

Financial Literacy and Financial Fragility in Mexico

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Abstract

The objective of this research is to analyze the relationship between Mexicans' financial fragility and the following variables: financial literacy, savings, assets owning, financial shocks, financial education, and financial inclusion. Likewise, socioeconomic and demographic characteristics associated with financial fragility are identified. The dichotomous Probit model is used for the analysis, estimated with data from the 2021 National Survey of Financial Inclusion. The results show that financial literacy, savings (formal and informal), financial education and possession of assets are negatively related to the probability of being financially fragile. High income and holding formal and informal savings are the most robust predictors of financial fragility, with a marginal effect of -9.40%, -5.34% and -5.27%, respectively. The probability of being considered financially fragile is related to low income and a low educational level, plus having overspent in the last year. The findings can be useful for financial education strategies design, to provide the population financial training in resources administration and protection against income decrease.

JEL Classification: G51, G53.

Keywords: Financial fragility, financial literacy, saving, education, financial inclusion, Mexico.

Alfabetización Financiera y Fragilidad Financiera en México

Resumen

El objetivo de esta investigación es analizar la relación entre la fragilidad financiera de los mexicanos y las siguientes variables: alfabetización financiera, ahorro, tenencia de activos, shocks financieros, educación financiera e inclusión financiera. También se identifican las características socioeconómicas y demográficas asociadas a la fragilidad financiera. Se utiliza un modelo Probit dicotómico estimado con datos de la Encuesta Nacional de Inclusión Financiera, 2021. Los resultados muestran que la alfabetización financiera, el ahorro (formal e informal), la educación financiera y la tenencia de activos se relacionan negativamente con la probabilidad de ser financieramente frágil. Los altos ingresos y la tenencia de ahorros formales e informales son los predictores más robustos de fragilidad financiera, con un efecto marginal de -9.40%, -5.34% y -5.27%, respectivamente. La probabilidad de ser financieramente frágil está relacionada con bajos ingresos y bajo nivel educativo, así como haber experimentado sobreendeudamiento en el último año. Los hallazgos pueden ser de utilidad para el diseño de estrategias de educación financiera que brinden a la población capacitación y de esta forma protección contra la disminución de ingresos.

Clasificación JEL: G51, G53.

Palabras clave: Fragilidad financiera, Alfabetización financiera, Ahorro, Educación, Inclusión financiera.

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1. Introduction

The data analyzed in this research is from 2021, a year marked by the uncertainty caused by the Covid-19 pandemic. The Covid-19 pandemic has severely affected economies, and as a consequence, many households around the world faced severe financial challenges (Szustak *et al.*, 2021; Cziriak, 2022). In the face of an immediate drop in household income, the financial fragility of families and the difficulties they have in facing an economic emergency are revealed (Demertzis *et al.*, 2020; Cantor & Landry, 2020; Clark *et al.*, 2021; Despard, *et al.*, 2020). According to the Mexican Central Bank the acute turmoil generated by the pandemic stands among the four largest episodes of financial distress experienced by the country (Carrillo and Garcia, 2021). This situation highlights the importance of households to be trained to manage their finances and carry out an adequate financial planning to avoid a crisis (Fox & Bartholomae, 2020; Babiarez and Robb, 2014; Beshears, *et al.*, 2020).

While financial literacy literature emphasizes the importance of personal savings (Nguyen, *et al.*, 2017), there is international evidence that many households have insufficient savings in the face of income losses, spending crises, and other financial emergencies (Preston, 2022; Despard, *et al.*, 2020; Morduch & Schneider, 2017).

Financial literacy, savings and spending decisions can impact people's financial situation in the short and long term (Lusardi *et al.*, 2021; OECD, 2020a). According to Babiarez and Robb (2014), the low household savings rate has effects not only in the short term, due to households' inability to face an emergency, but also due to its potential effect of financial insecurity in the long term. Thus, in a situation of income loss, households are more likely to report that they cannot face an unexpected expense and are more likely to resort to both formal and informal sources of credit (Cziriak, 2022; CNBV, 2022; Bratberg & Monstad, 2015). Therefore, when facing an emergency situation, adequate planning is of great importance, primarily in low-income households, who have less access to traditional credit and whose tighter budget makes it more difficult to save (Nguyen, *et al.*, 2017; Collins and Gjertson, 2013).

However, most households do not plan for foreseeable events such as retirement (Harahap, *et al.*, 2022; Ghadwan, *et al.*, 2022; Lusardi and Mitchell, 2011) and do not anticipate unexpected events and emergencies (Rothwell *et al.*, 2022), leaving them exposed to financial shocks. Likewise, most households have few or no assets and do not have emergency funds, making them very vulnerable to changes in their income (Demertzis *et al.*, 2020; Hasler and Lusardi, 2019; Lusardi, 2011). Not having a savings fund for emergencies is the result of poor planning or a forecast error in households (Babiarez and Robb, 2014). Financial education, which is associated with less financial fragility, can mitigate the negative consequences of income loss by increasing people's capacities to face emergency expenses (Cziriak, 2022; Clark *et al.*, 2021; Hasler and Lusardi, 2019; Sherraden, 2010).

Based on the above, the following questions are formulated: How does financial literacy influence households' financial fragility? What is the effect that assets owning, savings, financial inclusion and financial education have on financial fragility? What are the sociodemographic variables related to financial fragility?

The objective of this research is to analyze the relationship between Mexicans' financial fragility and the following variables: financial literacy, savings, assets owning, financial shocks,

financial education, and financial inclusion. Likewise, the socioeconomic and demographic determinants of the population's financial fragility are identified. The study is organized as follows: Section 2 presents the literature review, Section 3 the research methodology and the model description. In Section 4 the results are presented. The discussion of the results is found in Section 5 followed by the conclusions and implications in Section 6.

2. Literature review

Financial fragility and its relationship with financial literacy in young and adult populations is a topic of great interest in the scientific literature due to its impact on individual well-being (Baker *et al.*, 2023; Chhatwani & Mishra, 2021; Clark *et al.*, 2021; Nikolaos & Christos, 2020; Ramli *et al.*, 2022). Empirical evidence determines a strong negative and statistically significant relationship between financial literacy and financial fragility (Cziriak 2022; Lusardi *et al.*, 2021; Nikolaos & Christos, 2020; Lusardi *et al.*, 2011). According to INEGI (2022b), financial fragility is defined as the maximum period during in which people aged 18 and over could cover their expenses with their savings, in the event of an unforeseen income loss.

