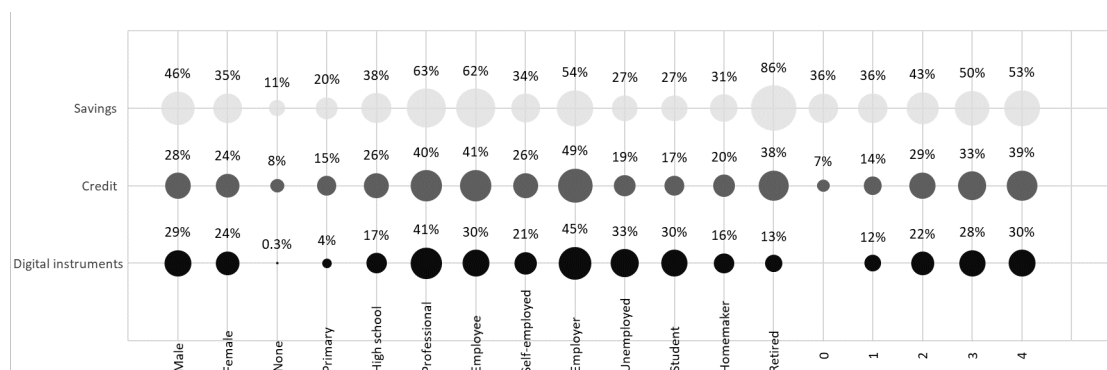

Figure 1: *Formal financial instruments by sociodemographic groups and financial literacy*

Figure 1 shows that there is a gender gap in holding savings instruments. The percentage of formal savings increases with the education level, which might be reflecting the fact that education is highly correlated with income and other socioeconomic variables. Among the employed, employees and employers are the groups with the highest proportions of savings accounts, probably because they receive their wages through it. Most of the retired people has savings account, mainly because retirement payments and some social aids are made directly into bank accounts.

Regarding credit, the patterns by gender and education level are similar to the ones for savings, but with smaller proportions for all groups, pointing out that there are less people who can access to credits. Opposite to what was observed for savings, employers have credits in a bigger proportion than employees, probably related to their higher incomes. Retired, unemployed, students and homemakers reported the lowest proportions of credit may be due to a lack of a continuous stream of income, but also to a lack of collaterals.

Digital financial instruments have similar patterns for gender and education, but with even smaller proportions than those for credit. Employers are the group who reports the highest proportion of digital instruments, followed by unemployed and homemakers. The group with the lowest proportion of digital instruments are the retired, probably due to the lack of digital skills.

As for financial literacy, the percentage of people with formal savings, credit and digital instruments increases with the number of correct answers. It is worth noting that this pattern is steeper for credits and digital instruments, probably because the decision-making process related to these products might entail more difficulties than those related to more simple products, such as savings.

3. Econometric Analysis

3.1. Methodology

Our empirical strategy is based on the Roy model of comparative advantage (Roy, 1951); (Heckman et al., 2006), estimated through a linear probit specification given the binary[3] nature of our dependent

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[3]It is assumed that there is a continuous financial inclusion index y_i^* for which $y_i = 1$ if $y_i^* \geq 0$, and $y_i = 0$ otherwise.

variables. As pointed out by the financial literacy literature, it is possible that an unobserved factor simultaneously influences financial inclusion and financial literacy; or, that there is double causality among these two variables – i.e., the use of financial instruments give rise to a financial learning-by-doing process (Roa et al., 2019). Both problems lead to endogeneity in the regression. To tackle these potential endogeneity issues, we use an instrumental variable (IV) probit model (Koomson, I., 2021); (Melesse, 2019):

$$y_i = \beta FinLit_i + TRAITS_i'\Theta_1 + X_i'\Gamma_1 + u_{1i} \tag{1}$$

$$FinLit_i = TRAITS_i'\Theta_2 + X_i'\Gamma_2 + Z_i'\delta + u_{2i} \tag{2}$$

where y_i represents each one of our three binary financial inclusion indexes (formal savings, formal credit, digital instruments), corresponding to the i respondent. $FinLit_i$ is the financial literacy indicator, and $TRAITS_i'$ is a vector of personal traits that includes: tendency to plan, self-control, and long-term preferences. X_i' is a vector of sociodemographic controls. Z_i' denotes the set of instrumental variables that met the basic required conditions for IV (Pearl, 2000): variable Z is unrelated to the outcome y, but is related to the predictor FinLit, and is not causally affected by y, FinLit, or the error term u_1[4].

