Journal of Infrastructure, Policy and Development 2024, 8(6), 4522.
https://doi.org/10.24294/jipd.v8i6.4522

Article

Financial literacy and sociodemographic characteristics of the Mexican Petroleum Company employees

Elena Moreno-García[1,*], Milka Elena Escalera-Chávez[2], María Belén Del Ángel Flores[1]

[1] Universidad Cristóbal Colón, Campus Calasanz, Carretera Veracruz-Medellín S/N, Boca del Río, Veracruz 94271, Mexico
[2] Unidad Académica Multidisciplinaria Zona Media, Universidad Autónoma de San Luis Potosí, Carr. Rioverde a San Ciro de Acosta Km 4 Puente del Carmen 79650 Rioverde, S.L.P., Mexico
*** Corresponding author:** Elena Moreno-García, elenam@ucc.mx

CITATION

Moreno-García E, Escalera-Chávez ME, Del Ángel Flores MB. (2024). Financial literacy and sociodemographic characteristics of the Mexican Petroleum Company employees. Journal of Infrastructure, Policy and Development. 8(6): 4522. https://doi.org/10.24294/jipd.v8i6.4522

ARTICLE INFO

Received: 1 February 2024
Accepted: 18 March 2024
Available online: 6 June 2024

Abstract: Low levels of financial literacy cause people to have lower savings rates, higher transaction costs, larger debts and the loans acquisition with higher interest rates, therefore it becomes relevant to analyze the determinants of financial literacy. The aim of this research is to identify whether there is an association between the financial literacy level and sociodemographic characteristics. The Mexican Petroleum Company (Pemex) employees is the population analyzed. Pemex is the state-owned oil and natural gas producer, transporter, refiner and marketer in Mexico. A non-probabilistic convenience sampling was performed and 404 responses were obtained. The analysis of data was carried out with the Bayesian method. The results show that there is an association between Pemex employees' level of financial literacy and their level of education, income, age and type of retirement saving. No association was found between their level of financial literacy and gender, marital status and whether or not they have children.

Keywords: Bayesian model; financial literacy; Mexico; petroleum; workers

1. Introduction

Several financial literacy definitions are found in literature. The attention to this concept focuses on knowledge or the ability to use knowledge and even people's self-confidence towards their own financial actions (Zait and Berthea, 2014). Lusardi and Mitchell (2014), refer to financial literacy as the ability individuals have to process economic information correctly and make well-informed decisions that allow them to understand terms such as wealth accumulation, debt and pensions.

Kaiser and Menkhoff (2017), state that financial literacy aims to improve the individual's financial knowledge and awareness, which allows them to function well in their social and economic environment. Roa et al. (2018) agree with this definition and add that financial literacy allows the individual to discern between the benefit of choosing formal financing instruments or the risk of choosing informal financing instruments. Santini et al. (2019) mention that financial literacy is associated with socioeconomic characteristics, behaviors and attitudes, which is why it is understood as the ability to use knowledge, skills and attitudes to manage resources correctly and generate well-being over time.

Research in different parts of the world shows that, in general, the population's financial literacy levels are low, both, in developing and developed countries (Atkinson and Messy, 2012; Antonio-Anderson et al., 2020; Klapper et al., 2014; Xu and Zia, 2012). In Mexico, low financial literacy levels have been found in general (Antonio-Anderson et al., 2020; García, 2021), although the results vary depending on

the sociodemographic characteristics of the population. As Lotto (2020) refers, adult population exhibits large financial literacy gap, therefore, adults should not be considered as a homogenous group, rather gender, age, education and income levels should be taken into consideration while designing financial literacy improvement public initiatives.

Low levels of financial literacy are concerning because they lead to lower savings rates, higher transaction costs, larger debts, and the loans acquisition with higher interest rates (Lusardi and de Bassa, 2013; Lusardi and Tufano, 2015; Oton and Torrento, 2017). The analysis of the recent papers confirms that having a poor level of financial literacy across different regions and nations is connected with ineffective spending, planning and financial fragility (Amari et al., 2020), therefore, it becomes relevant to analyze the determinants of financial literacy. On the other hand, having a good level of personal financial management that includes knowledge of fundamental concepts, arithmetic skills, interest rate calculation, understanding of the inflation effect and risk diversification allows to improve an individual's financial decision-making (Lusardi, 2019). Particularly for workers, having good levels of financial literacy allows them to face, with more resources, skills and knowledge, financial challenges related to their activity, (Struckell et al., 2022) ranging from information and sophisticated financial products (Kamakia et al., 2017) to responsibilities related to social security and taxes (Van Rooij et al., 2007) as well as their retirement planning (Lusardi and Mitchell, 2011b). In contrast, workers with low financial literacy, worried about their personal finances may find it hard to focus at work and affect their productivity (Kaur et al., 2021).

