



Financial literacy and retirement savings of Mexicans during the COVID-19 pandemic

Alfabetización financiera y ahorro para el retiro de los mexicanos durante la pandemia de Covid-19

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Received January 12, 2024; accepted March 20, 2024
Available online April 1, 2024

Abstract

The research aims to analyze how Mexicans' retirement savings changed during the Covid-19 pandemic and determine whether the change depended of their financial literacy level, their financial education, and their socioeconomic and demographic characteristics. A multinomial Logit model was estimated with data from the National Financial Inclusion Survey corresponding to 2021 and 2018. The results show a significant increase of 5.76% of people who saved formally for retirement in 2021 compared to 2018 and a decrease 3.91% of those who saved informally. There is evidence that supports the hypotheses of the positive and significant effect of financial literacy and financial education on retirement savings. Except for having a sophisticated account, the change in retirement savings was based on socioeconomic and demographic characteristics. The results highlight the importance of financial literacy and financial education in people's ability to face the uncertainty generated by a crisis such as the COVID-19 pandemic.

JEL Code: G50, G51, G53

Keywords: Covid-19; financial literacy; financial education; retirement saving

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Peer Review under the responsibility of Universidad Nacional Autónoma de México.

<http://dx.doi.org/10.22201/fca.24488410e.2025.5419>

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Resumen

Esta investigación tiene como objetivo analizar como cambió el ahorro para el retiro de los mexicanos durante el periodo de pandemia y determinar si el cambio estuvo en función de su nivel de alfabetización financiera, su educación financiera y sus características socioeconómicas y demográficas. Se estima un modelo Logit multinomial con datos de la Encuesta Nacional de Inclusión Financiera correspondientes a 2021 y 2018. Los resultados evidencian un aumento significativo del 5.76% de personas que ahorraron de manera formal para el retiro en el 2021 con respecto al 2018 y una disminución de 3.91% de los que ahorraron de manera informal, así como del incremento de la probabilidad de ahorrar para el retiro de manera formal y la disminución de la probabilidad del ahorro informal y del no ahorro en el mismo periodo. Se tiene evidencia que apoya las hipótesis del efecto positivo y significativo de la alfabetización financiera y la educación financiera sobre el ahorro para el retiro. A excepción de tener una cuenta sofisticada, el cambio en el ahorro para el retiro sucede en función de las características socioeconómicas y demográficas. Los resultados remarcan la importancia que tienen la alfabetización y la educación financieras en la capacidad de las personas para afrontar la incertidumbre generada por una crisis como la de pandemia de COVID-19.

Código JEL: G50, G51, G53

Palabras clave: ahorro para el retiro; alfabetización financiera; educación financiera; Covid-19

Introduction

Saving for retirement has become a personal responsibility. The low benefits paid by the public pension system drive individuals to accumulate more capital during their working life and manage their resources in the decumulation phase. To achieve this, a good level of financial literacy is key (Kurach et al., 2020). Financial literacy is an important factor that impacts personal finance and wealth accumulation in general and behavior toward retirement savings in particular (Lusardi, 2008; Behrman et al., 2010; Lusardi & Mitchell, 2011a; Cupák, Kolev, & Brokešová, 2019; Chen & Chen, 2023). Financial literacy also determines activities aimed at retirement planning, such as being aware of and properly selecting financial products that contribute to investing adequately in preparation for old age (Harahap et al., 2022).

Financial literacy is the capacity that individuals must acquire to process economic information correctly and make well-informed decisions that enable them to understand terms such as wealth accumulation, debt, and pensions (Lusardi & Mitchell, 2014). For their part, Atkinson and Messy (2012) define it as a set of financial knowledge, attitudes, and behaviors necessary for better economic and social well-being. People with a high level of financial literacy are much more likely to plan for their retirement, which will likely leave them in a better economic position (Lusardi & Mitchell, 2011b).

Good levels of financial literacy are important in day-to-day decision-making and indispensable in times of crisis. Nevertheless, according to the results of the latest application of the National Financial

Inclusion Survey (ENIF, 2021; Spanish: Encuesta Nacional de Inclusión Financiera), the financial literacy index for Mexico was 57 points, comparable to that of other emerging economies but low compared to developed countries. In addition, according to the ENIF (2021), in Mexico, the percentage of the population with a retirement savings account is only 39.1% (CNBV, 2022; Spanish: Comisión Nacional Bancaria y de Valores). As Hernández-Mejía and Moreno-García (2023) state, most of Mexico's labor force is without protection for their adult years.

These conditions of low levels of financial literacy and poor pension system coverage were present in Mexico during the COVID-19 pandemic. The recent pandemic generated a shock wave that affected the world economy and triggered the biggest crisis in over a century (World Bank, 2022). The isolation measures implemented to reduce the spread of the virus caused major economic disadvantages. As the duration of the security measures implemented in the pandemic lengthened, unemployment rates increased (Celik, Ozden, & Dane, 2020), and due to job losses and wage cuts, people were forced to use their savings or borrow (Gopal & Malliasamy, 2022).

The pandemic significantly impacted the economy in Mexico and occurred at three points. The first was for states whose main economic activity is tourism, such as Quintana Roo and Baja California Sur. These states were affected by the cancellation of international flights. The second phase was the closure of non-essential activities, mainly affecting the service sector and some manufacturing sectors. The third phase was an uneven and slow reopening process that generated uncertainty in most of the population (Esquivel, 2020).

The objective of this research is to analyze the impact that the COVID-19 pandemic had on the retirement savings of Mexicans and whether this changed as a function of the level of financial literacy, financial education, and the socioeconomic and demographic characteristics of the population. Based on the above, the following questions arise: How did Mexicans' retirement planning change during the pandemic period, and did financial literacy, financial education, and socioeconomic and demographic characteristics influence how they saved for retirement during the pandemic period? The literature review follows. Section 3 presents the research methodology. The results are presented in section 4, discussed in section 5, and finally, section 6 shows the conclusions.