Planning and savings availability is important to deal with any income drop. The results of the International Financial Literacy Survey (INFE) indicate that less than a third (28%) of the adults in the sample have savings to cover their expenses for a week if they lose their main source of income (OECD, 2020a). In developing economies, a common alternative to saving in a financial institution is informal saving (Demirguc-Kunt *et al.*, 2017). Roa and Villegas (2022), CNBV (2022) and Lusardi *et al.* (2011) identified that to face changes in their income or an overspending, people resort to various forms of informal savings. There is also evidence that young people prefer to save informally, such as giving money to a trusted person or family member, keeping money at home, participating in savings groups, or in-kind (OECD, 2020b).

Hilgert, Hogarth, and Beverly (2003) identified a positive relationship between financial knowledge and behavior towards saving. Their results show that the households with the lowest scores on the general measure of financial knowledge are those with low scores on the savings index, as well as the lowest scores on the savings sub-index (savings account, emergency savings, long-term savings). Bhutta *et al.*, (2021) identify that financial literacy is an element that helps explain the preparation of families to face unexpected expenses or their income interruption. In their estimation, they find that high levels of financial literacy are positively correlated with having liquid savings.

According to the OECD (2020a), financial education aims to make people better prepared to manage their money and thereby achieve financial well-being. Wagner (2019) identified that financial education is positively related to financial literacy. In this regard, Cardona-Montoya *et al.*, (2022) identified that households with more financial knowledge are better prepared to face adverse events, thereby reducing the probability of financial fragility in the household. Lusardi *et al.*, (2011) find that those who received financial education at school are more likely to cover expenses in an economic emergency, compared to their counterparts. In the results of Anderson, *et al.*, (2017), answering an additional financial literacy question correctly increases the probability of answering affirmatively to the precautionary savings-holding question by about 8%.

Sherraden's (2010) conceptual model of financial capabilities states that good financial behavior and the ability to cover expenses with savings in the face of an income loss occurs when

individuals have financial knowledge, skills, and access to financial products. Friedline and West (2016) identify that among young adults, access to financial products (checking account, credit card, bank account and savings account), and having received formal financial education are factors related to the ability to face an economic emergency. Being financially capable was associated with a 176% increase in the probability of meeting expenses in a financial emergency. Being financially included was associated with a 123% increase, compared to their counterparts, and being financially educated was associated with a 40% increase in the probability of meeting their expenses in an economic emergency.

Various authors have identified factors related to financial fragility. Table 1 presents the variables, their relationship (positive or negative) with financial fragility, and their references. Women are more likely to be financially frail than men (Cziriak, 2022; Lusardi *et al.*, 2011; Hasler *et al.*, 2018). Financial fragility is more accentuated in young people and in older age groups (Cziriak, 2022; Lusardi *et al.*, 2011). People with a higher level of education are less likely to be financially fragile (Roa and Villegas, 2022; Hasler *et al.*, 2018; Cziriak, 2022; Friedline and West, 2016; Lusardi *et al.*, 2011). Significant differences were also found among people in different regions. These were about their ability to handle unexpected spending (Lusardi *et al.*, 2011; Friedline and West, 2016).

Table 1. Financial fragility and sociodemographic characteristics

Variable	Relation with financial fragility	Authors
Sociodemographic characteristics		
Female	(+)	Cziriak (2022), Lusardi <i>et al.</i> (2011) Hasler <i>et al.</i> (2018)
Age (Young and older adults)	(+)	Cziriak (2022), Lusardi <i>et al.</i> (2011)
Higher education	(-)	Cziriak (2022), Lusardi <i>et al.</i> (2011), Hasler <i>et al.</i> (2018), Roa & Villegas (2022)
Marital status (married)	(-)	Cziriak (2022), Friedline & West (2016), Hasler <i>et al.</i> (2018)
Job position (Full-time or part-time employed)	(-)	Babiarz & Robb (2014), Friedline & West (2016), Cziriak (2022), Hasler <i>et al.</i> (2018)
Economic dependents	(+)	Friedline & West (2016), Hasler <i>et al.</i> (2018), Hasler & Lusardi (2019), Lusardi <i>et al.</i> (2011)
Income	(-)	Hasler <i>et al.</i> (2018), Cziriak (2022)
Financial literacy, financial inclusion and financial education		
Financial literacy	(-)	Cziriak (2022); Lusardi <i>et al.</i> (2011), Nikolaos & Christos (2020); Lusardi <i>et al.</i> (2011), Hasler <i>et al.</i> (2018)
Financial inclusion (Having a bank account and having a sophisticated account -investment funds-)	(-)	Demirgüç-Kunt <i>et al.</i> (2022), Demirguc-Kunt <i>et al.</i> (2017), Ramli <i>et al.</i> (2022), Pomeranz & Kast (2022), Friedline & West (2016)

Financial education	(-)	Cardona-Montoya <i>et al.</i> (2022), Cziriak (2022), Clark <i>et al.</i> (2021), Lusardi <i>et al.</i> (2011)
Informal savings	(-)	Roa & Villegas (2022), Lusardi <i>et al.</i> (2011)
Assets owning and financial shocks		
Assets owning	(-)	Cziriak (2022), Friedline & West (2016)
Financial shock	(+)	Cziriak (2022), Lusardi <i>et al.</i> (2011) Ramli <i>et al.</i> (2022), Hasler <i>et al.</i> (2018)

Source: Author's elaboration.

Married people are more capable of coping with a situation of financial fragility, compared to people in a different marital status (Cziriak, 2022; Lusardi *et al.*, 2011; Friedline and West, 2016). Those who work full-time or part-time, compared to those who are unemployed, are more likely to cover expenses in an economic emergency (Babiarz and Robb, 2014; Friedline and West, 2016; Cziriak, 2022). People with higher income are more likely to cover their expenses in an economic emergency. People with higher levels of financial literacy are less likely to be financially fragile (Cziriak 2022; Lusardi *et al.*, 2021; Nikolaos & Christos, 2020; Lusardi *et al.*, 2011). People who have access to financial services are better prepared to cope with an income crisis (Demirgüç-Kunt *et al.*, 2022; Demirgüç-Kunt *et al.*, 2017; Ramli *et al.*, 2022; Pomeranz and Kast, 2022).