In Mexico, the analysis of the financial literacy of employees and workers has been scarcely explored and the present research contributes to the existing literature by analyzing the financial literacy of the employees of the Mexican state-owned company that produces, transports, refines, and markets oil and natural gas, which occupies the twelfth place in the world in oil production (Secretaría de Energía, 2020). The objective of this study is to identify whether there is an association between the financial literacy level and the sociodemographic characteristics of Pemex employees. The study is organized as follows. Section 2 presents the literature review. Section 3 presents the research methodology. The empirical results are presented in section 5, followed by concluding remarks in section 6.

2. Literature review

Numerous studies have been carried out around the world on the financial literacy of workers. Oton and Torrento (2017) identified in a group of employees that their financial literacy level is moderate and that their greatest weakness lies in being able to identify the best financial product and investment options. Poblacion and Manigo (2022) found high financial literacy levels in a group of government employees in the Philippines. Calepre et al. (2017) also identified a group of public and private school teachers in the Philippines who have very low financial literacy levels. Clark et al. (2015) found that the United States Federal Reserve employees have higher financial literacy levels than the rest of the population.

Several investigations show that the sociodemographic characteristics of the population are decisive in financial literacy levels (Dewi, 2021). Regarding gender, the evidence suggests that women have lower financial literacy levels than men (Adam et al., 2018; Atkinson and Messy, 2012; Cupák et al., 2018; Gutti, 2020; Gudjonsson et al., 2022; Kiliyanni and Sivaraman, 2016; Klapper and Lusardi, 2020; Lusardi and Mitchell, 2017; Niu et al., 2020; Philippas and Avdoulas, 2019; Rasool and Ullah, 2020; Tinghög et al., 2021). According to Lusardi (2008), women's low financial literacy levels compared to men occur particularly in relation to knowledge about diversification and risk. Fornero and Monticone (2011) identified that gender disparities in financial literacy are related to socioeconomic status. Botazzi and Lusardi (2020) state that the social and cultural environment in which boys and girls develop is decisive in explaining gender differences. Bağci and Kahraman (2019) found that gender has no significant effect on financial literacy, that the financial literacy is affected by financial education and that there will not be any difference between men and women if women are educated and equipped with financial information as a part of the society. Irman and Fadrul (2020) also found no association between gender and financial literacy. For Mexico, the evidence suggests lower financial literacy levels in women (García, 2021; Hernández et al., 2022), even in young students' populations (Villagómez, 2016). However, Antonio-Anderson et al. (2020) identified that adult Mexican women have higher financial literacy levels than men.

Atkinson and Messy (2012) explain that income does not have an impact on people's ability to acquire knowledge. However, low income can be the explanation for behaviors such as not saving or planning financially speaking. International evidence shows that this variable, as well as educational level, maintain a positive and statistically significant relationship with financial literacy (Atkinson and Messy, 2012; Antonio-Anderson et al., 2020; García, 2021; Garg and Singh, 2018; Klapper et al., 2014; Kalmi and Ruuskanen, 2018; Hernández et al., 2022; Nguyen et al., 2022). Klapper et al. (2014) point out that in poor countries, there is no evidence that income is associated to financial literacy levels as it is in rich countries, which could be related to the educational and consumer protection policies that rich countries have. Regarding educational level, Baihaqqy et al. (2020) found that there is a significant correlation between the investor education level and their understanding of financial literacy, thus influencing investors in the financial decisions they make.

