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Article

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Financial literacy is a construct: an ordered logit approximation in Mexico

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ABSTRACT

This research aims to identify the factors explaining the level of financial literacy, divided into three levels, low, medium and high, of the Mexican population over the age of 18. This study fills a gap in microeconomic studies, which essentially lack an analysis of financial literacy and the study of financial literacy as a construct defined by the ENIF 2021 and by the Organization for Economic Cooperation and Development, in which financial literacy is measured by three components, financial knowledge, behaviour and attitudes; a relevant empirical assumption for this methodology is that the variable does not fit a standard normal distribution. Due to the nature of the dependent variable, an Ordered Logistic Model is used, taking into account independent variables with economic, socio-behavioural and institutional characteristics. The number of observations used was 13,570, in which the sample has a probabilistic, three-stage, stratified, clustered design; the sample represents 90.3 million people over the age of 18. The results show that the main explanatory factors for financial literacy are *income level, mobile phone tenure, gender, age and town size*. Young people (aged 18-35) are more likely to be financially literate than people over 65, who are less financially literate. Females are also more likely to be financially literate than males. In terms of institutional focus, urban dwellers are more likely to be financially literate than those in rural areas. This paper provides policymakers with a valuable opportunity to understand Mexican society better and improve financial decision-making, money management and positive future behaviours.

IMPACT STATEMENT

This study employs the ENIF 2021 to analyse financial literacy as a construct comprising financial knowledge, behaviour and attitude. Furthermore, it identifies the variables that determine this construct, including income level, mobile phone ownership, gender, age and city size. Given the characteristics of this construct, the analysis is conducted using an ordinal logit model.

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Introduction

Why is financial literacy important? evidence suggests that financial literacy promotes the individual well-being of the population, the development of society and the economy, and greater financial inclusion (Adam et al., 2017; Hasan et al., 2021; Morgan & Long, 2020; Xiao & Porto, 2017). Financial education has been proven to be a powerful tool, empowering individuals to make better decisions, allocate their income more effectively, and manage their credit to avoid over-indebtedness and enable savings. Financial correct behaviour leads to higher levels of financial literacy, enhancing individual well-being, societal development, and economic growth. It would seem prudent, therefore, for the government and policymakers to consider ways of encouraging financial literacy. It would be beneficial to consider the potential advantages of encouraging financial literacy.

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The positive impact of financial literacy extends further, increasing financial inclusion and aiding in reducing poverty and inequality within the population. These findings inspire hope and optimism about the potential for positive change through financial education (Hasan et al., 2021; Swiecka et al., 2020; Xiao & Porto, 2017). In many countries and economies, it has become a long-term policy and is recognised as an essential complement to market conduct, prudential regulation, and financial inclusion.

In May 2020, more than 70 countries and economies designed or implemented national financial education strategies (Organization of Economic Cooperation and Development [OECD], 2022). The growing complexity of the financial system requires policy development aimed at improving knowledge of financial products and their associated risks, as well as promoting the financial literacy of consumers to make informed decisions that generate wealth and well-being within a legal framework of user protection (Hsu, 2022; Lusardi & Mitchell, 2017; OECD, 2022).

Specifically in Mexico, the financial system is strongly lagging as only 31% of the adult population has credit in a financial institution or department store, 47% has an account in the financial system, and only 17% has a savings account (Lartigue Mendoza et al., 2020). However, recent financial literacy surveys by the OECD and national agencies, such as the National Banking and Securities Commission (CNBV), in Mexico 2021 demonstrate that several people, particularly vulnerable groups such as women with lower levels of education and individuals with low incomes, lack basic financial knowledge and are ill-prepared to make better financial decisions (CNBV, 2019; CNBV & INEGI, 2018; García Mata et al., 2021).

Financial literacy is essential to make better decisions to avoid financial problems, better manage income, and gain greater security to achieve long-term goals (Beckmann, 2013; Ergün, 2018; Hsu, 2022). This term implies understanding the relevance of current and future savings, credit management, and greater participation of the population in financial sector products, implying greater financial inclusion (Antonio-Anderson et al., 2020; Grohmann et al., 2018; Morgan & Long, 2020).

Low financial literacy can lead to unsecured personal loans (Wang et al., 2021), hardship, possibly bankruptcy (Adam et al., 2017; Bourova et al., 2018; Lusardi et al., 2021), potential bankruptcy, over-indebtedness, inadequate planning for retirement, susceptibility to scams, and failure to gain from innovations in financial products, such as mobile money and Corresponsalias bancarias (CB)[1], and other accessible financial services. This situation is especially prevalent among low-income individuals in rural areas of developing countries (Antonio-Anderson et al., 2020; García Mata et al., 2021; Van Nguyen et al., 2022; Wagner, 2019).