People who have received training on how to save, budget or use credit responsibly are more likely to face an economic emergency (Cardona-Montoya *et al.*, 2022; Cziriak, 2022; Clark *et al.*, 2021; Lusardi *et al.*, 2011). People who have formal savings or informal contingency and emergency savings mechanisms are less financially fragile (Roa and Villegas, 2022; Lusardi *et al.*, 2011). Homeowners may be able to leverage this asset to establish financial stability (Cziriak, 2022; Friedline and West, 2016). People who experienced a decrease in their income are more vulnerable to economic emergencies (Cziriak, 2022; Lusardi *et al.*, 2011; Ramli *et al.*, 2022).

Consistent with Sherraden's (2010) model that suggest a relationship between financial literacy, savings, financial inclusion, and financial education with financial fragility, the following hypotheses are proposed:

H1: Financial literacy has a negative and statistically significant effect on the probability of being financially fragile.

H2: Financial inclusion has a negative and statistically significant effect on the probability of being financially fragile.

H3: Financial education has a negative and statistically significant effect on the probability of being financially fragile.

H4: Holding informal savings has a negative and statistically significant effect on the probability of being financially fragile.

H5: The sociodemographic variables (gender, age, educational level, marital status, town size, geographic region, job position and income) are related to the probability of being financially fragile.

3. Methodology

The type of study is non-experimental and cross-sectional, descriptive and correlational. The data used corresponds to the Mexican National Survey of Financial Inclusion 2021 (INEGI, 2022a). In this survey, the population under study is made up of people in the age range of 18 to 70, who live in Mexico, in the national geographic coverage of urban-rural cut, divided into six geographical areas: Northwest, Northeast, West Bajío, Mexico City (CDMX), South and Central South and East. The total sample of 15,291 people was obtained between June 28 and August 13, 2021 through personal interviews at the respondents' home.

The data for this research correspond to 7,251 people who declared receive income from work, as suggested by Hasler *et al.* (2018) and Cziriak (2022). They are between the ages of 18 and 65 and were not pensioners at the time of the survey. For the analysis, variables whose data were reported by the national survey and whose relationship with financial fragility was sufficiently supported in the scientific literature were considered. To measure the main variable of this research, financial fragility, question 4.10 of the survey is used: "If you stopped receiving an income, how long would you be able to cover your expenses with your savings? The response options are: a) less than a week/no savings, b) at least a week, but less than a month, c) at least a month, but less than three months, d) at least three months, but less than six months, e) six months or more. The responses "no answer" and "don't know" were not considered for the analysis.

For the statistical strategy, a dichotomous variable is designed, as in Cziriak (2022) and Lusardi *et al.*, (2011), which takes the value of 1 for responses a), b), c), or d) and a value of 0 for answer e). The value of 1 indicates that the person is "financially fragile" and 0 indicates that the person is "not financially fragile". From this, the dichotomous Probit model is built.

The concept of financial literacy used in this research is the one proposed by Lusardi (2019), who defines it as the abilities a person has to apply three fundamental concepts in the decision-making process of savings and investment. In its operational form, three questions are used to measure financial literacy i) the calculation of interest and understanding the capitalization of interest; ii) inflation and its effect on purchasing power and iii) the benefit of risk diversification (Lusardi, 2019; Cziriak 2022). The first two measure the individual's ability to perform a calculation and the third assesses whether the respondent knows the relationship between diversification and risk.

To measure the financial literacy of the respondent, three questions from the survey are used (question 4.7.3, savings diversification; question 13.3, compound interest and question 13.4, inflation knowledge). For each question, a dichotomous variable is designed. The value of 1 is assigned if the respondent answers correctly, and 0 otherwise. From this, an indicator of financial literacy determined as the sum of correct answers is designed, whose range goes from 0 to 3, (Lusardi and Mitchell, 2011; Cziriak 2022). To determine the impact of financial literacy on financial fragility, the dichotomous Probit regression model is used.

Financial inclusion is operationalized according to the standard first-level measure, indicated by having an account in a formal financial institution (Grohmann and Menkhoff, 2020), with indicators of having a savings account and a sophisticated account (Lusardi *et al.*, 2010). For the financial education proxy, question 4.5 is used: Have you taken a course on how to save, how to make

a budget or how to use credit responsibly? Regarding informal savings, the possession of any of the forms of informal savings indicated in question 5.1 of the survey is considered. The proxy variable of financial shocks is measured from an overspending in relation to the income received each month, indicated in question 4.3. For the proxy of assets possession, owning a home, car or land are considered (Friedline and West, 2016). Sociodemographic characteristics of the respondent are included: gender, age, educational level, marital status, work income, region of residence, town size, job position. Table 2 presents the operationalization of the variables, their codification and their references.

Table 2. Operationalization and coding of the sociodemographic and financial characteristics of the respondents

Variable	Variable type	Survey's question number (INEGI, 2022a)	Operationalization
Financial fragility	Categorical	4.10	A dichotomous variable is designed. The value of 1 is assigned for answers a), b), c) or d) and a value of 0 for answer e). The value of 1 indicates that the person is "financially fragile" and 0 indicates that the person is "not financially fragile".(Cziriak, 2022; Lusardi <i>et al.</i> , 2011).
Gender	Dichotomous	2.4	Categories: Man, Woman. Code: 1 if male, 0 if female (Hasler <i>et al.</i> , 2018; Friedline & West, 2016).
Age	Continuous	2.5	Ordered categories expressed in years. The categories are designed as proposed in Hasler <i>et al.</i> (2018): 18-27, 28-37, 38-47, 48-57, 58-67 years. Base category: 18-27 years (Proposed by authors).
Educational level	Categorical	3.1	Categories: primary, secondary, high school, university, master's or doctorate (Secretary of Public Education, 2021). A dichotomous variable is designed for each category (Friedline & West, 2016; Lusardi <i>et al.</i> , 2011). Base category: primary.
Marital status	Categorical	3.2	Categories: free union, separated, divorced, widowed, married, single. A dichotomous variable is designed for each category. Base category: married (Sekita, 2011).
Town size	Dichotomous	Identification question	Categories: rural: from 1 to 14,999 inhabitants; urban: 15,000 or more inhabitants (INEGI (2022b) Code: 1 if the respondent lives in an urban location, 0 if they reside in a rural location.
Geographic region	Categorical	Identification question	Regions of Mexico: Northwest, Northeast, West and Bajío, CDMX, Central South and East, South (INEGI, 2022b). A dichotomous variable is designed for each region (Friedline and West, 2016). Base category: Mexico City.