Review of the literature

Saving for retirement during uncertain times

Saving can be considered a critical tool in households to meet financial expectations and improve well-being (Kumarasinghe & Munasinghe, 2016). Fisher and Montalto (2010) and Le Blanc et al. (2015) found

that emergency and retirement savings were the reasons that most increased the probability of saving. According to Mody, Ohnsorge, and Sandri (2012), uncertainty about future income and economic stability is another strong motivator of household savings.

Savings behavior changes when uncertainty increases, and in the face of the COVID-19 economic crisis, the savings rate in households showed important changes (Villar, Jiménez, & Sánchez, 2023). In this respect, Jin et al. (2021) found that, in cases of public health emergency, people are more willing to save money than to spend it, although Ellmeier, Koch, and Scheiber (2023) showed that very few people increased their savings during the pandemic and these were people with high levels of income and education. Gopal and Malliasamy (2022) found that the uncertainty caused by the pandemic caused people to be willing to cut a portion of their savings dedicated to preventive and safe living purposes and channel them into emergency savings.

Pozzi and Sabada (2022) agree with the increase in emergency savings during the pandemic, albeit by the wealthiest households, while the rest of the households had to adapt and reduce their consumption according to their reduced income and credit restrictions.

The OECD (2020) has identified several potential challenges to retirement savings that could result from the COVID-19 pandemic, including a decline in asset values and retirement savings financial products and, crucially, a reduction in the ability of many to contribute to their savings plans. Based on this evidence, hypotheses one and two of the research arise:

H1. During the COVID-19 pandemic, the number of Mexicans saving for retirement decreased.

H2. During the COVID-19 pandemic, Mexicans were less likely to save for retirement.

Financial literacy and retirement savings

Financial literacy is an essential life skill and is high on the policy agenda in many countries (OECD, 2014). Efforts have been made around the world to measure levels of financial literacy, and the results in both developed and developing countries show that financial literacy levels are generally low (Lusardi, 2019). There is sufficient evidence in the scientific literature that financial literacy has a significant and positive relation with retirement savings (Chen & Chen, 2023; Hauff et al., 2020; Nolan & Doorley, 2019; Kalmi & Ruuskanen, 2018; Dolls et al., 2018; Meir, Mugerman, & Sade, 2016; Bucher-Koenen & Lusardi, 2011). The more literate an individual is, the more they plan for retirement (Safari, Njoka, & Munkwa, 2021).

On the other hand, low levels of financial literacy have been found to negatively affect well-being during retirement (Lusardi, Mitchell, & Curto, 2014). The COVID-19 pandemic has reinforced the

argument that financial literacy is an important tool in retirement planning (Hasler et al., 2023). These authors found that those with higher financial literacy are 12.2 percentage points more likely to plan for retirement. From these findings, hypothesis three of the research arises:

H3. Retirement savings for Mexicans during the pandemic changed as a function of their levels of financial literacy.

Retirement savings and socioeconomic and demographic characteristics

Sociodemographic characteristics have been found to impact retirement planning (Mansor et al., 2015; Yao & Cheng, 2017). Retirement planning has a significant relation with people's age (Yusof & Sabri, 2017; Zazili et al., 2017; Demirgüç-Kunt, Klapper, & Panos, 2016), their educational and income level (Fabian et al., 2022; Mansor et al., 2015; Yang & DeVaney, 2012), and gender. Van Rooij, Lusardi, and Alessie (2012), Ntalianis and Wise (2011), Lotto and Tokic (2020), and Tomar et al. (2021) concluded that men tend to be better prepared to plan for retirement than women. Financial inclusion has also increased formal retirement savings (Bogan, 2023). Celerier and Matray (2019) showed that financial inclusion fosters household wealth accumulation. Therefore, financial inclusion facilitates retirement preparedness. Based on this evidence, the fourth hypothesis states the following:

H4. Mexicans' retirement savings during the pandemic changed according to socioeconomic and demographic characteristics.

Financial education and retirement savings

Financial education is the teaching process that aims to lead to financial literacy, promoting financial empowerment and individual well-being, motivating people to change their financial behavior, and inducing them to make informed financial decisions (OECD, 2014). Financial education can have an effect on retirement savings (Harvey & Urban, 2023; Kaiser et al., 2021; Fernandes, Lynch, & Netemeyer, 2014), increasing the probability of saving for retirement and the amount set aside for this purpose (Kaiser et al., 2021).

The results of Hasler et al. (2023) showed that those adults who took a financial education course were 16.6 percentage points more likely to plan for retirement than those who did not. Positive financial outcomes, such as retirement savings, occur when people have financial knowledge, skills, and access to financial products (Sherraden, 2013). As expressed by Lusardi (2019) and Clark, Lusardi, and Mitchell

(2015), financial education has become a critical tool for making informed decisions regarding retirement planning and investment portfolios with better returns. Derived from the above, the fifth research hypothesis arises:

H5. Mexicans' retirement savings during the pandemic changed as a function of their level of financial education.

Methodology

This research aims to analyze how the retirement savings of Mexicans changed during the pandemic and whether this change was a function of their financial literacy, financial education, and socioeconomic and demographic characteristics. For this purpose, data from the National Financial Inclusion Survey (ENIF) corresponding to the year 2021 (INEGI, 2022; Spanish: *Instituto Nacional de Estadística y Geografía*) and 2018 (INEGI, 2019). The sample design of the ENIF is characterized as probabilistic and stratified was used. The survey is representative of the country's adult population and enables disaggregation at the regional level (CNBV, 2022). The sample comprised 11 500 people in 2021 and 10 863 in 2018, aged between 18 and 65, who reported not having retired during the survey. The frequency distribution of the participants, by sociodemographic characteristic, is presented in Table 1.