Following the financial literacy literature reviewed above, we use the average sophisticated financial knowledge of the people around the person as instrument. The idea behind this instrument is to measure the exposure to financial knowledge and to peers with higher financial knowledge as done in Klapper et al. (2012) and Roa et al. (2019). The instrument is unrelated to the persons financial inclusion (passing an over-identifying restrictions test) but is highly correlated with the predictor financial literacy (passing a weak instruments test) and is not causally affected by the person's financial inclusion or literacy.

We construct the instrument with questions linked to advanced or more sophisticated financial knowledge. In particular, we use knowledge from a formal financial education course and knowledge of the risk diversification concept. We also use the holding of insurance products since, in the case of insurance decisions, the decision-making process implies a higher level of difficulty than choosing more simple financial products – such as a savings account (Roa et al., 2021). The instrument is constructed as the average value of the number of "correct" answers to three questions from the ENIF 2018 questionnaire within region, area, occupation, education level, age group, and gender. In this case, correct means that the answer implies a higher level of sophisticated financial knowledge. Therefore, the first step for the construction of the index is to add individually the number of correct answers to the following questions:

- 4.7. Have you taken a course on saving, budgeting, or responsible use of credit?

- 4.9.2. If someone offers you the possibility to earn money easily, you can also lose it easily. True or false?

- 8.1. Do you have any car, house, life, medical or other insurance?

The next step to obtain the instrument is to average the individual number of correct answers within region, area, occupation, education level, age group, and gender. Since the instrument is averaged spa-

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[4]If there is no endogeneity in the model, it is, if u_1i and u_2i are not correlated, estimating equation 2 is enough to determine the impact of financial literacy and other covariates on financial inclusion. However, as it is shown in the results, we rejected the null hypothesis of no endogeneity.

tially and by individual characteristics, we do not use the most granular disaggregation for which the data is representative (locality), because there might be combinations of categories for which the average is zero due to lack of data. So, we construct the instrument at the regional level. Also, by doing so we avoid potential issues resulting from the different sizes of the localities. Finally, intracluster homogeneity that might arise from the design of the instrument is considered by averaging by individual characteristics, besides the region and the area. Therefore, clustered standard errors at the PSU level are used for the estimation of the models.

The resultant instrument met the required conditions mentioned above and proved to be a strong instrument to tackle the endogeneity problem, as can be seen in the post estimation diagnostics presented in Table 2, which are explained below.

3.2.   Results

We estimated the model for the complete sample and a subsample of employed population since only labor related income is available. Table A1 presents IV probit estimates, while the post estimation diagnostics reported at the bottom of the table reject the hypothesis that the instruments are not valid. Models 1, 2 and 3 in Table A1 correspond to our three financial inclusion indexes estimated for the whole sample, while models 4 and 5 correspond to the subsample[56]. , Results for the whole sample and the employed group show that financial literacy has a statistically significant and positive association with our three measures of financial inclusion. Therefore, lower levels of financial literacy increase the probability of being financially excluded. Regarding personality traits, higher levels of self-control are related to a lower probability of having a formal credit, for both groups. Among the sociodemographic controls, women have higher probability of having a savings account and a formal credit, compared to men. Higher levels of education are related to higher probability of having a formal credit, but only for the employed group.

Compared to being an employee, being self-employed reduces the probability of having formal savings or credit instruments. Also compared to the same group, being unemployed, employer, student, or homemaker reduces the probability of having a savings account, while being student also reduces the probability of having formal credit instruments—maybe due to the lack of collateral or a regular income. Conversely, being homemaker increases the probability of having digital instruments.

For the employed population, we include variables to account for the effect of labor vulnerability in financial inclusion. One approximation for vulnerability often used in the literature is the status in the employment: employees respect to self-employed and laborers, being the first associated with better working conditions and more security in the job. However, as stated by Gammarano (2018), there are employees that lack basic elements of decent work (adequate earnings and work conditions, formal arrangements, social security, among others), and there are self-employed or laborers who have these elements. Therefore, we include income level, frequency, and regularity to better approximate labor vulnerability. It is worth noting that we also included the employer-sponsored health insurance as a proxy of the formality of the employment. However, due to the high correlation of this variable with the income regularity, and since the results remained robust in both specifications, we maintained only the latter in the model.