Job position	Categorical	3.7	Categories: employee, day laborer, self-employed worker, boss or employer. A dichotomous variable is designed for each category (Cziriak, 2022). Base category: employee.
Monthly income*	Quantitative	3.8a & 3.8b	Income quartiles expressed in US dollar are designed as proposed in Lusardi <i>et al.</i> (2011) and Cziriak (2022). A dichotomous variable is designed for each quartile: \$0.0 < quartile 1 ≤ \$233.37, \$233.37 < quartile 2 ≤ \$350.00, \$350.00 < quartile 3 ≤ \$554.25, quartile 4 > \$554.25. Base category: quartile 1.
Financial literacy	Multiple choice	4.7.3, 13.3, 13.4	For each question, a dichotomous variable is designed. The value of 1 is assigned if the respondent answers correctly, and 0 otherwise. A determined financial literacy indicator is designed as the sum of correct answers, whose range goes from 0 to 3 (Lusardi and Mitchell, 2011).
Having a savings account	Dichotomous	5.4.4	Categories: If you have a savings account, you do not have a savings account. Code: 1 if you have a savings account, 0 if you do not (Friedline & West, 2016).
Having a sophisticated account	Dichotomous	5.4.6, 5.4.7	Categories: If you have a sophisticated account, if you do not have a sophisticated account. Code: 1 if you have any of the following accounts: fixed-term deposit, investment fund; 0 you do not have any (Lusardi <i>et al.</i> , 2011).
Informal savings	Dichotomous	5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.1.5, 5.1.6	Categories: yes, saved in some form of informal savings, did not save. Code: 1 if saved, 0 did not save (Development Bank of Latin America, 2021).
Overspending	Dichotomous	4.3	Categories: had overspending, did not have. Code: 1 if you declared an overcharge and 0 if you did not. (Hasler <i>et al.</i> , 2018).
Assets owning	Dichotomous	14.2.1, 14.2.2, 14.2.3	Categories: If you are an asset owner, you are not an asset owner. Code: 1 if the respondent owns a house or apartment, a car, or has some land, and 0 does not have any (Friedline and West, 2016; Cziriak, 2022).
Financial education	Dichotomous	4.5	Categories: financially empowered, not financially empowered. Code: 1 if he declared having taken a financial education course, and 0 otherwise (Friedline and West, 2016). Categorical variable: You took a course on how to save, how to make a budget or on the responsible use of credit. Did not take any courses.

* Mexican Peso/US dollar exchange rate at August 16th, 2023 (17.14 Mexican pesos per dollar). Calculated with data from Banco de México exchange market web page. Retrieved from: <https://www.banxico.org.mx/tipcamb/main.do?page=tip&idioma=sp>

Source: Author's elaboration.

3.1 Model Description

To explain the behavior of the dependent variable (y), financial fragility, with other demographic, socioeconomic and financial variables, the dichotomous Probit model is used (Aldrich & Nelson 1984). Let y^* be an unobservable variable, determined by

$$y^* = \beta_0 + \mathbf{X}\boldsymbol{\beta} + e, \quad y = 1 [y^* > 0]$$

where X denotes the independent variables, β vector of parameters to be estimated, $y = 1(y^* > 0)$ is an indicator function, therefore $y = 1$ if $y^* > 0$, $y = 0$ if $y^* \leq 0$, e is an error term that is distributed as a standard normal. From the above, the probability of response for y is calculated:

$$P(y = 1 / \mathbf{X}) = P(y^* > 0 / \mathbf{X}) = G(\beta_0 + \mathbf{X}\boldsymbol{\beta}),$$

where G is the standard normal cumulative distribution function. From the maximum likelihood estimate, the estimators $\hat{\beta}_j$ and their corresponding standard error $\sigma_{\hat{\beta}_j}$ are obtained. For the individual significance test ($H_0: \beta_j = 0$), the statistic $t_c = \frac{\hat{\beta}_j}{\sigma_{\hat{\beta}_j}}$ is formed. If α is the significance level of the test and t -tables is the critical value, then the testing mechanism that rejects the null hypothesis is when,

$$P[|t| > t_{tablas}] = \alpha$$

Significant variables related to the probability of y are identified. The marginal effect of the qualitative variables of going from $x_k = 0$ to $x_k = 1$ is calculated, keeping all the other variables fixed,

$$= G(\beta_0 + \beta_1 x_1 + \dots + \beta_{k-1} x_{k-1} + \beta_k) - G(\beta_0 + \beta_1 x_1 + \dots + \beta_{k-1} x_{k-1})$$

Where the expression $G(\cdot)$ is evaluated with the value of the average of the independent variables. In this model, the dependent variable is financial fragility and the independent variables are: gender, age, educational level, marital status, town size, geographic region, job position, income, financial literacy, financial shocks, financial inclusion, informal savings, assets owning and financial education.

4. Results

In the total sample, the majority are men (58.20%), 73.74% are under 47 years old, 48.15% have secondary school as the highest level of education, 34.34% are married, 26.55% obtain an income of less than 233.37 US dollar per month (corresponding to the first quartile of income), 66.90% reside in an urban area, 67.33% are employ and 24.37% are self-employed. Regarding the financial information of the respondents, 21% have a savings account in a bank or a financial institution, 62.1% save informally, less than 3% have a sophisticated account, 9.54% declare that they have received financial education, 55.22% declare that they are asset owners and 48.64% declare having had an overspending experience.

Table 3 presents the numerical characteristics of the sample, divided by groups regarding the condition of financial fragility and by demographic and economic characteristics. Of the total sample, 88.33% is financially fragile. This percentage is made up of those who, in the event of losing their main source of income, cannot cover their expenses with their savings for six months. Those who could cover their expenses with their savings from six months or more, comprise only 11.67%. More women than men (29.46% and 26.35%, respectively) declared that they have no savings or that if they stopped receiving income they would not be able to cover their expenses for a week. In a greater proportion, people in the 48-67 age range, and those living separated, divorced or widowed are considered financially fragile. Respondents with the highest educational level (20.06% with master and 28.42% with doctorate) state that they could cover their expenses with their savings for six months or more, while 42.80% and 34.03%, corresponding to people with primary and secondary studies, could cover their expenses less than a week.