Table 1
 Socioeconomic and demographic characteristics of Mexicans

Variable	Category	2018 N=10863		2021 N=11500	
		Total	Percentage	Total	Percentage
Gender	Female	6004	55.27%	6229	54.17%
	Male	4859	44.73%	5271	45.83%
Location	Rural	2591	23.85%	4219	36.69%
	Urban	8272	76.15%	7281	63.31%
Region	1. Northwest	2031	18.70%	2135	18.57%
	2. Northeast	1996	18.37%	2027	17.63%
	3. West	2028	18.67%	2214	19.25%
	4. Mexico City	640	5.89%	768	6.68%
	5. Central South and				
	East	2091	19.25%	2138	18.59%
Age	6. South	2077	19.12%	2218	19.29%
	18-27	2570	23.66%	2613	22.72%
	28-37	2788	25.67%	2980	25.91%
	38-47	2563	23.59%	2658	23.11%
	48-57	1893	17.43%	2071	18.01%
	58-67	1049	9.66%	1178	10.24%

Educational level	No schooling	379	3.49%	305	2.65%
	Primary and Secondary School	5963	54.89%	5603	48.72%
	Baccalaureate	2377	21.88%	2889	25.12%
	Undergraduate and Postgraduate	2141	19.71%	2703	23.50%
Monthly income*	No income	3298	30.00%	3917	33.33%
	Quartile 1	1891	17.50%	1957	16.65%
	Quartile 2	1891	17.50%	1957	16.65%
	Quartile 3	1891	17.50%	1957	16.65%
	Quartile 4	1891	17.50%	1957	16.65%
Marital status	Cohabiting	2514	23.14%	2655	23.09%
	Separated	880	8.10%	1036	9.01%
	Divorced	322	2.96%	357	3.10%
	Widowed	327	3.01%	353	3.07%
	Married	4439	40.86%	4321	37.57%
	Single	2381	21.92%	2778	24.16%
Occupation	Economically Active Population (EAP)	7457	68.64%	8404	73.07%
	Student	391	3.60%	376	3.27%
	Housekeeping	2397	22.07%	2023	17.59%
	Disabled	51	0.47%	68	0.59%
	Not working	567	5.22%	599	5.21%
Job position	Unpaid worker in a family business	391	3.60%	573	4.98%
	Employee or worker	4978	45.83%	5400	46.96%
	Day laborer	540	4.97%	521	4.53%
	Self-employed	1959	18.03%	2296	19.97%
	Employer	151	1.39%	156	1.36%
	Did not help or work (unemployed, unable to work due to disability).	2843	26.18%	2554	22.21%

Source: created by the authors

* Average income expressed in US dollars (USD). The average peso/dollar exchange rate observed in the survey application period was between April 30 and June 22, 2018 (19.81 MXN per USD) and between June 28 and August 13, 2021 (19.96 MXN per USD). Calculated with data from Banco de México's foreign exchange market webpage. <https://www.banxico.org.mx/tipcamb/main.do?page=tip&idioma=sp>
 In 2018, quartile 1 (average: 99.82 USD), quartile 2 (average: 211.02 USD), quartile 3 (average: 319.41 USD), quartile 4 (average: 720.49 USD). In 2021, quartile 1 (average: 130.78 USD), quartile 2 (average: 269.07 USD), quartile 3 (average: 382.77 USD), quartile 4 (average: 828.76 USD)

The dependent variable in this research is retirement savings, measured by question 9.8 of the ENIF 2021 and question 9. 9 of the ENIF 2018: "In your old age, do you plan to cover your expenses with what you receive from 1) government support for older adults; 2) your pension, retirement, Afore or private retirement plan; 3) selling or renting goods or properties (vehicles, houses, livestock, etcetera); 4)

money given to you by your spouse or partner, daughters, sons or other relatives, 5) other.” For each alternative, you can respond with “Yes, No, I do not know” (INEGI, 2022).

Based on the methodology of Klapper and Panos (2011), three retirement savings strategies are defined according to the response alternatives: strategy 1) No savings, defined by alternatives 1, 4, and 5; strategy 2) formal savings, defined by alternative 2; strategy 3) informal savings, defined by alternative 3. It is worth mentioning that the alternative “other,” included in the group of non-savers, was chosen by only one respondent. Thus, the group of non-savers comprises those who, in their old age, plan to cover their expenses with the support they receive from the government and money given to them by someone else. For the design of the statistical model, the retirement savings variable is coded as an unordered categorical variable that takes the values 0, 1, and 2 for the strategies no savings, formal savings, and informal savings, respectively. An Excel spreadsheet is used for the grouping process.

Lusardi and Mitchell (2008, 2011a, 2011c) proposed to assess financial literacy with three fundamental concepts that are the basis for financial decision-making. These concepts are (1) arithmetic related to calculating interest rates and understanding interest compounding, (2) understanding inflation, and (3) understanding risk diversification (Lusardi, 2019). Based on this approach, three questions from the ENIF (2018 and 2021) were used to measure financial literacy. For each financial literacy question, a dichotomous variable is designed: 1 if the respondent answers correctly and 0 if the respondent answers incorrectly (Lusardi & Mitchell (2011a).

Following the methodology of Lusardi and Mitchell (2011b), two financial literacy indices are designed. Index 1) all correct answers (coded as a dichotomous variable, which takes the value of 1 if the respondent answers all three questions correctly, and 0 if they answer 2 questions or less correctly); index 2) sum of correct answers (coded as an ordinal categorical variable that takes integer values in the range of 0 to 3). The coding of the independent, socioeconomic, and demographic variables is presented in Table 2.