The International Network of Financial Education (INFE) offers a definition of financial literacy that encompasses a range of elements, including awareness, knowledge, skills, and behaviours. These are seen as contributing to the ability to make informed financial decisions and, ultimately, to achieve financial well-being. The OECD has taken a step towards aligning with the INFE concept by attempting to incorporate three additional dimensions to financial literacy, which is often conflated with financial knowledge alone. In light of these considerations, the OECD has developed a tree-component index that incorporates financial knowledge, financial behaviours, and financial attitudes. This index is presented in Appendix A and includes a series of questions designed to elicit information on these three key areas.

In 2019, Mexico's financial literacy score of 58.2 placed it below the G20 average of 60.5. In examining the specific components, it is notable that Mexico performs well in the area of financial knowledge, with a score of 65.8 compared to the G20 average of 61.4. However, there is room for improvement in the area of financial behaviour, where Mexico scored a 48.2 evaluation compared to the G20 average of 60. Similarly, there is an opportunity to enhance financial attitudes, with Mexico scoring 65 compared to the G20 average of 60 (Del-Río-Chivardi et al., 2019). In the latest 2021 version, the OECD has incorporated new questions on both financial attitude and financial behaviour.

It would be beneficial to have a reliable measurement of literacy. This is because it encompasses three distinct dimensions, and results may vary when compared across different areas. Additionally, including more questions could help to more accurately assess each component of the construct under study.

The first contribution to literature is in adding these new questions to the construct formation of the dependent variable called the 'financial literacy construct', and using an ordered logistic model given the lack of normality of the dependent variable. Therefore, the OECD financial literacy construct and methodology are being added to, looking forward to a better understanding of the Mexican population with the latest and improved ENIF (CNBV & INEGI, 2021).

The second contribution is to identify the factors that may influence the level of financial literacy among Mexican adults over the age of 18. This will be done by examining the questions from the ENIF 2021 survey. It is worth noting that the younger Mexican population appears to be in a medium-to-higher stratum regarding financial literacy. Additionally, women seem to be more likely to be in this medium-to-higher level, despite the prevailing descriptive statistics and social gender inequality that place them below men. It may be observed that individuals who have access to mobile phones are more likely to have a higher level of financial literacy.

This paper is divided into four parts: the first corresponds to a literature review, which allows knowledge of the variables determining financial literacy; the second part corresponds to the modelling, which explains how the financial literacy construct is developed based on the OECD (2018) recommendations and why the OLM is used with the corresponding validation; the third part presents the results and discussion, and the last corresponds to the conclusions.

Literature review

Financial literacy has been gaining relevance nowadays, as financial products and services are becoming complex due to the tremendous variety in the market and the inherent risks in some products. Their characteristics and requirements to meet the population's diverse needs require a minimum level of financial literacy so that people can choose better when saving, spending, borrowing, and accumulating wealth (Bonilla et al., 2022). Not to mention that the constant evolution of technology has digitalised financial services and the ability to conduct financial transactions from mobile devices, such as mobile phones (Beck et al., 2018; Ravikumar et al., 2022; Ren et al., 2018).

Financial education enables people to make better financial decisions. It provides the necessary elements to follow basic concepts such as savings, investment, debt, and retirement plans better, among others. It also helps people better understand the economic and financial issues affecting their economy and avoid making rash decisions, succumbing to possible scams, or falling into over-indebtedness (Grohmann, 2018; Grohmann et al., 2018; Lusardi et al., 2021; Lusardi & Mitchell, 2017).

People with higher financial literacy can comprehend the implemented economic and social policies, which can be positively associated with their financial well-being and, therefore, develop the financial system (Adam et al., 2017; García et al., 2013; Hasibuan et al., 2018; Xiao & Porto, 2017; Yap et al., 2018; Younas et al., 2019). Studies have been performed to identify the variables that affect the so-called financial literacy, some of which are sociodemographic variables such as educational level, gender, marital status, age, type of locality, and others of an economic nature: income, income variability, telephone, indebtedness, cell phone ownership, access to financial services, among others (Antonio-Anderson et al., 2020; García Mata et al., 2021; Kadoya & Khan, 2020; Karakurum-Ozdemir et al., 2019; Lotto, 2020).

Concerning sociodemographic variables, some studies have identified gender gaps favouring men, ie because in Mexico, culturally speaking, women have fewer opportunities as Mexican society is more masculine in social and cultural dimensions (Hofstede, 2016). For example, in education and jobs offers that help women professionally, there is a substantial difference between women and men, who also have a higher level of financial literacy than women do (Adam, 2017; Antonio-Anderson et al., 2020; Bucher-Koenen et al., 2017; Cupák et al., 2018; García Mata et al., 2021; Kadoya & Khan, 2020). However, only a few studies, (Adam, 2017; Beckmann, 2013) have found higher rates of financial literacy in women than in men or no difference between the two.