About age, Lusardi and Mitchell (2011a) show that the relationship between financial literacy and age has an inverted U shape: low for people under 35 years of age, increases as age increases, and decreases again in people over 65. Oton and Torrento (2017) and Bawre and Kar (2019) agree with these inverted U results, as well as Antonio-Anderson et al. (2020). In a regional analysis by García (2021), age is a variable that affects financial literacy differently depending on the Mexican region analyzed. The results obtained by Hernández et al. (2022) show that it is the youngest who best answer the questions related to risk, diversification and compound interest. However, the inverted U behavior is observed in relation to knowledge about inflation. Garg and Singh (2018) identify that young people have the lowest financial literacy levels and Bhushan and Medury (2013), Kim and Mountain (2019) as well as Irman and Fadrul (2020) show that age is not related to financial literacy. Marital status is

not associated to financial literacy level according to Filipiak and Walle (2015) and García (2021). Antonio-Anderson, et al (2020) found that people who live with a partner have higher levels of financial literacy than those who live alone and Hedrawaty et al. (2020) as well as Hernández et al. (2022) confirmed these results, particularly among married people. Lusardi and Tufano (2009) found that low financial literacy levels were more prevalent among separated, widowed, and divorced people.

People with economic dependents are more financially literate than those who do not have dependents (Oton and Torrento, 2017; Hernández et al., 2022). Antonio-Anderson et al. (2020) not only agree with this, but also found that financial literacy level increases with each additional dependent. **Table 1** presents the results of different studies conducted around the world on financial literacy and its relationship with sociodemographic characteristic.

Table 1. Financial literacy and sociodemographic characteristics studies results.

Variable	Findings	Author
Gender	Women have lower financial literacy levels than men.	Lusardi, 2008; Fornero and Monticone, 2011; Atkinson and Messy, 2012; Kiliyanni and Sivaraman, 2016; Villagómez, 2016; Lusardi and Mitchell, 2017; Adam et al., 2018; Cupák et al., 2018; Philippas and Avdoulas, 2019; Botazzi and Lusardi, 2020; Klapper and Lusardi, 2020; Gutti, 2020; Rasool and Ullah, 2020; Niu et al., 2020; Tinghög et al., 2021; García, 2021; Hernández et al., 2022; Gudjonsson et al., 2022.
	Gender has no significant effect on financial literacy.	Bağci and Kahraman, 2019; Irman and Fadrul, 2020.
	Women have higher financial literacy levels than men.	Antonio-Anderson et al., 2020.
Age	The relationship between financial literacy and age has an inverted U shape: low for people under 35 years of age, increases as age increases, and decreases again in people over 65.	Lusardi and Mitchell, 2011a; Oton and Torrento, 2017; Bawre and Kar, 2019; Antonio-Anderson et al., 2020; Hernández et al. (2022).
	Young people have the lowest financial literacy levels.	Garg and Singh (2018)
	Age is not related to financial literacy.	Bhushan and Medury, 2013; Kim and Mountain, 2019; Irman and Fadrul, 2020.
Income	Income has a positive and statistically significant relationship with financial literacy.	Atkinson and Messy, 2012; Klapper et al., 2014; Garg and Singh, 2018; Kalmi and Ruuskanen, 2018; García, 2021; Hernández et al., 2022; Antonio-Anderson et al., 2020; Nguyen et al., 2022.
	Income is associated to financial literacy levels.	Klapper et al., 2014.
Education	Education has a positive and statistically significant relationship with financial literacy.	Atkinson and Messy, 2012; Klapper et al., 2014; Garg and Singh, 2018; Kalmi and Ruuskanen, 2018; Baihaqqy et al., 2020; Antonio-Anderson et al., 2020; García, 2021; Hernández et al., 2022; Nguyen et al., 2022.
Marital Status	Marital status is not associated to financial literacy level.	Filipiak and Walle, 2015; García, 2021.
	Married people and those who live with a partner have higher levels of financial literacy than those who live alone.	Antonio-Anderson et al., 2020; Hedrawaty et al., 2020; Hernández et al., 2022.
	Financial literacy levels were more prevalent among separated, widowed, and divorced people.	Lusardi and Tufano, 2009.
Economic dependent	People with economic dependents are more financially literate than those who do not have dependents.	Oton and Torrento, 2017; Antonio-Anderson et al., 2020; Hernández et al., 2022.

Source: Authors.

Based on the evidence presented in the literature review, the following null and alternative hypotheses of the research can be deduced:

H0: There is probability of no association between financial literacy level and each sociodemographic variable.

H1: There is probability of veracity of the association hypothesis between financial literacy level and each sociodemographic variable.

3. Materials and methods

The study is a non-experimental design investigation based on how the inferences about the relationships between variables are made without intervention or direct influence.