Table 2
Coding of respondent’s demographic and socioeconomic variables

Variable	Variable type	Question number (INEGI, 2019)	Question number (INEGI, 2022)	Operationalization
Gender	Dichotomous	2.3	2.4	Categories: Male, Female. Dichotomous: 1 if male, 0 if female (Yao & Cheng, 2017)
Age	Continue	2.4	2.5	Ordinal variable expressed in years. The categories are designed as proposed in Van Rooij, Lusardi,

				and Alessie (2012): 17-27, 28-37, 38-47, 48-57, 58-67 years. Base category: 17-27 years (proposed by the authors)
Educational level	Categorical	3.4	3.1	Categories: No education, primary or secondary school, baccalaureate, bachelor's, master's, or doctoral degree (Secretaría de Educación Pública, 2021). A dichotomous variable is designed for each category (Van Rooij, Lusardi, & Alessie, 2012). Base category: No schooling
Marital status	Categorical	3.2	3.2	Categories: Cohabiting, separated, divorced, widowed, married, single. A dichotomous variable is designed for each category. Base category: married (Demirgüç-Kunt, Klapper, & Panos, 2016)
Occupation	Categorical	3.5	3.5	Categories: Employed (EAP), student, housework, retired, disabled, not working. A dichotomous variable is designed for each category. Base category: employed (Demirguc-Kunt, Klapper, & Panos, 2016)
Job position	Categorical	3.7	3.7	Categories: Unpaid worker, employee or laborer, day laborer, self-employed, employer, did not help or work. A dichotomous variable is designed for each category. Base category: unpaid worker (Demirguc-Kunt, Klapper, & Panos, 2016)
Monthly income *	Quantitative	3.8a, 3.8b	3.8a, 3.8b	Income quartiles are designed (Demirguc-Kunt, Klapper, & Panos, 2016), expressed in dollars, at the average peso/dollar exchange rate. A dichotomous variable is designed for those who reported having no income and for each quartile. Base category: no income
Location	Dichotomous	Identification question	Identification question	Rural location: 1 to 14 999 inhabitants; Urban location: 15 000 or more inhabitants (INEGI, 2022). Dichotomous: 1 if the respondent lives in an urban area, 0 if the respondent lives in a rural area

Region	Categorical	Identification question	Identification question	Regions of Mexico: Northwest, Northeast, West and Bajío, Mexico City (CDMX), Central South and East, South (INEGI, 2022). A dichotomous variable is constructed for each region. Base category: CDMX
Afore	Dichotomous	9.1	9.1	Categories: Has AFORE, Does not have AFORE. Dichotomous: 1 has, 0 does not have (Demirguc-Kunt, Klapper, & Panos, 2016)
Savings account	Dichotomous	5.9.4	5.4.4	Categories: Has savings account, Does not have savings account. Dichotomous: 1 has a savings account, 0 does not have (Demirguc-Kunt, Klapper, & Panos, 2016)
Sophisticated account	Dichotomous	5.9.5, 5.9.6, 5.9.7	5.4.5, 5.4.6, 5.4.7	Categories: Has a sophisticated account, does not have a sophisticated account. Dichotomous: value 1 is assigned if the person has one of the following accounts: checking, fixed-term deposit, mutual fund, 0 if the person has none (Demirguc-Kunt, Klapper, & Panos, 2016)
Wealth	Dichotomous	13.2.1, 13.2.3	14.2.1, 14.2.3	Categories: Owns wealth, does not own wealth. Dichotomous: value 1 is assigned if the person owns a house or apartment or has land for cultivation or housing, 0 if none (Yao & Cheng, 2017)
Income shock	Dichotomous	4.5	4.3	Categories: Had shocks, did not have shocks. Dichotomous: 1 if the person reports one overdraft per month, 0 if the person has none (Lusardi & Mitchell, 2011b)
Financial education	Dichotomous	4.7	4.5	Categories: Financially qualified, financially unqualified. Dichotomous: 1 if the person reported having taken a financial course; 0 if the person did not take any financial course (Hasler et al., 2023)

Source: created by the authors with information from the ENIF 2018 and 2021

A multinomial logit regression model was used, enabling the relation between individuals' savings decisions and financial literacy, financial education, and socioeconomic and demographic

variables for each year. Significant variables related to respondents' retirement savings were identified, and probabilities were calculated for each alternative.

Model description

A multinomial logit model based on profit theory was used for an individual's decision about their specific characteristics, as presented by Greene (1999). For the probability that an individual i belonged to category $j = 1, 2, \dots, J$ was modeled as follows:

$$Prob(Y_i = j) = \frac{e^{B'_j x_i}}{\sum_{k=0}^J e^{B'_k x_i}} \quad j = 0, \dots, J$$

In this model, the decision for any of the alternatives depends on the characteristics of X_i . In this study, the following equations were defined:

$$Prob(Y = 0/x) = 1 - Prob(Y = 1/x) - Prob(Y = 2/x)$$

$$Prob(Y = 1/x) = \frac{e^{B'_1 x_i}}{1 + e^{B'_1 x_i} + e^{B'_2 x_i}}$$

$$Prob(Y = 2/x) = \frac{e^{B'_2 x_i}}{1 + e^{B'_1 x_i} + e^{B'_2 x_i}}$$

Two parameter vectors, B'_1 and B'_2 , of size k were estimated using a likelihood function. The estimation showed the determinants of the savings decision for the three categories. The adjusted probabilities for each category, the marginal effect, and the effect of the change in variable X_i on the absolute probability of choosing any of the alternatives were calculated. In order to calculate the marginal effect of the binary variable, from $x_k = 0$ to $x_k = 1$, the equations were evaluated at the mean value of the independent variables. The dependent variable, retirement savings y_i , was coded with three unordered alternatives (0: non-savers, 1: formal savers, 2: informal savers). The independent variables x_i were: financial literacy, gender, age, educational level, monthly income, marital status, occupation, job position, locality, region, having an AFORE (Spanish: Administradora de Fondo para el Retiro), having a savings account, having a sophisticated account, wealth, income shocks, and financial education.