Table 3. Levels of financial fragility and sociodemographic characteristics

(If you stopped receiving an income, how long could you cover your expenses with your savings?)							
	Less than a week/no savings	At least a week, but less than a month	At least one month, but less than three months	At least three months, but less than six months	Six months or more	Total sample	%
	Financially fragile				No financial fragility		
	(%)	(%)	(%)	(%)	(%)		
	27.65	20.36	29.10	11.23	11.67	7251	100
Gender							
Female	29.46	20.39	27.75	11.22	11.18	3031	41.80
Male	26.35	20.33	30.07	11.23	12.01	4220	58.20
Age							
18-27	19.75	21.40	35.02	13.82	10.01	1519	20.95
28-37	22.31	20.77	31.09	12.79	13.04	2017	27.82
38-47	28.88	20.15	28.49	10.27	12.20	1811	24.98
48-57	36.45	19.03	24.41	9.13	10.97	1303	17.97

58-67	42.76	19.80	19.47	6.82	11.15	601	8.29
Educational level							
Primary	42.80	24.06	21.81	5.55	5.77	1334	18.40
Secondary	34.03	23.18	26.80	7.60	8.39	2157	29.74
High school	23.58	20.40	34.55	11.02	10.44	1887	26.02
University	13.96	14.79	31.72	19.47	20.06	1690	23.30
Master's or doctorate	10.38	10.93	28.96	21.31	28.42	183	2.52
Marital status							
Free union	28.72	22.77	28.49	10.13	9.89	1678	23.14
Separated	36.75	19.85	25.22	8.83	9.35	781	10.77
Divorced	33.10	18.31	23.24	9.51	15.85	284	3.92
Widowed	36.92	21.03	24.77	8.41	8.88	214	2.95
Married	27.71	19.92	28.88	11.29	12.21	2490	34.34
Single	20.68	19.18	33.09	13.80	13.25	1804	24.88
Town size							
Rural	31.13	21.54	29.25	7.75	10.33	2400	33.10
Urban	25.93	19.77	29.02	12.95	12.33	4851	66.90
Geographic region							
Northwest	34.39	18.50	26.23	11.04	9.85	1422	19.61
Northeast	28.80	20.97	26.90	9.88	13.45	1316	18.15
West	23.79	20.32	29.33	11.93	14.63	1442	19.89
CDMX	28.82	17.90	29.26	14.85	9.17	458	6.32
Central South	27.26	20.87	30.76	11.21	9.89	1284	17.71
South	23.48	22.12	32.43	10.76	11.21	1329	18.33
Job position							
Employee	24.97	19.36	31.20	12.25	12.23	4882	67.33
Day labor	48.29	22.01	23.29	3.21	3.21	468	6.45
Self-employed worker	30.90	23.15	24.67	10.24	11.04	1767	24.37
Employer	10.45	14.18	31.34	14.93	29.10	134	1.85
Monthly income							
Quartile 1	40.31	24.47	24.21	5.51	5.51	1925	26.55
Quartile 2	30.63	22.23	30.63	8.40	8.12	2119	29.22
Quartile 3	23.38	21.80	30.72	13.53	10.58	1390	19.17
Quartile 4	14.03	12.71	31.26	18.82	23.17	1817	25.06
Assets owning							
Not having assets	30.95	22.21	28.86	10.07	7.91	3247	44.78
Having assets	24.98	18.86	29.30	12.16	14.71	4004	55.22

Source: Author's elaboration based on the Mexican National Survey of Financial Inclusion (2021).

Of those who do not have assets, 30.95% could cover their expenses with their savings for less than a week, compared to 24.98% of those who do have assets. The same situation for the 31.13% who reside in a rural location, higher than the 25.93 that live in a city, but the percentage of those

who are not financially fragile is higher among those who live in a city (12.33% vs 10.33% living in rural area). Regarding the geographic region and job position, the Northwest has the largest number of financially very fragile people (34.39%) as well as the day laborer position (48.29%). Quartile 1 and quartile 2, are considered financially very fragile (40.31% and 30.63% respectively), compared to 14.04% of quartile 4.

Table 4 presents the numerical characteristics of the sample, divided by groups regarding the condition of financial fragility and financial literacy, financial education and financial condition. The 21.55% of the respondents answered the three financial literacy questions correctly, 69.80% understand the concept of diversification, 38.11% can calculate compound interest and 76.52% understand the effect of inflation on purchasing power. The 47.17% of the respondents who obtained zero correct answers, those who do not have a formal or informal savings account (31.48% and 47.01%, respectively), the 29.24% who lack financial education and the 37.74% who indicated having an overspending, can't cover their expenses with their savings for more than a week.

On the opposite, respondents who can cover their expenses for six months or more are those who answered the three questions correctly (15.43 vs. 4.85% who can cover their expenses for this period and didn't answer any correctly). There are also those who save; those who have not had an overspending (16.78 vs. 6.27%) and those who have received financial education (25.58 vs. 10.20%).

Table 4. Financial fragility by financial literacy, overspending, savings and financial education

(If you lost your main source of income, how long could you continue to cover your living expenses with own savings?)							
	Less than a week /no savings	At least a week, but not one month	At least one month, but not three months	At least three months, but not six months	Six months or more	All sample	%
	Financial fragility				No Financial fragility		
	(%)	(%)	(%)	(%)	(%)		
	27.65	20.36	29.10	11.23	11.67	7251	100
Financial literacy							
Saving							
Diversification							
Incorrect	35.30	20.91	26.30	8.95	8.54	2190	0.3020
Correct	24.34	20.11	30.31	12.21	13.02	5061	0.6980
Compound interest							
Incorrect	30.35	20.10	27.96	10.90	10.70	4488	0.6189
Correct	23.27	20.77	30.94	11.76	13.25	2763	0.3811
Inflation							
Incorrect	34.53	19.96	28.48	9.10	7.93	1703	0.2348
Correct	25.54	20.48	29.29	11.88	12.82	5548	0.7652
Correct answers							
0	47.17	19.41	22.64	5.93	4.85	371	0.0511
1	34.82	20.51	27.08	9.33	8.26	1950	0.2689