Regarding age, several studies confirm that the lowest levels of financial literacy are found among the youngest and the oldest. As people age, they acquire skills and experience in the different financial decisions they face (Antonio-Anderson et al., 2020; Garg & Singh, 2018; Kadoya & Khan, 2020; Karakurum-Ozdemir et al., 2019; Klapper & Panos, 2011; Lusardi & Mitchell, 2014). Studies conducted in the United States focused on people over 60 years old mention a negative relationship between age and financial literacy (Finke et al., 2017).

Similarly, some authors (Boisclair et al., 2017; Eberhardt et al., 2019; Ravikumar et al., 2022) also claim that experiential knowledge improves decision-making among adults. Some (Ansari et al., 2023; Li et al., 2013; Lusardi, 2019) argue that older age is associated with greater financial literacy. Additionally,

financial priorities are changing, and youngsters focus on establishing themselves professionally and financially, while older people begin to focus on retirement plans (Eberhardt et al., 2019).

The constant evolution of the financial system and the tendency to adopt new technology means that youth are more familiar with accessing information and consulting new financial tools (Choudrie et al., 2018; Jünger & Mietzner, 2020; Varga, 2017). It is for this reason that public policies are taken to Silver Finance, to provide support to adults to facilitate the use of new technology or devices that could potentially help them to improve their interrelationship with it, older people are more resilient to change and have a greater aversion to adopting new technology, which affects their financial literacy (Lusardi, 2019).

The educational level plays a crucial role in financial literacy, as people with higher levels of education tend to have better analytical and critical thinking skills and a better understanding of basic financial concepts. They can build a more solid financial knowledge with less effort. People with higher levels of education have higher levels of financial literacy (Ansari et al., 2023; Antonio-Anderson et al., 2020; Bourova et al., 2018; García Mata et al., 2021; Kadoya & Khan, 2020; Karakurum-Ozdemir et al., 2019). It has been established that these people can better understand basic economic concepts and make better decisions. Financial courses are also often taught at some universities (Ergün, 2018; Lusardi, 2019; Xiao & Porto, 2017) which precisely increases the financial knowledge that is part of the financial literacy construct.

Considering other factors in addition to those mentioned, low-income people are less financially literate (Ansari et al., 2023; García Mata et al., 2021; Kadoya & Khan, 2020; Lotto, 2020; Van Nguyen et al., 2022), as they have less access to services that could help them increase their financial knowledge, such as the Internet, books, and financial courses. Additionally, because they have low incomes, they do not have the opportunity to gain financial management experience as they are focused on satisfying their basic needs and economic dependents, It would seem that this is a common issue in developing countries such as Mexico, where there is not enough income to invest, save, or make long-term pension decisions. The stress of meeting their basic needs leads them to make impulsive and presumptive decisions, rather than informed and planned ones. Low-income people are more likely to lack access to financial services such as a savings account at a financial institution for retirement or savings (Kumar Vaid et al., 2020; Mauldin et al., 2016; Mushtaq & Bruneau, 2019; Ozili, 2021).

Similarly, a person's marital status affects their financial literacy. For those living with a partner, sharing household financial responsibilities means that the stress of meeting basic needs is reduced for each partner, positively influencing the way economic decisions are made in the household as decisions can be informed and planned (Antonio-Anderson et al., 2020; Bucher-Koenen et al., 2017; Finke et al., 2017; García Mata et al., 2021). Another way in which the financial literacy of a cohabitant is affected is by delegating income management to one person, ie financial decisions are made by one person rather than a couple, affecting the financial literacy of the non-income earner and, at best, benefiting the financial literacy of the income earner, that is way cloud be not significative (Ansari et al., 2023; Kadoya & Khan, 2020).

Nowadays, banking operations such as transfers, purchases, payments, and investments on mobile phones are widespread, and in Mexico, CB for diverse purposes is a relevant financial infrastructure; enabling financial transactions to be carried out by people in complex areas where there is insufficient infrastructure to help develop financial literacy. Without income management, financially illiterate people with mobile phones could easily suffer from financial fraud indebtedness and have problems meeting their basic needs (Goyal & Kumar, 2021). Mobile phone users are likely to be more literate (Evans, 2018; French et al., 2020; Van Nguyen et al., 2022).

Finally, people living in rural areas have fewer educational resources, including financial education courses, and fewer opportunities to access financial services that would help them increase their experience and skills to manage income (Azeez & Akhtar, 2021; Beckmann, 2013; Ren et al., 2018; Van Nguyen et al., 2022). In this situation, access to technology such as mobile phones and CB is an excellent alternative to obtaining financial services, and some courses are offered on digital platforms. This training would allow them to develop financial skills (Van Nguyen et al., 2022). However, limitations such as the lack of high-speed Internet affect the financial development of people in these locations (Ren et al., 2018).

The research Hypothesis states:

H1: Income level, mobile phone tenure, gender, age, and town size are statistically significant, explaining the level of financial literacy measured as a construct.