Results

Table 3 presents the retirement savings results for the 2021 and 2018 samples. In the comparison, the ratio of those saving formally is higher in 2021 than in 2018, with a difference of 5.76 percentage points. The difference is statistically significant ($Z=8.61$; $P\text{-value}=0.000$). The proportion of people who did not save for retirement is lower in 2021 compared to 2018. This difference is significant ($Z=-2.77$; $P\text{-value}=0.005$). Comparing those who save informally for retirement, the proportion in 2021 is lower than in 2018, with a difference of 3.91 percentage points. The difference is statistically significant ($Z=-8.12$; $P\text{-value}=0.000$). These results partially support hypothesis 1.

Table 3
Retirement savings for samples

Category	Retirement savings		Difference in proportions: $\tilde{p}_{2021} - \tilde{p}_{2018}$	Z-statistic (P-value)
	ENIF 2018 N=10863	ENIF 2021 N=11500		
No retirement savings	n=3979 (36.63%)	n=4008 (34.85%)	-1.78%	-2.77 (0.005)
Formal savings	n=4997 (46.00%)	n=5952 (51.76%)	5.76%	8.61 (0.000)
Informal savings	n=1887 (17.3%)	n=1540 (13.39%)	-3.91%	-8.12 (0.000)

Note: The Z-statistic is used for the difference of proportions test.

Source: created by the authors with information from the ENIF 2018 and 2021

Tables 4 and 5 present the results of the multinomial logit model of retirement savings and its relation to the socioeconomic and demographic variables for the 2021 and 2018 samples. The results in Table 4 used financial literacy index 1, and Table 5 used index 2. The results of the significant variables are interpreted.

Comparing the results in Table 4, the probability of saving formally is higher in 2021 compared to 2018, both for the group that answered all three financial literacy questions correctly and for those who answered two or fewer. The difference is 5.33 percentage points among those who answered all three questions correctly and 7.85 percentage points for those who answered two or fewer. The probability of saving informally is lower in 2021 compared to 2018 for those who answered all questions correctly and those who did not.

Based on the results in Table 5, for each additional question answered correctly, the probability of saving formally is higher for 2021 than the 2018 results. The results partially support hypothesis H2 and show that the probability of saving increased for those with a pension or formal retirement savings

plan; nevertheless, there was a decrease in the probability of saving for retirement for those who did so informally.

In the results of Tables 4 and 5, retirement savings are positively related to financial literacy indicators for both periods. In Table 4, those who answered all three financial literacy questions correctly in 2021 were 2.97 percentage points more likely to save formally than those who did not answer all of them correctly (56.69 vs. 53.72 percentage points, respectively). In 2018, this difference was 5.49 percentage points. Regarding informal savings, in 2021, the result is not significant.

Table 4
Adjusted probability values (%) from multinomial logistic regression model

Socioeconomic and demographic characteristics	Categories	Model 1 (ENIF 2018)			Model 1 (ENIF 2021)		
		No savings	Formal savings	Informal Savings	No savings	Formal savings	Informal savings
Financial literacy (Indicator 1)	All answers are correct	29.33	51.36***	19.31***	29.44	56.69**	13.87
	Two correct answers or less	35.45	45.87	18.67	32.60	53.72	13.68
Gender	Male	29.37	50.43***	20.21***	31.09	53.77	15.14***
	Female (RC)	38.57	43.82	17.60	32.67	54.71	12.62
Age	18-27 (RC)	14.17	70.88	14.95	2.28	95.59	2.14
	28-37	23.57	58.90***	17.53**	10.65	82.72***	6.63**
	38-47	36.07	45.03***	18.90**	35.11	50.41***	14.47**
	48-57	50.18	31.30***	18.52**	65.00	17.25***	17.75**
	58-67	63.62	19.83***	16.55**	81.31	3.99***	14.70**
Educational level	No schooling (RC)	43.31	37.58	19.11	38.88	48.13	12.99
	Primary or secondary school	27.47	54.52***	18.01**	25.45	60.32***	14.23**
	Baccalaureate	16.18	69.26***	14.56***	18.96	66.14***	14.90***
	Undergraduate or postgraduate degree	11.20	74.60***	14.21***	14.69	71.75***	13.56***
Income	No income (RC)	42.76	39.83	17.42	34.87	51.63	13.49
	Quartile 1	39.09	42.84***	18.06***	33.40	52.99***	13.62***
	Quartile 2	35.14	46.17***	18.69***	31.87	54.40***	13.73***
	Quartile 3	31.47	49.33***	19.20***	30.64	55.54***	13.82***
Marital status	Quartile 4	19.90	59.95***	20.15***	26.08	59.86***	14.06***
	Married (RC)	35.24	45.77	18.99	32.02	54.03	13.95
	Cohabiting	33.65	47.58	18.77	32.73	52.99	14.28
	Separated	34.52	48.33	17.15	34.34	54.24	11.42**
	Divorced	32.80	51.43	15.77	34.05	55.14	10.81
	Widowed	31.15	55.38*	13.47	33.24	55.39	11.37
Occupation	Single	31.03	50.84***	18.13	31.75	55.21	13.05
	EAP (RC)	35.25	45.75	19.00	32.78	53.07	14.15
	Student	13.71	74.36***	11.94*	11.68	84.01***	4.31
	Housekeeping	41.98	38.14***	19.87	35.56	50.17*	14.27
	Disabled	39.78	43.32	16.90	34.03	62.48	3.49
	Not working	38.34	43.54	18.12	29.49	60.20	10.31