2	24.94	20.31	29.93	12.17	12.65	3368	0.4645
3	19.91	20.49	31.37	12.80	15.43	1562	0.2155
Saving account							
No	31.48	22.11	28.27	9.25	8.88	5695	0.7854
Yes	13.62	13.95	32.13	18.44	21.85	1556	0.2146
Informal saving							
No	47.01	19.72	19.97	6.49	6.81	2744	0.3784
Yes	15.86	20.75	34.66	14.11	14.62	4507	0.6216
Overspending							
No	18.10	17.86	32.71	14.55	16.78	3724	0.5136
Yes	37.74	22.99	25.29	7.71	6.27	3527	0.4864
Financial education							
No	29.24	21.30	28.72	10.54	10.20	6559	0.9046
Yes	12.57	11.42	32.66	17.77	25.58	692	0.0954

Source: Author's elaboration based on the Mexican National Survey of Financial Inclusion (2021).

Table 5 presents the estimation of five Probit models, which include the sociodemographic variables indicated in table 3, the financial literacy, financial inclusion, financial education and savings holdings indicators. Model 1 includes the financial literacy indicator. From the results, it is identified that the coefficient of the financial literacy indicator has a negative and statistically significant effect ($\beta=-0.1009$, $p<0.01$) on the probability of being financially fragile, after incorporating the sociodemographic variables, which supports the Hypothesis 1 of this research. Model 2 includes financial inclusion indicators. Having a savings account has a negative and significant effect ($\beta=-0.3865$, $p<0.01$) on the probability of being financially fragile, which supports hypothesis 2 of this research, considering the definition of financial inclusion in its most basic form.

Model 5 includes the financial education indicator. Financial education has a negative and significant effect ($\beta=-0.2991$, $p<0.01$) on the probability of being financially fragile, which supports hypothesis 3 of this research. Model 3 includes the informal savings indicator. Informal savings have a negative and significant effect ($\beta=-0.4202$, $p<0.01$) on the probability of being financially fragile, which supports hypothesis 4 of this research. Model 4 includes the overspending and assets owning variable. Overspending has a positive and significant effect ($\beta=0.4373$, $p<0.01$) on the probability of being financially fragile; asset ownership has a negative and significant effect ($\beta=-0.2029$, $p<0.01$). In this model, the gender variable (male) has a positive and significant effect ($\beta=0.0834$, $p<0.10$).

For the marginal effect analysis, the results of model 6 are used, which includes all the study variables. Men are 1.02% more likely to be financially fragile, compared to women. The probability of being financially fragile decreases with a higher educational level (bachelor's, master's or doctorate), in 4.79% and 7.34% compared respectively, compared to those who have basic education. According to their marital status, those who are single are less likely to be financially fragile (2.30%), compared to those who are married. Those who reside in an urban location, compared to those who reside in a rural location, have a higher probability (2.0%) of being financially fragile. Those who reside in the Northeast and West region are less likely to be financially vulnerable compared to the Mexico City region. As for their job position, those who are day laborers are more likely (4.19%) to be financially fragile, compared to those who are employees, while those with an employer job position are less likely (4.74%). With a higher income, people are less likely to be financially fragile.

Those who receive an income corresponding to quartile 4 are less likely (9.40%) to be financially fragile, compared to those in quartile 1.

Respondents who answered all questions correctly are less likely to be financially fragile. For each question with a correct answer, the probability of being financially fragile decreases by 1.12%. Having a savings account decreases the probability of being financially fragile by 5.34%, and having informal savings decreases the probability by 5.27%. Those who had an overspending in the previous year are more likely (6.38%) to be financially vulnerable than their counterparts. The possession of assets decreases the probability (2.21%) of being financially fragile, compared to those who do not have assets. Finally, those who have taken a course in financial education are less likely (5.06%) to be financially fragile, compared to those who indicated that they have not taken any courses.

Table 5. Marginal effects from Probit models

	Model1	Model2	Model3	Model4	Model5	Model6	Marginal effects Model6
Constant	2.2372*** (0.1470)	2.0873*** (0.1411)	2.3512*** (0.1458)	1.8570*** (0.1445)	2.0815*** (0.1410)	2.2108*** (0.1562)	
Gender (Ref=Female)	0.0252 (0.0442)	0.0145 (0.0445)	0.0081 (0.0446)	0.0834* (0.0453)	0.0249 (0.0443)	0.0641 (0.0462)	0.0102
Age (Ref.=18-27)							
28-37	-0.0799 (0.0616)	-0.0832 (0.0619)	-0.1170* (0.0621)	-0.0931 (0.0629)	-0.0866 (0.0618)	-0.1239* (0.0640)	-0.0203
38-47	-0.1079 (0.0668)	-0.1202* (0.0671)	-0.1833*** (0.06777)	-0.1362** (0.0692)	-0.1175* (0.0670)	-0.1961*** (0.0707)	-0.0332
48-57	-0.1005 (0.0739)	-0.1183 (0.0743)	-0.1982*** (0.0751)	-0.1350* (0.0766)	-0.1145 (0.0740)	-0.2111*** (0.0788)	-0.0366
58-67	-0.2072** (0.0940)	-0.2366** (0.0944)	-0.3131*** (0.0955)	-0.2221** (0.0964)	-0.2159** (0.0940)	-0.3300*** (0.0991)	-0.0625
Educational level (Ref.=primary)							
Secondary	-0.1306* (0.0721)	-0.1179 (0.0724)	-0.1103 (0.0731)	-0.1497** (0.0731)	-0.1393* (0.0720)	-0.0957 (0.0747)	-0.0155
High school	-0.1974*** (0.0756)	-0.1755** (0.0759)	-0.1768** (0.0765)	-0.2030*** (0.0767)	-0.1981*** (0.0756)	-0.1153 (0.0786)	-0.0189
University	-0.4449*** (0.0782)	-0.3982*** (0.0787)	-0.4368*** (0.0787)	-0.4367*** (0.0792)	-0.4147*** (0.0787)	-0.2742*** (0.0824)	-0.0479
Master's degree or a Doctorate	-0.5539*** (0.1239)	-0.5032*** (0.1248)	-0.5946*** (0.1241)	-0.5327*** (0.1255)	-0.4992*** (0.1252)	-0.3699*** (0.1293)	-0.0734
Marital Status (Ref.=Married)							
Free union	-0.0245 (0.0576)	-0.0277 (0.0579)	0.0156 (0.0581)	-0.0438 (0.0763)	0.0274 (0.0578)	-0.0413 (0.0594)	-0.0066
Separated	-0.0740 (0.0751)	-0.0645 (0.0754)	-0.0542 (0.0759)	-0.0763 (0.0643)	-0.0814 (0.0751)	-0.0769 (0.0776)	-0.0126
Divorced	-0.1737* (0.0751)	-0.1501 (0.0754)	-0.1715* (0.0759)	-0.1775* (0.0643)	-0.1794* (0.0751)	-0.1632 (0.0776)	-0.0285