H2: The distribution of the dependent variable is not normal, OLM is appropriate for modelling the financial literacy construct originated with financial knowledge, behaviour and, attitude.

Modelling: the ordinal logistic model

Data

The National Financial Inclusion Survey (ENIF, 2021) is Conducted by the National Institute of Statistics and Geography (INEGI) of Mexico which is the institution in charge of the national censuses and representative surveys at a national level. In 2012, INEGI had the privilege of carrying out the collection of information from the first National Financial Inclusion Survey (ENIF). The CNBV (National Bank Value Commission) was kind enough to take on the important task of analysing and disseminating the information. Subsequently, a second and third surveys were published in 2015 and 2018, respectively, to monitor several of the indicators from the initial version.

The analysis of financial literacy in Mexico is based on ENIF 2021, conducted by CNBV and INEGI (2021), which is a representative sample of the entire adult population from 18 to 70 years at the national level, by locality size (urban and rural), gender, and regions (CNBV, 2019). June 28 to August 13, 2021, was the survey period. The confidence level of the sample is 90% (CNBV, 2019). The sample has a probabilistic, three-stage, stratified, and clustered design. A direct interview (face-to-face) with an electronic device was the data collection method. The sample represents 90.3 million people aged 18 and over.

Dependent variable construction

The dependent variable called financial literacy is a construct obtained by adding three previous subindices: Financial Knowledge (7 points), Financial Behaviour (9 points), and Financial Attitudes (5 points) per individual and is normalised to the value of 100 for a better interpretation, with the highest literacy occurring with the highest scores, the maximum being 100, according to the OECD (2018) methodology. Annex 1 contains the questions considered for elaborating on the financial literacy construct, according to the methodology cited (OECD, 2018).

On the basis of the score obtained from the literacy construct (an average of 56.37), financial literacy was classified into three levels: low, medium, and high (see Table 1). Then, a model with multiple categories of dependent variables was applied in an OLM.

Model

This paper uses the OLM because the dependent variable is ordered with categorical multiple responses. The dependent variable (financial literacy) was constructed based on the OECD (2018) method. The OLM is presented as a latent variable model, which can be represented as follows:

$$y_i^* = x_i\beta + \varepsilon_i \tag{1}$$

Where i is the observation and ε_i is the random error. The model divides y_i^* into ordinal categories. For example,

Table 1. Multiple categorical dependent variable: Financial literacy.

Financial Literacy	Frequency	Percentage	Accumulated Percentage
Low level	1449	10.68	10.68%
Intermediate level	8748	64.47	75.14%
High level	3373	24.86	100.00%
Total	13,570	100.00	

Source: Own elaboration based on data from ENIF 2021.

$$y_i^* = \mathrm{m}; \tau_{m-1} \leq y_i^* < \tau_m \ \ for \ \ m = 1 \ \ to \ \ J \tag{2}$$

where the cut-off point is τ to τ_{J-1}, with more than two classes.

The applied model responds to the fact that the values of the dependent variable are not normally distributed and are missing, given that the values of the items are on a Likert scale and, to facilitate their interpretation, are normalised to the maximum value of 100, which implies order values grouped into three categories.

Application of the OLM

The OLM is estimated based on the defined categorical dependent variable, see Table 2.

Validation

Validating is crucial. So whether the assumption of parallelism or proportional ratios is met needs verification. Therefore, the test of the regression's parallelism is used, the results of which are presented below.

According to Long and Freese (2014), the command *oparallel, ic* (version 15. Stata) is used, which provides multiple tests to check whether it violates the assumption of parallel lines, see Table 3.

Table 2. Final OLM.

Financial Literacy	Odds Ratio	with	P>|z|
Income: Less than 4,260			
4260–6389.9	1.108924	1.59	0.111
6390–8519.9	1.513946	5.41	0.000
8520–12,999.9	2.384524	10.84	0.000
13,000–20,000	4.033988	14.38	0.000
More than 20,000	7.133351	14.64	0.000
Location: Less than 15,000			
Over 15,000	1.273786	4.65	0.000
Sex: Male			
1.Female	1.419631	7.02	0.000
Mobile phone			
Yes	2.58369	13.56	0.000
Age_vol: Over 65			
56–65	1.305761	2.05	0.040
46–55	1.405634	2.75	0.006
36–45	1.853494	5.05	0.000
26–35	2.415644	7.19	0.000
18–25	2.007846	5.42	0.000
/cut1	−0.779003	0.1135028	
/cut2	3.069613	0.1218432	

Source: Own elaboration with data from ENIF 2021. V. Stata. 15.

Table 3. Proof of assumption of parallelism of regression.

Tests	Chi2	df	P > Chi2
Wolfe Gould	17.13	13	0.193
Brant	17.46	13	0.179
Score	17.71	13	0.169
Likelihood ratio	17.06	13	0.197
Forest	17.52	13	0.177

Source: Authors. Stata V.15, oparallel, ic.