Job position	Unpaid worker in a family business (RC)	37.81	34.32	27.87		34.38	47.02	18.61
	Employee or worker	27.75	61.53***	10.72***	28.55	62.00***	9.45***	
	Day laborer	40.17	48.32	11.51***	31.44	60.45	8.11***	
	Self-employed	39.64	41.40**	18.96	38.34	49.24***	12.42**	
	Employer	43.55	34.32**	22.13	40.80	45.40	13.81	
	Unemployed, unable to work due to disability	32.40	52.36	15.24	37.20	52.25*	10.55***	
Location	Rural (RC)	42.48	33.15	24.37	34.58	49.74	15.69	
	Urban	31.55	51.40***	17.05	30.41	56.94***	12.65	
Region	CDMX (RC)	36.47	44.31	19.22	35.14	51.62	13.24	
	Northeast	21.04	65.21***	13.74***	22.02	60.54***	17.44***	
	Northwest	25.29	58.19***	16.51	19.40	65.24***	15.36***	
	West	26.66	52.76***	20.58***	22.17	63.23***	14.60***	
	Central South and East	30.94	42.99	26.07***				
	South	25.32	49.62***	25.07***	23.13	56.06***	20.81***	
AFORE	No (RC)	37.16	40.34	22.49	47.20	33.41	19.39	
	Yes	30.61	54.40***	14.99***	15.12	78.01***	6.87	
Wealth	No (RC)	40.76	42.99	16.25	36.54	51.92	11.54	
	Yes	25.13	51.94***	22.92***	27.25	56.35***	16.4***	
Savings Account	No (RC)	23.59	30.46	45.95	19.19	31.14	49.67	
	Yes	28.90	50.14***	20.95***	26.86	55.30***	17.84**	
Sophisticated account	No (RC)	34.50	46.78	18.72	32.01	54.39	13.60	
	Yes	27.46	50.24	22.31	30.58	52.27	17.15	
Income shock	No (RC)	32.37	48.04	19.60	30.22	55.76	14.03	
	Yes	36.93	45.29***	17.78***	33.83	52.77***	13.40**	
Financial Education	No (RC)	34.67	46.49	18.84	32.50	54.14	13.37	
	Yes	30.48	51.13**	18.39	26.07	55.64**	18.30***	
Dependent variable mean		1.807420			1.785391			
S.D. of the dependent variable		0.709195			0.660618			
Number of 'correctly predicted' cases		= 6927 (63.8%)			= 7942 (69.1%)			
Likelihood ratio contrast		= Chi-square(68) = 4283.49			= Chi-square(68) = 4889.25			
		[0.0000]			[0.0000]			

RC: Reference category; *, **, ***: Statistical significance at 10%, 5%, 1% respectively

Source: created by the authors

Table 5 shows, for both the 2021 and 2018 results, that for each additional question answered correctly, the greater the probability of saving both formally and informally. The results show that those with higher financial literacy are more likely to save for retirement formally and informally, leading to the acceptance of research hypothesis 3.

Table 5
Adjusted probability values (%) from multinomial logistic regression model

Socioeconomic and demographic characteristics	Categories	Model 2 (ENIF 2018)			Model 2 (ENIF 2021)		
		No saving s	Formal savings	Informal Savings	No savings	Formal savings	Informal Savings
Financial literacy.	0	41.25	39.70	19.05	39.36	48.63	12.01
Indicator 2 (Number of correct answers)	1	35.96	44.07***	19.97***	35.14	51.89***	12.97***
	2	30.99	48.34***	20.68***	31.14	54.95***	13.91***
	3	26.40	52.43***	21.17***	27.40	57.78***	14.81***
Gender	Male	27.63	50.49***	21.88***	31.05	53.80	15.15***
	Female (RC)	36.45	44.29	19.26	32.64	54.76	12.61
Age	18-27 (RC)	12.42	71.55	16.03	2.19	95.64	2.17
	28-37	21.32	59.73***	18.96***	10.46	82.86***	6.68**
	38-47	33.60	45.81***	20.59***	35.13	50.42***	14.45**
	48-57	47.95	31.80***	20.25***	65.56	17.05***	17.38**
	58-67	61.97	20.00***	18.03***	82.10	3.87***	14.03**
Educational level	No schooling (RC)	39.28	39.52	21.20	38.32	48.51	13.17
	Primary or secondary school	25.45	55.31***	19.24**	25.86	60.08***	14.06**
	Baccalaureate	16.38	67.78***	15.84***	19.63	65.78***	14.60***
	Undergraduate or postgraduate degree	11.76	72.67***	15.57***	15.40	71.35***	13.25***
Monthly income	No income (RC)	41.23	39.78	18.99	34.83	51.67	13.51
	Quartile 1	37.72	42.64***	19.64***	33.36	53.02***	13.62***
	Quartile 2	33.94	45.80***	20.26***	31.83	54.44***	13.73***
	Quartile 3	30.45	48.80***	20.76***	30.61	55.58***	13.81***
	Quartile 4	19.43	58.90***	21.67***	26.07	59.90***	14.02***
Marital status	Married (RC)	33.28	45.99	20.72	31.98	54.07	13.95
	Cohabiting	31.44	48.11	20.45	32.70	53.01	14.29
	Separated	32.36	48.87	18.76	34.23	54.31	11.46**
	Divorced	30.90	51.94	17.16	34.07	55.10	10.83
	Widowed	28.98	56.33*	14.68	33.21	55.42	11.36
	Single	29.08	51.15***	19.78	31.73	55.22	13.05
Occupation	EAP (RC)	33.05	46.24	20.71	32.72	53.12	14.16
	Student	12.95	74.21***	12.84*	12.00	83.72***	4.28
	Housekeeping	40.05	38.16***	21.79	35.66	50.05*	14.29
	Disabled	36.47	44.94	18.58	33.51	62.89	3.60*
	Not working	36.09	44.10	19.81	29.41	60.24	10.35
Job position	Unpaid worker in a family business (RC)	35.57	33.92	30.51	34.32	47.07	18.62
	Employee or worker	26.10	62.05***	11.85***	28.54	62.02***	9.44***
	Day laborer	37.51	49.84	12.64***	30.87	60.94	8.19***
	Self-employed	37.13	42.15**	20.72	38.44	49.17***	12.39***
	Employer	40.76	35.01**	24.23	41.04	45.21*	13.75
	Unemployed, unable to work due to disability	30.24	53.32	16.44	36.94	52.50*	10.56***
Location	Rural (RC)	38.56	35.75	25.69	34.40	49.86	15.74
	Urban	28.33	54.12***	17.54	30.45	56.92***	12.63