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[5]We also estimated the conditional marginal effect to know how much the probability of being financially included changes for every discrete change of the covariate (holding all other covariates at its mean level). Results are available upon request.

[6]Due to insufficient data, we could not estimate the model for digital financial instruments for the subsample of employed people.

Regarding the income of the person, it seems that besides the amount per se, the regularity and the frequency of the payments explains financial inclusion. Finally, owning real estate increases the probability of having savings or credit instruments, pointing out the importance of having collateral to access to credits, while lack of trust in financial institutions has a negative effect in these probabilities.

Regarding the post estimation diagnostics, first we tested for endogeneity to determine whether a simple probit model was preferred to the IV probit model. Our results rejected the null hypothesis that the specified endogenous regressors could be treated as exogenous at the 1% level for models 1, 2, 3, and 5, and at the 5% level for model 4; therefore, our IV probit specification is preferred.

Secondly, we examined if our instruments were weak, meaning that they were only weakly correlated with the endogenous variable. The null hypothesis for this test was that the IV estimator's approximate asymptotic bias exceeds a fraction of a "worst-case" benchmark, which coincides with the ordinary least-squares bias (when errors are conditionally homoskedastic and serially uncorrelated). We rejected the null hypothesis at the 5% level for all models, proving that our instrument is not weak[7]. The third statistic presents the underidentification test (Kleibergen-Paap rk LM statistic) which is an LM test of whether the instruments are "relevant", which means that they are correlated with the endogenous regressors. The null hypothesis of this test was that the equation is underidentified. We rejected this hypothesis at the 1% level for models 1, 2, 4, and 5 and at the 10% level for model 3[8].

3.3.   Robustness exercise

We performed a robustness exercise to check the validity of our findings. The estimates in Table A1 replicate the IV probit estimations, using an alternative measure for financial literacy. Instead of the number of correct answers to the financial literacy questions, our alternative measure is based on a Pridit index. This index is weighted by the distribution of people who chose each answer to the questions, therefore, the weighting framework reflects the importance of each question (Behrman, J. R. and D. Bravo., 2012).

To construct our financial literacy index, we generated a dichotomous variable for each question of Panel B of Table 1. Following Bross (1958) and Brockett, P. L. and Levine, A. (1977), we calculated a RIDIT score according to the following expression.

$$R_i = \sum_{j<i}^{i-1} f_j + \frac{f_i}{2} \tag{3}$$

Where R_i s the RIDIT value of category i, and is equal to the sum of the cumulative frequencies of the respondents in the following categories plus the relative frequency of category i divided by two. Then, following Brockett, P. L. et al. (2002), we performed a principal component analysis of the RIDIT

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[7]It is worth noting that we used the Montiel Olea Plueger test instead of the Cragg-Donald Wald statistic (which is often reported) following Andrews, I. et al. (2019) who recommend this test for models with a single endogenous regressor and the possibility of having non-homoskedastic errors in the reduced-form and first-stage regressions.

[8]We do not report the Hansen J statistic or overidentification test of all instruments since our equation is exactly identified because we have only one instrument.

and took the first principal component as the Pridit financial literacy index. A higher value of the index implies a higher level of financial literacy.

Table A2 presents the results of the robustness exercise. Similar to our main estimations, all 5 models exhibit positive statistically significant coefficients, though slightly smaller in magnitude, for our new measure of financial literacy, proving that our results are robust even when the financial literacy index weights the answers to the different questions to reflect the importance of each question. Signs and significance of other coefficients are similar compared to the main models, changing only slightly in their magnitude.

4.   Discussion and Conclusions

In this study we shed light on the role of financial literacy in financial inclusion in Mexico. Our main findings are as follows. Firstly, our results reveal the importance of financial capabilities in explaining financial inclusion in Mexico. More specifically, having a higher level of financial literacy increase the probability of holding formal financial instruments. Notably, financial literacy is a relevant factor for both traditional and novel financial products, even after controlling for socioeconomics factors. Nevertheless, it seems more important for more complex ones, such as digital instruments and credit.

Secondly, socioeconomic vulnerabilities also explain financial exclusion in this country. We find that being unemployed or self-employed, not having a regular income, and the lack of real states reduce the probability of being financial included. Hence financial exclusion is also explained by harmful socioeconomic circumstances that limit access to formal labor markets.