Table 4. Akaike and Bayesian reporting criteria.

Information criteria	Model ologit	Model Gologit	difference
AIC (Akaike)	12,687.26	12,696.20	−8.94
BIC (Bayesian)	12,792.53	12,892.72	−100.18

Source: Own elaboration. Stata v. 15.

Table 5. Brant's proof of the regression parallelism assumption.

Variable	chi2	p > chi2	Fd
All (Global)	17.46	0.179	13
2.ingr_re	1.48	0.223	1
3.ingr_re	1.08	0.298	1
4.ingr_re	0.35	0.552	1
5.ingr_re	2.22	0.137	1
6.ingr_re	1.57	0.210	1
1.urbano	0.49	0.485	1
1.sexo	3.90	0.048	1
1.celular	1.52	0.218	1
2.edad_r	3.18	0.074	1
3.edad_r	2.11	0.146	1
4.edad_r	1.33	0.248	1
5.edad_r	0.05	0.822	1
6.edad_r	2.36	0.125	1

A significant test statistic provides evidence that the parallel regression assumption has been violated.

The results indicate that the assumption of parallelism is fulfilled. Likewise, the logistic model is compared with the generalized model based on the Akaike information and Bayesian criteria. The ologit model is smaller than the generalized one, providing evidence that fits the data better, see Table 4.

The Brant test is also performed, which shows the results separated by each of the independent variables of the OLM, expressing the rejection of the violation of the assumption of parallelism, confirming the outcome of the previous test[2], see Table 5.

The literature review supports the independent variables, explaining why adults are grouped in one of the three categories indicated and classified by their *economic nature*: income, income variability, mobile phone ownership, *economic-financial socio*-behaviour (level of formal education, gender, age, and marital status) and *finally institutional*, such as the location of the home whether urban or rural.

First, eight independent variables were considered, and the OLM was run to eliminate the non-significant variables, based on the statistical significance test and Wald test (Long & Freese, 2014). The independent variables eliminated were 'income variability,' 'educational level,' and 'marital status.'

According to the literature review, these variables are associated with three groups: the first two variables related to the economic factor are income and mobile phone; the second group corresponds to socio-behaviour, which refers to characteristics of people affecting their behaviour, such as age and gender; and the last variable related to the institutional economy is the size of the locality, that is, whether in urban or rural areas.

Results

In Table 6, the majority of the population (74.91%) earns an income of less than 6389.9 pesos, corresponding to 1.5 minimum salaries (355 USD[3]); and from 8520 to 12,999.99 pesos (473.34–722.22 USD) a 13.57% of the Mexican population, and in the specific case of 13,000–20,000 pesos (722.22–1111.11 USD) a 7.68% of the population, and the last one greater than 20,000 (1111.11 USD) just the 3.84%, as seen in this table Mexican population has a slow wage compared to G20 economies.

In terms of income variability 55.7% of the population receives a variable income, this is important because there is a much larger population that does not have a fixed income not allowing them to make the desired planning; representing the job informality problematics of the Mexican population.

In terms of the level of study, it is notable that the majority of individuals have completed only secondary education (years). In specific terms of Bachelor's and Postgraduate studies, a smaller proportion of the population has concluded this educational stage.

With regard to the tenure of mobile phones, it is notable that 27.97% of the population does not have or use a smartphone, while 72% have mobile phones. This is also relevant in the context of financial infrastructure and financial usage, given that a significant portion of economic services are available on these platforms.

The data indicates that there is a greater female population than a male one, with 54.2% of the adult population surveyed being female and 45.8% being male. In living arrangements, it is observed that

Table 6. Descriptive statistics of the independent variables.

Income from work	Frequency	Percentage	Accumulated Percentage
up to 4259.9	2649	32.10	32.10
4260–6389.9	2229	27.01	59.11
6390–8519.9	1304	15.80	74.91
8520–12,999.9	1120	13.57	88.48
13,000–20,000	634	7.68	96.16
But of 20,000	317	3.84	100.00
Total	8,253	100.00	
Income variability			
Variable	4597	55.70	55.70
Fixed	3656	44.30	100.00
Total	8253	100.00	
Level of Study			
Elementary	3682	27.13	27.13
High school & Tec	3860	28.45	55.58
High school2 & Tec	3055	22.51	78.09
Bachelor and Postgraduate	2973	21.91	100.00
Total	13,570	100.00	
Mobile phone ternure			
No	3796	27.97	27.97
Yes	9774	72.03	100.00
Total	13,570	100.00	
Sex			
Female	7355	54.20	54.20
Male	6215	45.80	100.00
Total	13,570	100.00	
Accompanied			
Live alone	5626	41.46	41.46
Accompanied	7944	58.54	100.00
Total	13,570	100.00	
Locality			
Under 15,000	4996	36.82	36.82
Over 15,000	8574	63.18	100.00
Total	13,570	100.00	
Age			
18–25	2079	15.32	15.32
26–35	2962	21.83	37.15
36–45	2761	20.35	57.49
46–55	2215	16.32	73.82
56–65	1747	12.87	86.69
Over 65	1806	13.31	100.00
Total	13,570	100.00	

Source: Own elaboration based on data from ENIF 2021.