	(0.1003)	(0.1015)	(0.1015)	(0.1016)	(0.1006)	(0.1039)	
Widowed	-0.0738	-0.0755	-0.0655	-0.0266	-0.0784	-0.0620	-0.0102
	(0.1349)	(0.1350)	(0.1376)	(0.1360)	(0.1348)	(0.1383)	
Never married	-0.1301**	-0.1213**	-0.1355**	-0.1578***	-0.1397**	-0.1387**	-0.0230
	(0.0575)	(0.0578)	(0.0578)	(0.0586)	(0.0576)	(0.0596)	
Town size (Ref=Rural)	0.1492*** (0.0483)	0.1427*** (0.0486)	0.1358*** (0.0487)	0.1268*** (0.0491)	0.1576*** (0.0484)	0.1230** (0.0500)	0.0200
Geographic region (Ref.=Ciudad de México)							
Northwest	0.0922	0.0456	0.0541	0.0360	-0.0809	0.0701	0.0107
	(0.0994)	(0.0997)	(0.1002)	(0.1015)	(0.0996)	(0.1032)	
Northeast	-0.3213***	-0.3122***	-0.2905***	-0.2312**	-0.3306***	-0.2144**	-0.0372
	(0.0982)	(0.0983)	(0.0988)	(0.1000)	(0.0984)	(0.1014)	
West	-0.3679***	-0.3394***	-0.3296***	-0.2974***	-0.3626***	-0.2208**	-0.0382
	(0.0978)	(0.0981)	(0.0985)	(0.0995)	(0.0980)	(0.1011)	
Central-South	-0.2089**	-0.2050**	-0.1735*	-0.1676	-0.2135**	-0.1258	-0.0210
	(0.1022)	(0.1024)	(0.1031)	(0.1040)	(0.1024)	(0.1055)	
South	-0.3040***	-0.2809***	-0.2584**	-0.2423**	-0.2968***	-0.1951*	-0.0335
	(0.1005)	(0.1006)	(0.1013)	(0.1022)	(0.1007)	(0.1036)	
Job position (Ref.=employee)							
Day labor	0.3490***	0.3729***	0.3540***	0.3466***	0.3696***	0.3216**	0.0419
	(0.1250)	(0.1258)	(0.1266)	(0.1263)	(0.1248)	(0.1296)	
Self-employed	-0.0269	0.0230	-0.0249	-0.0167	-0.0277	0.0300	0.0047
	(0.0501)	(0.0507)	(0.0506)	(0.0507)	(0.0502)	(0.0519)	
Employer	-0.3831***	-0.3033**	-0.3780***	-0.3485**	-0.3695***	-0.2550**	-0.0474
	(0.1210)	(0.1219)	(0.1211)	(0.1216)	(0.1214)	(0.1243)	
Monthly income (Ref.=Quartile 1)							
Quartile2	-0.1943***	-0.1839***	-0.1933***	-0.1542**	-0.1929***	-0.1372**	-0.0226
	(0.0652)	(0.0656)	(0.659)	(0.0662)	(0.0653)	(0.0674)	
Quartile3	-0.3121***	-0.2952***	-0.2865***	-0.2316***	-0.3170***	-0.1942***	-0.0333
	(0.0713)	(0.0718)	(0.0722)	(0.0725)	(0.0715)	(0.0739)	
Quartile4	-0.6965***	-0.6555***	-0.6931***	-0.5576***	-0.6906***	-0.5019***	-0.0940
	(0.0686)	(0.0460)	(0.0693)	(0.0707)	(0.0688)	(0.0723)	
Financial literacy	-0.1009*** (0.0262)					-0.0710*** (0.0271)	-0.0112
Savings account		-0.3865*** (0.0460)				-0.3005*** (0.0474)	-0.0534
Sophisticated account		-0.0633 (0.1131)				-0.0456 (0.1155)	-0.0074
Informal savings			-0.4202*** (0.0467)			-0.3515*** (0.0481)	-0.0527
Overspending				0.4373*** (0.0447)		0.4035*** (0.0456)	0.0638
Assets owning				-0.2029*** (0.0472)		-0.1410** (0.0482)	-0.0221

Financial education					-0.3477*** (0.0601)	-0.2759*** (0.0616)	-0.0506
Number observations	7251	7251	7251	7251	7251	7251	
Mean dependence variable	0.8833	0.8833	0.8833	0.8833	0.8833	0.8833	
McFadden's R ² :	0.0875	0.979	0.1009	0.1074	0.0909	0.1346	
Number of correctly predicted cases	6405 (88.3%)	6404 (88.3%)	6404 (88.3%)	6402 (88.3%)	6401 (88.3%)	6401 (88.3%)	
f(beta'x)	0.173	0.171	0.168	0.166	0.173	0.158	
Likelihood ratio test: $\chi^2(g.l)$	$\chi^2(27) = 457.342$ [0.0000]	$\chi^2(28) = 511.726$ [0.0000]	$\chi^2(27) = 527.176$ [0.0000]	$\chi^2(28) = 561.349$ [0.0000]	$\chi^2(27) = 474.902$ [0.0000]	$\chi^2(33) = 703.625$ [0.0000]	

Note: The dependent variable Financial Fragility equals one and zero otherwise.

Ref.= Reference variable. The value within the first bracket is the standard error value. Significance levels * p<0.05; ** p<0.01; *** p<0.001.

Source: Author's elaboration.

Table 6 shows the summary of hypotheses, models and research results.