Thirdly, being a self-controlled individual tends to decrease the probability of having a formal credit for all the sample. This result contrasts with those found in the related literature, where self-control is associated with higher use of formal financial instruments (Roa, 2022). Notwithstanding this, our result might be linked to the fact that although in developing countries financial inclusion policies and specifically microcredit have been considered as successful development and poverty reduction tools, some forms of over-indebtedness and financial distress have emerged due to the extended access to credit (Guérin et al., 2014). This fact in conjunction with the global mortgage crisis could have led people to see formal debt as a problem instead of a solution, especially for self-controlled individuals. That said, even when we used questions to develop valid indicators of this personality trait, we plan to consider more precise indicators of this attribute for future work, which will allow us to get a better understanding of how personality traits affect financial behaviors (Rustichini, A. and Burks, S., 2016).

Fourthly, although there is a gender gap in holding formal financial instruments, women have a greater probability of holding formal savings products. It may be a result of interventions designed to improve financial inclusion among women in the last decades, such as opening savings account for beneficiaries of government to person payments (G2P) (Maldonado et al., 2011). However, it is important to mention that having an account does not imply using it to actively save (Chiapa and Prina, S., 2017).

On the other hand, the digitalization of G2P pay¬ments has become a potential instrument to promote women financial inclusion (Gammage, 2017). In this regard, we find that although homemakers have a lower probability of holding a saving accounts in Mexico, they have a greater probability of having digital instruments. Nevertheless, special attention should be pay to the lack of digital financial

skills, especially for vulnerable women and older people, to avoid digital financial exclusion (Highet, 2021).

Thirdly, the lack of trust in financial institutions stands out as a relevant barrier to financial inclusion in Mexico. This barrier is one of the most often cited reasons for not saving in the formal sector in Latin America (Demirgüç-Kunt et al., 2017), where continuous financial and economic crises have hit hardly on the confidence in the financial systems (Latinobarómetro, 2015). The lack of trust becomes a more complex issue with the digitization of financial services, either by the increasing appearance of cyber frauds, as well as technology failures or lack of digital financial literacy. However, the use of digital media could close certain gaps of discrimination to some segments of the population, such is the case of women. Digital financial literacy programs and solid consumer protection laws should be key to promote trust in financial systems and digital finances (Roa et al., 2017).

We conclude highlighting the fact that when it comes to reducing financial exclusion in Mexico it is essential to implement a transversal and multidimensional policy approach. Financial inclusion and financial education programs –including digital financial literacy- should be parallelly implemented with social programs aimed at diminishing labor exclusion and economic vulnerabilities, as well as regulations that guarantee the soundness of financial systems (Acevedo, I. et al., 2020). On this matter, the new social programs launched by the Mexican government in the last years have been a potential mechanism to increase the financial access of the most vulnerable groups[9]. The programs promote financial inclusion through the access to basic credit and savings products, as well as G2P digital payments (Hernández and Pensado, J. E. M., 2021). Moreover, to reduce the harmful consequences of the Covid-19 pandemic in the income of the most vulnerable groups, Mexican government have implemented additional social programs using financial products (Blofield, M. and Trasberg, M., 2021); (Cejudo et al., 2020). Due to the low levels of financial literacy and the lack of familiarity of the beneficiaries of social programs with formal financial products and intermediaries, the priority and challenge from now on will be to provide them digital and financial literacy.

5. Declaration of interest

We the authors state that we have not had any conflict of interest during the realization of this Project.

6. Data Availability Statement

We would like to express our willingness to share the data and the codes employed in our econometric analysis. The database is public and available at: https://www.inegi.org.mx/programas/enif/2018/Microdatos.

A. Annex

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[9]The linkage of financial inclusion with social programs was considered in the National Policy for Financial Inclusion (Consejo Nacional de Educación Financiera, 2020).