58.5% of the population resides with others, while 41.5% resides alone. It would be beneficial to consider the following. Relative to town size 63% live in localities with more than 15,000 employees, which generally have more significant public services such as health, education, and Internet. As illustrated in Table 6, a notable proportion of the Mexican population falls within the younger age groups. In fact, 21.83% of the population is between the ages of 26 and 35, while 20.35% of the population falls within the 35–45 age range.

Aligned with theory, the results of this paper show that the main variables determining financial literacy are associated with economic factors: income level and mobile phone ownership. The higher the level of income, the higher the degree of financial literacy, as they have more access to education and financial services, which increases their experience in income management as the authors (Antonio-Anderson et al., 2020; French et al., 2020; Kadoya & Khan, 2020; Van Nguyen et al., 2022).

According to Table 3, the higher the income above two minimum wages, the higher the estimated probability of higher literacy. For example, people with incomes above 20,000 are 7.13 times more likely to have better outcomes than those earning less than 1.5 minimum monthly wages. People with higher incomes not only attain higher levels of education but also access financial courses and products that require solid financial literacy knowledge and attitudes, which helps them make informed and planned financial decisions to manage their income better, aligned with (Kaiser & Menkhoff, 2017; Wagner, 2019; Xiao & Porto, 2017).

The results confirm those of other researchers (Ansari et al., 2023; Antonio-Anderson et al., 2020), ie in terms of age, the most financially literate are young adults, who have more time and are willing to take financial education courses. Mexicans with higher financial literacy are likelier to be relatively young, ie age ranges from 18 to 35. For example, people between 18 and 25 are 2.0 times more likely to be in the middle or high level.

People who are older than 65 and those between 26 and 35 are 2.4 times more likely to be more financially literate (Finke et al., 2017). The results show that older people are less financially literate because of the fewer opportunities for saving, investing, wealth, and debt management. On the other hand, older people may have more experience, which could help them make better financial decisions (Eberhardt et al., 2019).

Regarding gender, most of the empirical evidence (Antonio-Anderson et al., 2020) shows that men are more financially literate than women because, historically, the gender gap has benefited men in various aspects such as education, access to financial services and better jobs in line with (Cupák et al., 2018; García Mata et al., 2021). However, in this aspect, the global situation is progressing. With the new gender equality policies in various countries, empirical evidence reveals that women have better financial literacy than men. Table 3 shows that women are more likely to have higher levels of financial literacy, ie women are 1.41 times more likely to be at the high or medium level.

Finally, where people live could influence their level of financial literacy, as people living in urban areas have greater access to education, financial services, technology, and internet infrastructure, which allow them access to electronic resources. They have a higher concentration of financial institutions, such as banks, companies, and credit unions. Rural areas in Mexico lack opportunities for people to have quality education and have limited or no access to workshops and seminars to help them acquire new skills and experiences in income, savings, credit, and debt management like (Lopez & Winkler, 2018; Mora-Rivera & García-Mora, 2021).

Discussion implications and interpretation

Regarding the variables associated with socio-behavioural characteristics, variables such as education and marital status were not statistically significant. In the case of education, this situation could be because education systems do not prioritise teaching basic financial skills, and even those that do include financial education courses teach them abstractly, making students see them as detached from reality and irrelevant in practice. It is also crucial to note that financial literacy focuses on skills acquired through experience and not in the classroom (Dewi et al., 2020; Xiao & Porto, 2017). Marital status may not be relevant as it is acquired through personal experiences, so living together may not be appropriate for a person's financial literacy (Ansari et al., 2023; Kadoya & Khan, 2020). Regarding Income variability, it was not included in the final model because it was not statistically significant at 95% confidence.

The results appear to indicate a correlation between income level and financial literacy. It seems that as income increases, so does financial literacy. (Antonio-Anderson et al., 2020; French et al., 2020; Kadoya & Khan, 2020; Van Nguyen et al., 2022) this relationship was expected and gives certainty of modelling by implicit logic in which the odds ratio increases from 1.108 at the lowest income level to 7.133 being only non-significant in the lowest decile of the surveyed population.