3.1. Population and sample

According to Pemex (2020) Sustainability Report, presented on the official website, at the end of 2020, the company had 146,782 employees, of whom 28% were women and 72% men, distributed in different types of employment regimes. **Table 2** presents the data used to calculate the sample size from the application of the following formula:

$$n = (NZ\_\alpha^2 pq\ )/(e^2(N-1) + Z\_\alpha^2 pq) \quad (1)$$

Table 2. Sample size.

Where:	**Value**
Population size (N)	146,782
Confidence level (Z) at 95%	1.96
Probability event occurs (*p*)	50%
Probability event doesn't occur (q)	50%
Margin of error (e)	5%
Sample size (n)	**383**

Source: Authors.

Considering the sample size, a non-probability sampling was carried out for convenience and the electronic survey was sent via WhatsApp. Participation was voluntary and anonymous and 404 responses were obtained. Removing atypical cases, 300 responses remained with 52% women and 48% men.

3.2. Instrument

To measure financial literacy, the instrument derived from Rieger's research (2020) is taken up. It is made up of 6 multiple-choice questions, of which the first 3 correspond to "the big three" by Lusardi and Mitchell (2011a) and the last three from the research carried out by Cumurovic and Hyll (2019). With these questions, the calculation of simple and compound interest, knowledge about inflation, the relationship between risk and return, diversification and risk, investment funds and the stock market are evaluated. Rieger (2020) demonstrated in his research that this instrument turned out to be the most complete and adequate to measure financial literacy because it has a reasonable amount of items that allows easy measurement and

obtained good reliability (Cronbach's alpha 0.62). As the instrument is made up by dichotomous variables, its validation was carried out with the Kuder-Richardson reliability test (KR-20). The coefficient allows establishing the reliability from the means and variations of the instrument items. The mean of a dichotomous question is the proportion of individuals who answer it correctly (p) and its variance is the product of (p)(q):

$$KR_{20} = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum pq}{\sigma^2}\right)$$

where:

k = Number of instrument items.

p = Percentage of people who respond correctly to each item.

q = Percentage of people who answer incorrectly to each item.

σ^2 = total variance of the instrument.

According to the data of this research (k = 6; σ^2 = 2.19; Σpq = 2.19), the KR-20 value is 0.50, which indicates that the reliability of the instrument is medium (0.41 to 0.60), according to the Palella and Martins (2003).

To create the financial literacy variable indicator, a scale was generated considering the scores obtained in the six questions with a dichotomous result, where 1 = knows and 0 = does not know. Following the criteria used by Chen and Volpe (2002), who classified the financial literacy levels in low, medium and high, and based on the scores obtained, the scale was formed as follows: 1 = low (0–2), 2 = medium (3–4) and 3 = high (5–6). The financial literacy level is shown in **Table 3**. To contrast the H0 $\mu \leq 2$ a t-test and its significance were carried out. The results show that the significance value is less than 0.05, it means that the financial literacy level in sample is greater than 2.

Table 3. Univariate descriptive analysis.

	Financial literacy level (%)			
	Low (1)	Medium (2)	High (3)	Total
	17.7	40.00	42.3	100
T value$_{(299gl)}$	2.365	-	-	-
Calculated *t* value$_{(299gl)}$	5.809	-	-	-
P-value	0.00	-	-	-

Source: Authors.

3.3. Contrasting by the Bayesian method

On many occasions, only two hypotheses are formulated: one of no difference or no association, noted as H0, and another as the opposite event. However, one advantage of this model is that the Bayesian hypothesis test is not based on the rejection of a null hypothesis, but on being able to contrast two hypotheses: the null or no-effect (H0) against the alternative or effect (H1). The relationship between these two hypotheses is summarized in the "Bayes or BF factor". The Bayes factor BF0u quantifies the probability that the data is observed under H0 rather than under H1. Therefore, BF0u can be interpreted as the relative support in the observed data for H0 versus H1. If BF0u is 1, there is no preference for H0 or H1. If BF0u is greater than 1,

H0 is preferred. If BF0u is between 0 and 1, H1 is privileged. The Bayes factor of H1 versus H0, that is, reversing the order of the hypothesis, is denoted by BFu0 = 1/BF0u (Hoijtink, et al. 2019). Then, the Bayes factor determines the relative probability of the data under two different hypotheses (Poldrak, 2024) and is defined as:

$$BF = \frac{p(dataH_0)}{p(dat\ /\ Hu)}$$

where:

P(H0) = Probability of no difference or no association.