Table A1: *IV probit estimations for financial inclusion indexes(1/,2/)*

	All the sample		All the sample and Employed	Employed	
	(1)Formal Savings	(2) Formal Credit	(3) Digital financial instruments(3/)	(4)Formal Savings	(5)Formal Credit
Financial literacy	1.066***	1.180***	1.255***	1.034***	1.185***
Self-control					
Lower	Reference category	Reference category	Reference category	Reference category	Reference category
Medium	-0.183	-0.316**	0.019	-0.264*	-0.357***
	(0.14)	(0.12)	(0.16)	(0.15)	(0.14)
Higher	-0.176	-0.264**	0.123	-0.253*	-0.304**
	(0.12)	(0.12)	(0.16)	(0.14)	(0.13)
Tendency to plan	0.292	-0.050	-0.267	0.062	-0.095
	(0.26)	(0.24)	(0.32)	(0.31)	(0.28)
Long-term preferences					
Lower	Reference category	Reference category	Reference category	Reference category	Reference category
Medium	0.007	0.056	-0.006	-0.093	0.048
	(0.07)	(0.07)	(0.10)	(0.11)	(0.09)
Higher	0.095	0.086	0.013	0.028	0.085
	(0.08)	(0.08)	(0.11)	(0.10)	(0.10)
Female	0.178***	0.134**	0.054	0.174*	0.113*
	(0.06)	(0.06)	(0.08)	(0.09)	(0.07)
Age	0.000	0.000	-0.005	0.000	0.003
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Education					
No education	Reference category	Reference category	Reference category	Reference category	Reference category
Primary	-0.131	0.162	0.204	0.024	0.390*
	(0.18)	(0.17)	(0.26)	(0.22)	(0.23)
High school	-0.219	0.126	-0.004	-0.087	0.339
	(0.16)	(0.20)	(0.12)	(0.21)	(0.26)
Professional	-0.150	0.017	-0.102	0.181	
	(0.19)	(0.21)	(0.25)	(0.31)	
Occupational status					
Employee	Reference category	Reference category	Reference category	Reference category	Reference category

Table A1: *IV probit estimations for financial inclusion indexes(1/,2/)*

	All the sample		All the sample and Employed	Employed	
	(1)Formal Savings	(2) Formal Credit	(3) Digital financial instruments(3/)	(4)Formal Savings	(5)Formal Credit
Self-employed/laborer	-0.338***	-0.191***	-0.134	-0.265**	-0.157*
	(0.10)	(0.07)	(0.08)	(0.11)	(0.09)
Employer	-0.298*	-0.054	-0.040	-0.328	-0.034
	(0.16)	(0.14)	(0.21)	(0.22)	(0.18)
Unemployed	-0.362**	-0.041	0.221		
	(0.18)	(0.12)	(0.17)		
Student/Unpaid family worker	-0.460***	-0.229*	-0.164		
	(0.14)	(0.12)	(0.19)		
Homemaker	-0.355**	-0.131	0.335**		
	(0.16)	(0.11)	(0.15)		
Retired/Permanently disabled	0.192	-0.052	-0.164		
	(0.16)	(0.15)	(0.15)		
Income					
Up to 1,499				Reference category	Reference category
1,500 - 4,999				-0.082	-0.025
				(0.13)	(0.12)
5,000 - 9,999				-0.14	-0.079
				(0.15)	(0.14)
10,000 - 14,999				0.162	0.061
				(0.24)	(0.16)
15,000 - 25,000				0.138	0.056
				(0.25)	(0.20)
More than 25,000				-0.273	-0.033
				(0.27)	(0.21)
Pay frequency					
Weekly				Reference category	Reference category
Fortnightly				0.272**	0.014
				(0.12)	(0.08)
Monthly				0.300**	0.027

Table A1: *IV probit estimations for financial inclusion indexes(1/,2/)*

	All the sample		All the sample and Employed	Employed	
	(1)Formal Savings	(2) Formal Credit	(3) Digital financial instruments(3/)	(4)Formal Savings	(5)Formal Credit
Yearly				0.570 (0.80)	
				(0.13)	(0.07)
Fixed income				0.140* (0.08)	0.153* (0.08)
Marital status					
Married/ de facto union	Reference category	Reference category	Reference category	Reference category	Reference category
Divorced	0.102 (0.08)	0.051 (0.09)	0.066 (0.10)	0.131 (0.09)	0.073 (0.10)
Widow	0.169 (0.12)	-0.197 (0.13)	-0.117 (0.18)	0.065 (0.21)	-0.168 (0.18)
Single	0.054 (0.07)	-0.046 (0.07)	0.121 (0.10)	0.051 (0.09)	-0.058 (0.09)
Head of household	0.096 (0.06)	0.086 (0.06)	0.124* (0.07)	0.063 (0.08)	0.082 (0.08)
Who makes HH budget decisions					
Decides alone	Reference category	Reference category	Reference category	Reference category	Reference category
Decides with someone else	-0.016 (0.06)	-0.028 (0.06)	0.113 (0.08)	0.019 (0.08)	0.044 (0.08)
Does not decide	-0.101 (0.12)	-0.025 (0.11)	0.138 (0.16)	-0.083 (0.19)	0.151 (0.15)
Owns real estate	0.126* (0.07)	0.140* (0.07)	-0.013 (0.09)	0.134 (0.10)	0.147 (0.10)
Lack of trust	-0.494*** (0.16)	-0.423*** (0.16)	-0.228 (0.22)	-0.485** (0.24)	-0.469* (0.27)
Urban	-0.148** (0.07)	-0.037 (0.07)	-0.031 (0.12)	-0.114 (0.08)	-0.001 (0.09)
Constant	-2.767*** (0.35)	-3.344*** (0.30)	-3.666*** (0.35)	-2.627*** (0.53)	-3.732*** (0.39)