Region	CDMX*	34.31	44.74	20.95	35.09	51.67	13.25
	Northeast	19.40	65.68***	14.92***	21.87	60.85***	17.28***
	Northwest	23.29	58.80***	17.91	19.42	65.24***	15.34***
	West	24.82	52.93***	22.25***	22.33	63.15***	14.52***
	Central South and East	28.70	43.01	28.29***	23.42	55.88***	20.69***
	South	23.26	49.65***	27.09***	21.88	60.35***	17.76***
AFORE	No (RC)	34.80	40.93	24.26	47.05	33.52	19.44
	Yes	28.56	55.27***	16.17***	15.18	77.96***	6.86
Wealth	No (RC)	40.13	42.66	17.20	36.41	52.04	11.55
	Yes	24.61	51.25***	24.13***	27.30	56.32***	16.38***
Savings account	No (RC)	24.61	34.11	41.28	19.21	31.32	49.48
	Yes	27.23	50.12***	22.65***	27.09	55.16***	17.75***
Sophisticated account	No (RC)	32.43	47.15	20.42	31.96	54.44	13.60
	Yes	25.79	50.10	24.11	30.82	52.14	17.04
Income shock	No (RC)	30.15	48.45	21.40	30.22	55.77	14.01
	Yes	34.52	45.91***	19.57***	33.75	52.84***	13.41**
Financial education	No (RC)	32.57	46.88	20.55	32.44	54.19	13.37
	Yes	28.67	51.31**	20.02	26.28	55.52**	18.20***
Dependent variable mean		1.807420			1.785391		
S.D. of the dependent variable		0.709195			0.660618		
Number of 'correctly predicted' cases		= 6960 (64.1%)			= 7952 (69.1%)		
Likelihood ratio contrast		= Chi-square(68) = 4326.87 [0.0000]			= Chi-square(68) = 4924.58 [0.0000]		

RC: Reference category; *, **, ***: Statistical significance at 10%, 5%, 1% respectively

Source: created by the authors

For the interpretation of the relation of saving for retirement with the socioeconomic and demographic variables, the results in Table 4 are used. The probability of saving formally is higher in 2021 for both men and women compared to 2018. For men, it increased from 50.43 in 2018 to 53.77 percentage points in 2021 (increased by 3.34 percentage points). In women, the increase was 10.89 percentage points. In 2021, there was no meaningful difference between men and women regarding formal saving. The probability of saving informally decreased in 2021 compared to 2018 for both men and women. The probability of saving formally is higher in 2021 relative to 2018 for the 18-27, 28-37, and 38-47 age range and lower for the 48-57 and 58-67 age range. For all age categories, informal saving is lower in 2021 than in 2018.

Between both periods, the probability of saving formally increased for those with basic education (5.8 percentage points) and decreased for those with a bachelor's degree or higher (approximately 3 percentage points). The probability of saving informally decreased for the former by 3.78 percentage points; for the latter, the decrease was less than 1 percentage point. For all income categories, the probability of formal saving is higher in 2021 than in 2018. The difference is larger in quartiles 1 and 2 (approximately 10 percentage points) than in quartiles 3 and 4 (approximately 5 percentage points). The probability of saving informally decreased by approximately 5 percentage points

for all categories. Regarding marital status, the probability of saving informally is lower by 5.73 percentage points in 2021 compared to 2018 for those who reported being separated.

Regarding occupation, the probability of formal savings for students and those in the household is higher in 2021 than in 2018. The difference is 9.5 and 12.3 percentage points, respectively. Regarding employment position, the probability of formal saving for the self-employed increased by 7.84 percentage points in 2021 compared to 2018. By type of locality, the probability of formal savings is higher in both urban and rural areas in 2021 compared to 2018. The difference is 5.54 percentage points in urban areas and 16.59 percentage points in rural areas. In all regions except northeastern Mexico, the probability of formal savings is higher in 2021 compared to 2018. The difference is approximately 5 percentage points.

The probability of saving formally increased in 2021, compared to 2018, for those who indicated having an AFORE, wealth, or savings account, even those who reported having an impact on their income. Those who indicated having an AFORE account are 23.61 percentage points more likely to save formally for retirement; for those who indicated having wealth, 4.41; for those who indicated having a savings account, 5.06 points; and for those who indicated having had an income shock, 7.48 percentage points. From the above results, it is identified that in 2021, the probability of saving formally increased, and the probability of saving informally decreased compared to 2018, with certain differences depending on socioeconomic and demographic characteristics, which supports hypothesis 4 of this research.