Localities with more than 15,000 inhabitants are 1.27 times more likely to have a greater financial literacy than those in rural areas as the conclusion of (Antonio-Anderson et al., 2020; Beckmann, 2013; Morgan & Long, 2020). It seems reasonable to suggest that greater access to financial services, information, courses and economic development could help to improve financial literacy. For instance, in Mexico, it is estimated that 52.1% of the population utilizes ATMs, while 43.9% of the population relies on CBs, which are corner shops where individuals can pay their bills and access financial services. It is thought that greater proximity to banking or financial services may lead to greater literacy in places where such infrastructure is lacking. Indeed, 41.5% of people use regular banks, so it is to be expected that a greater number will have greater literacy in places where there is greater proximity to banking or financial services.

In terms of gender, there is a difference in Mexican culture in which men regularly have greater financial literacy than women, as stated by Antonio-Anderson et al. (2020). However, when comparing both populations in terms of gender, it seems that women may have a slightly higher probability of having

more financial literacy. This is an interesting observation that may be related to financial behaviour, according to the ENIF (2021), where women appear to outperform men in keeping track of outstanding receipts or debts (42.6% of women versus 40.1% of men). In the second instance, it is notable that women are more likely to make entries related to expenses (25.1% versus 21.7% of men). Finally, it is worth noting that women appear to be more likely than men to keep a budget or record of income and expenses, with 22.9% versus 22% of men, respectively.

Concerning mobile phone tenure (Evans, 2018; Van Nguyen et al., 2022) people with a mobile phone have a higher financial literacy, ie people with a mobile phone are 2.5 times more likely to have a higher literacy score (ie medium or high) than those without.

In terms of age, there is another relevant finding to discuss that has to do with the fact that the lowest financial literacy is found at high ages, such as the range between 56 and 65 in which there are silver finance programs (Martin et al., 2022) for reverting financial exclusion in this population. It would appear that the age group most in need of financial literacy is between 18 and 35 years old. This may be an indication that greater information on financial education and behaviour is being made available to young people. With the rapid advancement of technology, young people are enthusiastic about using digital finance and have the potential to adapt more quickly to new financial products and the possibility of becoming financially educated using the latest technologies (Choudrie et al., 2018; Jünger & Mietzner, 2020; Varga, 2017).

Conclusions

Hypothesis 1 is accepted, because income level, mobile phone tenure, gender, age, and town size were statistically significant in explaining the level of financial literacy as a construct. Income variability and living-not-accompanied were not statistically significant in their *p*-values. Study level was not included to satisfy the assumption of parallelism of the Ologit model, the results are shown in Tables 4 and 6. Income was significant in all the different stages but not statistically significant in the specific case of the first income stage.

Hypothesis 2 is accepted because the distribution of the dependent variable is not normal, and OLM is appropriate for modelling the financial literacy construct originated with financial knowledge, behaviour and attitude. The financial literacy index lacks normal data and parallelism validity is fulfilled (ie Akaike Bayesian and Brant).

The most significant impact on Mexican people regarding financial literacy focuses on economic factors, such as income (Ansari et al., 2023) and mobile phone tenure (Evans, 2018; French et al., 2020; Van Nguyen et al., 2022). Age is also an exciting determinant; relatively young people (between 18 and 35 years old) are likely to have higher financial literacy than people over 65, who are ranked with lower financial literacy (Ansari et al., 2023; Finke et al., 2017; Li et al., 2013; Lusardi, 2019). Regarding gender, women are more likely to have greater financial literacy than men are (Adam, 2017; Beckmann, 2013). People who live in urban areas are more likely to have greater financial literacy than rural ones (Azeez & Akhtar, 2021; Beckmann, 2013; Ren et al., 2018; Van Nguyen et al., 2022).

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Authors contributions

All authors contributed to the study's conception and design. Material preparation, data management and conclusions were performed by José González-Núñez. Fernando José Mariné-Osorio and Salomón Domínguez were involved in the analysis and interpretation of the data. All authors contributed to the first draft of the manuscript and commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Notes

1. CB are attention centers, typically in a corner shop, where clients can conduct money transactions instead of in regular bank offices. Therefore, these CB can improve financial inclusion. In the specific case of the Mexican economy, this service form has gained importance because it is the second-most used economic infrastructure. The first is ATM with 52.1%, the second CB with 43.9%, and the third the bank office with 41.5% (CNBV & INEGI, 2021).
2. This was true except in the case of gender, which is at 4.8%, but overall, the result is very satisfactory.
3. It was used an implicit exchange rate of 18 pesos by dollar.
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Data availability statement

The data supporting this study's findings are openly available in INEGI at https://www.inegi.org.mx/programas/enif/2021/ or could be available from the author José González-Núñez at josecarlos.gonzalez@anahuac.mx.

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Appendix A. Dependent variable financial literacy

Table A1. Financial literacy construct.