Table A1: *IV probit estimations for financial inclusion indexes(1/,2/)*

	All the sample		All the sample and Employed	Employed	
	(1)Formal Savings	(2) Formal Credit	(3) Digital financial instruments(3/)	(4)Formal Savings	(5)Formal Credit
N	4,236	4,236	2,376	2,823	2,823
Endogeneity test	16.772	33.476	21.604	5.301	10.152
P-value	>0.000	>0.000	>0.000	0.0213	0.0014
Montiel-Pflueger					
Effective F statistic (5%)	110000	110000	19051	48404	48404
Critical Values (5%)	37.418	37.418	37.418	37.418	37.418
Underidentification test					
(Kleibergen-Paap rk LM statistic)	15.722	15.722	3.123	7.073	7.073
P-value	0.0001	0.0001	0.0772	0.0078	0.0078

[1]/ Clustered standard errors in parentheses. *p< 0.10, **p< 0.05, ***p< 0.01. Clusters at the PSU level;sampling stratification considers sociodemographic characteristics based on information from the 2010 Population and Housing Census.

[2]/ Since the reduced form for the endogenous explanatory variable of an instrumental variable probit is linear, post estimation diagnostics were obtained from the estimation of the linear version of the model.

[3]/ Includes only those who have an account and a mobile phone.

Table A2: IV probit estimations for financial inclusion indexes with Pridit financial literacy index(1,2/)

	All the sample		All the sample and Employed	Employed	
	(1)Formal Savings	(2) Formal Credit	(3) Digital financial instruments(3/)	(4)Formal Savings	(5)Formal Credit
Financial literacy	0.957***	1.057***	1.238***	0.941***	1.082***
	(0.05)	(0.06)	(0.05)	(0.16)	(0.09)
Self-control					
Lower	Reference category	Reference category	Reference category	Reference category	Reference category
Medium	-0.213	-0.347***	0.131	-0.281*	-0.378***
	(0.15)	(0.13)	(0.17)	(0.15)	(0.14)
Higher	-0.240*	-0.332**	0.215	-0.299**	-0.362***
	(0.13)	(0.13)	(0.16)	(0.14)	(0.14)
Tendency to plan	0.332	-0.003	-0.273	0.136	-0.010
	(0.24)	(0.22)	(0.31)	(0.30)	(0.27)
Long-term preferences					
Lower	Reference category	Reference category	Reference category	Reference category	Reference category
Medium	0.005	0.053	-0.031	-0.089	0.048
	(0.07)	(0.07)	(0.10)	(0.10)	(0.08)
Higher	0.074	0.062	-0.016	0.016	0.069
	(0.07)	(0.07)	(0.11)	(0.10)	(0.09)
Female	0.142**	0.094*	0.035	0.138	0.073
	(0.06)	(0.06)	(0.07)	(0.09)	(0.07)
Age	-0.001	-0.001	-0.006	-0.000	0.002
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Education					
No education	Reference category	Reference category	Reference category	Reference category	Reference category
Primary	-0.152	0.137	0.377	-0.031	0.313
	(0.19)	(0.19)	(0.27)	(0.26)	(0.26)
High school	-0.312*	0.020	0.052	-0.223	0.164
	(0.18)	(0.21)	(0.12)	(0.27)	(0.30)
Professional	-0.264	-0.110	0.000	-0.259	-0.018
	(0.21)	(0.23)	(0.00)	(0.31)	(0.34)
Occupational status					

Table A2: IV probit estimations for financial inclusion indexes with Pridit financial literacy index(1,2/)