The probability of saving formally is higher in 2021 compared to 2018 for those who indicated having taken a financial education course (55.64 vs. 51.13 percentage points). Nevertheless, it increased proportionately among those who reported not taking a financial course (54.14 vs. 46.49 percentage points).

The probability of informal savings decreased in 2021 for both cases; nevertheless, the decrease among those who received financial education was less than .1 percentage points. The reduction in informal savings was more than five points for those who did not receive financial education. In the 2021 sample, those who indicated having taken a financial course are 1.5 percentage points more likely to save formally but almost 5 percentage points more likely to save informally than those who did not receive financial education. This result indicates the positive effect of financial education on retirement savings, which supports hypothesis 5 of this research.

Discussion

This research shows that during the pandemic, the number of Mexicans who saved for their retirement formally increased proportionally, and the number of Mexicans who did not save for retirement and saved

informally decreased. The results also show that the probability of saving formally increased in 2021 compared to 2018 and that, in the same period, the probability of saving informally and not saving decreased. This trend could be explained by the surplus generated in those households that maintained their income but decreased expenditure due to the decrease in activities resulting from the lockdown. This logic could also explain the reduction in informal savers and the probability of saving informally for retirement in this period, considering that these people worked informally and were affected by the drop in economic activity during the pandemic.

Financial literacy was a crucial variable in the decision to save for retirement. The results were strong regarding the positive and significant relation found between the financial literacy of Mexicans and their savings for retirement, both formal and informal, and are consistent with the findings of Hasler et al. (2023), Chen & Chen (2023), Nolan & Doorley (2019), and Lusardi & Mitchell (2011b). Regarding financial education, although the results are consistent with those found by Hasler et al. (2023), Harvey and Urban (2023), Kaiser et al. (2021), and Fernandes, Lynch, and Netemeyer (2014), concerning the positive and significant relation between financial education and saving for retirement, it remains to be explored why the increase in formal savings in this period was lower among those who had taken a finance course than among those who had not.

The results indicate that there is no gender difference related to formal savings for retirement, which is consistent with those reported by Hasler et al. (2023), Yao and Cheng (2017), and Mansor et al. (2015) and differs from Tomar et al. (2021), and Van Rooij, Lusardi, & Alessie (2012). The decrease in the gender gap between both periods concerning the decision to save may result from the need to take precautionary measures for women due to the economic uncertainty derived from COVID-19 (Villar, Jiménez, & Sánchez, 2023).

The results exhibit a significant relation between retirement savings and age, consistent with those of Mansor et al. (2015) and Yusof and Sabri (2017). Young people between 18-27 showed a greater propensity toward formal savings, which contrasts with what was reported by Yao and Cheng (2017) as well as Hasler et al. (2023) and may be due to the moment of risk and uncertainty or to the need of older people, who also because of their age are more likely to have economic dependents, to increase their emergency fund before their retirement savings, as explained by Pozzi and Sabada (2022).

Educational level and income have a positive and significant effect on retirement planning, consistent with the results reported by other research (Hasler et al., 2023; Fabian et al., 2022; Mansor et al., 2015; Yao & Cheng, 2017; Yang & DeVaney, 2012). Nevertheless, in the cross-period comparison, formal savings increased among lower educational levels but decreased for higher levels.

In the results of this research, wealth has a positive effect on formal retirement savings, contrasting with the results reported by Yao and Cheng (2017). In the 2021 sample, the respondent's marital status is not significant in retirement savings, contrasting with the findings of Hasler et al. (2023) and Demirguc-Kunt, Klapper, and Panos (2016). Significant differences in formal savings according to occupation are identified. It is further shown that people with a bank account are more likely to save for retirement than those without one. Both findings coincide with what was reported by Demirguc-Kunt, Klapper, and Panos (2016). The non-significance of having a sophisticated account could be explained by the possibility that a (non-sophisticated) savings account gives savers a basic and sufficient product to save.

In the estimation of this research, those who faced income shocks are less likely to save for retirement. All regions of Mexico were significant except for the Northeast region, which includes the states of Coahuila, Chihuahua, Durango, Nuevo Leon, and Tamaulipas.

Conclusions

This research aims to analyze the change in the retirement savings of Mexicans during the COVID-19 pandemic and whether this change was a function of the level of financial literacy, financial education, and socioeconomic and demographic characteristics. The analysis was conducted regarding whether savings were carried out formally or informally. The results partially support the hypothesis that the number of savers decreased during the pandemic and the probability of saving for retirement since this only happened among those who saved informally. It could be inferred that, during this period, there was a migration of informal savers to the group that formally saved for retirement.

Evidence is generated to affirm that financial literacy and financial education had a positive and significant influence on the retirement savings of Mexicans during the pandemic period. Likewise, the results obtained regarding the relation between retirement savings and socioeconomic and demographic variables, except for having a sophisticated account, provide evidence in favor of the change in retirement savings depending on the characteristics of the individuals.

Further analysis by region remains for future research to explain, for example, why the northeastern region of Mexico was not significant. A possible explanation could be related to the impact that the closing of the border with the United States during the pandemic period had on the economic activity of this region. Future research could explain why the probability of saving formally decreased for those with undergraduate and graduate education and increased among those with only primary and secondary education. Another important line of research on this topic is the analysis of education and

financial literacy rates in the population that does not save for retirement and those who voluntarily contribute to their savings account.

The results of this research emphasize the role of financial literacy and education in saving for retirement, even during times of high uncertainty, such as during the pandemic. To this end, the design of strategies aimed at increasing levels of financial literacy based on personal finance education is a crucial objective, considering that it will provide the population with training that will allow them to make informed decisions in situations of economic risk, such as during the COVID-19 pandemic period.

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