Table 6. Hypotheses, models and research results.

Hypotheses	Model	Results
H1: Financial literacy has a negative and statistically significant effect on the probability of being financially fragile.	Models 1 and 6	The hypothesis is not rejected.
H2: Financial inclusion has a negative and statistically significant effect on the probability of being financially fragile.	Models 2 and 6	The inclusion hypothesis in its most basic form is not rejected.
H3: Financial education has a negative and statistically significant effect on the probability of being financially fragile.	Models 5 and 6	The hypothesis is not rejected.
H4: Holding informal savings has a negative and statistically significant effect on the probability of being financially fragile.	Models 3 and 6	The hypothesis is not rejected.
H5: The sociodemographic variables (gender, age, educational level, marital status, town size, geographic region, job position and income) are related to the probability of being financially fragile.	Model 6	For the following variables, the hypothesis is not rejected: age, educational level, town size, geographic region, job position and income.

Source: Author's elaboration.

5. Discussion

The empirical results of this research show the importance of financial literacy, financial inclusion, financial education and having savings to face financial fragility. According to the definition of financial fragility used, 88.33% of the sample is financially fragile and only 11.67% is not considered financially fragile. The result regarding the fragility group exceeds the percentage found by other studies (Arellano *et al.*, 2020; OECD, 2020a; Hasler *et al.*, 2018; Cziriak, 2022; Friedline and West, 2016). In our results, 21% of those surveyed have a savings account at a bank or financial institution, similar to the 25% reported by Demirgüç-Kunt *et al.* (2022); 62.1% save informally, higher than the 23% reported by OECD (2020a). The 9.54% declare to be financially educated, which differs from some abroad populations like the 21% reported by Wagner (2019) and the 6% found by Friedline and West (2016) and 48.64% declare having had an experience of overspending, similar to the 46% found by Hasler *et al.* (2018).

The Probit model results provide evidence that financial literacy has a negative and significant effect on the probability of being financially fragile. This result is consistent with Cziriak (2022), Lusardi *et al.* (2021), Nikolaos & Christos (2020), Hasler *et al.* (2018), Lusardi *et al.* (2011), and differs from Ramli *et al.* (2022) and Cardona-Montoya *et al.* (2022). The marginal effect of financial literacy on the probability of being financially fragile is 1.54%, while in Hasler *et al.* (2018) the effect varies between 2% and 7% depending on the characteristics of the population. Likewise, it differs from the result obtained by Friedline and West (2016), whose marginal effect is 176%.

The results of the model provide evidence that the holding of savings (formal and informal) is the second most robust predictor. Having formal savings decreases the probability (5.34%) of being financially fragile. The direction of the effect coincides with Roa and Villegas (2022) and Friedline and West (2016), but in the latter, the effect is 80.4%, while in Ramli *et al.* (2022) the relationship between both variables is very low. In the case of informal savings, the marginal effect is 5.27%, whose direction of effect (negative) coincides with Roa and Villegas (2022).

The results of this research also show a negative and significant relationship between financial education and financial fragility (with a marginal effect of 5.06%). The direction of the effect coincides with Cardona-Montoya *et al.* (2022), while it differs, in the magnitude of the effect, with Lusardi *et al.* (2011) and Friedline and West (2016), with 10.2% and 33.9%, respectively. The possession of assets has a negative and significant effect on the probability of being financially fragile, whose marginal effect is 2.21%. This result coincides in the direction of the effect with Friedline and West (2016) and Cziriak (2022), but differs in the magnitude of the marginal effect of 56.8% and 13%, respectively.

From the Probit model, it is evident that those who indicated having had a negative financial shock on income during the last year, are more likely to be very financially fragile (with a marginal effect of 6.38%); whose direction of effect coincides with Ramli *et al.* (2022), Cziriak (2022) and Hasler *et al.* (2018). In the latter, the magnitude of the effect varies between 4% and 10% depending on the characteristics of the population.

Regarding sociodemographic characteristics, in our model, there is no significant difference between men and women, regarding financial fragility. This result differs from other researches like Cziriak (2022); Lusardi *et al.* (2011) and Hasler *et al.*, (2018). Likewise, it is more likely that people are very financially fragile according to their sociodemographic characteristic: lower income (first

quartile), low educational level (primary), according to their marital status (single) and according to their employment position (day laborers). In general terms, these results are consistent with Cziriak (2022), Hasler *et al.* (2018), Roa and Villegas (2022), Friedline and West (2016) and Lusardi *et al.* (2011).

6. Conclusion

This research adds to the growing literature that demonstrates how financial literacy, financial education, financial inclusion and savings holdings (formal and informal), are variables significantly related to the possibility that a person who stopped receiving income could be able to cover their expenses for a period of at least six months.

The results of this research are consistent with those found by previous studies and highlight the importance that it must have for the state to design strategies that contribute to promoting financial education and financial inclusion. To achieve this goal, the evaluation of both variables is a fundamental first step. The national survey collects information that allows us to broadly understand the level of financial inclusion of Mexicans. However, in terms of financial education, the survey only ask if the participants have taken any course on budgeting, savings or credit. Having more information about the financial topics that Mexicans have studied and about the teaching-learning strategy would allow their effectiveness to be measured and would support the design of a national financial training strategy.

From the statistical estimates, a high percentage of Mexicans (88.33%) is in an evident financial fragility condition. Around two thirds (62.16%) save informally, in contrast to 21.46% of people who have a savings account at a bank or a financial institution. Likewise, one out of ten people in the sample declared to be financially educated and one out of five people answered the three financial literacy questions correctly, which indicates low financial literacy in Mexico. Coinciding with international results, the educational level is a significant variable related to the habit of saving and in this sense fundamental to face a financial emergency. Almost half of the sample analyzed in this study has secondary school as their maximum educational level. Therefore, it is recommended to include in school curricula, no later than secondary school, training in personal finance and the development of mathematical skills that increase people's analytical capacity for greater financial decision-making.

Sociodemographic variables are also related to the probability of being very financially fragile. It is more likely that people, male, with lower income (first quartile), low educational level (primary), according to their marital status (single) and according to their employment position (day laborers) are very financially fragile. Considering these determinants in the design of the educational strategy can help focus effort on vulnerable populations, who need to resolve the short term and at the same time include uncertainty and the long term in their plans.

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