Financial Knowledge Construct	
From the different sentences please indicate wich of them you consider true or false	True(1) False (0)
4.7.1. Inflation means that the price of things increases	
4.7.2. If someone offers you the ability to make money easily, you can easily lose it as well.	
4.7.3 It's better to save money in two or more ways or places than in just one (a savings account, a batch with family or acquaintances, etc.)	
Circulate just one	
13.1. If you lend 25 pesos to a friend and the next week you pay them back the 25 pesos, how much did you pay them in interest?	Nothing Other Value Don't know
13.2. Let's say you deposit 100 pesos into a savings account that gives you a profit of 2% a year. If you don't make deposits or withdrawals, including interest, you'll have at the end of the year …	more than 102 pesos? exactly 102 pesos? less than 102 pesos? Doesn't respond Don't know
13.3 If you deposit 100 pesos in a savings account that gives you a profit of 2% a year and make no deposits or withdrawals, including interest, you will have at the end of five years …	more than 110 pesos? Exactly 110 pesos? less than 110 pesos? Doesn't respond Don't know
13.4 If you are given $1000 pesos, but you have to wait a year to spend it and in that year inflation is 5%, could you buy?	more than you can buy today? The same? less than you can buy today? Don't know
Financial Behaviour (9 points)	
14.1 Are decisions about how money is spent or saved in your home made by your home?	just you? you and another person(s) in the household?
4.1 Do you keep a budget or record of your income and expenses?	only one other person or persons in the household?
4.2. For you or your home …	Otherwise
4.2.1 Do you make expenses notes?	
4.2.2 Do you keep money for payments or debts separate from money for daily spending?	
4.2.3 Do you keep track of any outstanding receipts or debts to make sure you don't forget to pay them?	
4.2.4 Do you use a mobile app or money management tool to track spending?	
4.2.5 Do you have any of your payments automatically charged to an account or card (direct debit)?	
Savings:	Yes/No
5.7 From July 2020 to date, have you saved or saved in your	
1. Payroll account or card (where you deposit your paycheck)?.	
2. Pension account or card (where do you deposit your pension)?.	
3. Account or card to receive government support?	
4. Savings account? … … … … … … … … … … … … … …	
5. Checking account? … … … … … … … … … … … …^	
6. Fixed-term deposit (can you only withdraw on certain dates)?	
7. Investment fund (holding shares in a brokerage firm)? … … … … … … … … …	
8. An account contracted through the Internet or an application such as *Mercado Pago* or *Albo*?	
9. Other	
Overspending:	Yes/No
4.3 From July 2020 to date, was what you earned or received each month enough to cover your expenses?	
4.4 The last time you couldn't cover your expenses, did you …	
2. You used the money you had saved? … … … … … … … … … … … … … … .	
3. Reduced your expenses? …^	
4. Sold or pawned any property? … … … … … … … … … … … … … … … … … …	
5. Did you applied for a salary advance, worked overtime, did not do temporary work? … …	

(*continued*)

Table A1. Continued.

Financial Knowledge Construct	
Product Comparison	Yes/No
5.15 Before signing up for your (last) (savings) account, did you compare it with other products, in other banks or in other financial institutions?	
6.11 Before taking out your (last) loan, did you compare it with other products, in other banks or in other financial institutions?	
8.11 Before taking out your (last) insurance, did you compare it with other insurances, other insurers or financial institutions?	
Means to Compare	Yes/No
5.16 To compare your account, did you use …	
3. Sites or pages of institutions such as *Condusef*[4] or *Banco de México*?	
5. Recommendation from specialists or analysts?	
6.12 To compare your credit, did you use …	
3. Sites or pages of institutions such as *Condusef* or *Banco de México*?	
5. Recommendation from specialists or analysts?	
8.12 To compare your insurance, did you use …	
3. Sites or pages of institutions such as *Condusef*, *National Insurance and Bonding Commission*, among others?	
5. Recommendation from specialists or analysts?	
Revision	Yes/No
4.8 Now I am going to read a few sentences. You will answer me to what degree or extent you agree or disagree	
3. Keeps a detailed review of your money management	
Goals	Yes/No
4.6 Generally	
4. Do you set long-term financial goals and strive to achieve them (buying a home, saving for retirement, paying for vacations or parties, starting a business, etc.)?	
Reflects	Yes/No
4.6 Generally …	
1. Do you carefully consider whether you can afford something before you buy it?	
Pay on time	Yes/No
4.6 Generally …	
2 Do you pay your bills on time (credit card, utilities, credit, etc.)? ….	
Financial attitudes	
Spending Preference Attitude	I agree
4.6 Generally …	Neither agree nor disagree
3. Would you rather spend money than save it for the future?	Disagree
Attitude without worry about the future	I agree
4.8 Now I am going to read a few sentences. You will answer me to what degree or extent you agree or disagree	Neither agree nor disagree
	Disagree
1. Tends to think about the present without worrying about the future.	
Spending Attitude	I agree
4.8 Now I am going to read a few sentences. You will answer me to what degree or extent you agree or disagree	Neither agree nor disagree
	Disagree
2. Money is meant to be spent.	