	All the sample		All the sample and Employed	Employed	
	(1)Formal Savings	(2) Formal Credit	(3) Digital financial instruments(3/)	(4)Formal Savings	(5)Formal Credit
Employee	Reference category	Reference category	Reference category	Reference category	Reference category
Self-employed/laborer	-0.309***	-0.160**	-0.142*	-0.234**	-0.121
	(0.11)	(0.07)	(0.08)	(0.12)	(0.09)
Employer	-0.344**	-0.108	-0.076	-0.380*	-0.074
	(0.15)	(0.13)	(0.18)	(0.21)	(0.16)
Unemployed	-0.391**	-0.076	0.224		
	(0.18)	(0.12)	(0.17)		
Student/Unpaid family worker	-0.432***	-0.201*	-0.190		
	(0.13)	(0.11)	(0.18)		
Homemaker	-0.363**	-0.143	0.226		
	(0.15)	(0.10)	(0.14)		
Retired/Permanently disabled	0.176	-0.066	-0.173		
	(0.15)	(0.13)	(0.13)		
Income					
Up to 1,499				Reference category	Reference category
1,500 - 4,999				-0.069	0.004
				(0.14)	(0.12)
5,000 - 9,999				-0.124	-0.053
				(0.16)	(0.13)
10,000 - 14,999				0.187	0.098
				(0.24)	(0.15)
15,000 - 25,000				0.182	0.112
				(0.24)	(0.18)
More than 25,000				-0.235	0.009
				(0.26)	(0.19)
Pay frequency					
Weekly				Reference category	Reference category
Fortnightly				0.269**	0.017
				(0.12)	(0.07)

Table A2: IV probit estimations for financial inclusion indexes with Pridit financial literacy index(1,2/)

	All the sample		All the sample and Employed	Employed	
	(1)Formal Savings	(2) Formal Credit	(3) Digital financial instruments(3/)	(4)Formal Savings	(5)Formal Credit
Monthly				0.251*	-0.026
				(0.14)	(0.07)
Yearly				-0.332	0.000
				(0.98)	(0.00)
Fixed income				0.139*	0.149*
				(0.08)	(0.08)
Marital status					
Married/ de facto union	Reference category	Reference category	Reference category	Reference category	Reference category
Divorced	0.096	0.045	0.028	0.133	0.080
	(0.08)	(0.09)	(0.10)	(0.10)	(0.11)
Widow	0.149	-0.214*	-0.135	-0.012	-0.244
	(0.12)	(0.13)	(0.17)	(0.19)	(0.17)
Single	0.021	-0.081	0.065	0.042	-0.068
	(0.08)	(0.07)	(0.09)	(0.09)	(0.09)
Head of household	0.074	0.062	0.075	0.031	0.041
	(0.06)	(0.06)	(0.07)	(0.08)	(0.08)
Who makes HH budget decisions					
Decides alone	Reference category	Reference category	Reference category	Reference category	Reference category
Decides with someone else	-0.044	-0.058	0.067	0.003	0.024
	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)
Does not decide	-0.154	-0.085	0.065	-0.162	0.063
	(0.11)	(0.10)	(0.14)	(0.18)	(0.14)
Owns real estate	0.112	0.125*	-0.040	0.121	0.129
	(0.07)	(0.07)	(0.09)	(0.10)	(0.10)
Lack of trust	-0.512***	-0.443**	-0.319	-0.458*	-0.427
	(0.17)	(0.18)	(0.21)	(0.27)	(0.31)
Urban	-0.153**	-0.043	0.000	-0.095	0.018
	(0.07)	(0.07)	(0.11)	(0.08)	(0.09)
Constant	0.298	0.048	-0.359	0.281	-0.365

Table A2: IV probit estimations for financial inclusion indexes with Pridit financial literacy index(1,2/)

	All the sample		All the sample and Employed	Employed	
	(1)Formal Savings	(2) Formal Credit	(3) Digital financial instruments(3/)	(4)Formal Savings	(5)Formal Credit
	(0.34)	(0.36)	(0.30)	(0.46)	(0.53)
N	4,236	4,236	2,376	2,823	2,818

1/ Clustered standard errors in parentheses. *p< 0.10, **p< 0.05, ***p< 0.01. Clusters at the PSU level;sampling stratification considers sociodemographic characteristics based on information from the 2010 Population and Housing Census.

2/ Since the reduced form for the endogenous explanatory variable of an instrumental variable probit is linear, post estimation diagnostics were obtained from the estimation of the linear version of the model.

3/ Includes only those who have an account and a mobile phone.

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