P(Hu) = Probability of veracity of the difference or association hypothesis.

Table 4 shows the quantifiable values of the Bayer factor.

Table 4. Quantifiable values of the Bayes factor according to Jeffrey.

BF0u Null hypothesis over alternative		**Value**
In favor of H0	Very strong	> 30
	Strong	10 to 30
	Moderate	3.1 to 10
	Anecdotal	1.1 to 3.1
	No evidence	1
In favor of H1	Anecdotal	0.3 to 0.9
	Moderate	0.29 to 0.1
	Strong	0.09 to 0.03
	Very strong	< 0.03

Source: Ramos-Vera (2021).

An interesting characteristic of the Bayesian method is the statistical evidence it provides when contrasting the hypotheses. Lecoutre (1999) mention that, when rejecting a hypothesis, classical statistics indicates that there is an effect, but not in what direction or magnitude. On the other hand, Bayesian inference assesses the credibility of the hypothesis, instead of making a decision to reject it or not, since the decision rule, on which the calculation of a posteriori probabilities of the hypotheses is based, depends on the results obtained (Alamilla-López and Jimenez, 2010).

4. Results and discussion

For the simulation, the a priori values are formed from the percentage of the demographic variables associated with the level of financial literacy variable (**Table 5**). A probability is assigned to each category to obtain an expected value according to:

E(θ) = A priori probability × Percentage + A priori probability × Percentage +…

To test the research hypothesis, where there is an association between the financial literacy level and gender, the Bayesian logarithm was used. The results shown in **Table 6** indicate that there is not enough evidence to say that there is an association between gender and the level of literacy, since the value of the Bayesian Factor of 10.051 indicates that it is ten times more likely that there is a large difference (strong) between the null hypothesis and the alternative hypothesis. The data supports ten times more in favor of the null hypothesis.

Table 5. A priori values of demographic variables and financial literacy level.

	Financial literacy level			
Demographic variable	**Low**	**Medium**	**High**	**A priori probabilities**
Gender				
Women	28	62	66	
Probability	0.15	0.4	0.45	
Probability × Percentage	0.042	0.248	0.297	0.587
Educational level				
Higher education level	26	46	61	
Probability	0.25	0.45	0.35	
Probability × Percentage	0.065	0.207	0.2135	0.4855
Age				
31–40	18	36	98	
Probability	0.2	0.5	0.3	
Probability × Percentage	0.036	0.18	0.294	0.51
Income level				
$18,001–$25,000	23	34	24	
Probability	0.25	0.5	0.25	
Probability × Percentage	0.0575	0.17	0.06	0.2875
Marital status				
Married	16	62	73	
Probability	0.25	0.4	0.35	
Probability × Percentage	0.04	0.248	0.2555	0.5435
With children	36	85	81	
Probability	0.3	0.35	0.35	
Probability × Percentage	0.108	0.2975	0.2835	0.689
Retirement planning				
Pension	45	65	50	
Probability	0.3	0.35	0.35	
Probability × Percentage	0.135	0.2275	0.175	0.5375

Source: Authors' results.

Table 6. Financial literacy level and gender.

Gender	**Financial literacy level**			
	Low	**Medium**	**High**	**Total**
Women	28	62	66	156
Men	20	56	68	144
Total	48	118	134	300
Bayes factor		10.051		

Source: Authors' results.

However, the identification of the posterior distribution shows a difference in the mean with respect to women and their level of financial literacy. **Table 7** shows that, in women, the financial literacy level oscillates between low and medium and it can

be said with 95% certainty that the distribution of the low-level mean is between -.380 and 1.113. Regarding the median financial literacy level, the distribution of the median is between −0.425 and 0.686. Both ranges (0.380 and 1.113; −0.425 and 0.686) are on a continuum, which could be zero. This supports the conclusion that there is not much evidence of a relationship between the variables.

Table 7. Financial literacy level and gender.

Interaction Financial literacy level / Gender	**Posterior**			**95% Simultaneous Interval**	
	Median	**Mean**	**Variance**	**Upper limit**	**Lower limit**
Women, Low	0.358	0.358	0.113	−0.380	1.113
Women, Medium	0.133	0.132	0.062	−0.425	0.686

Source: Authors' results.

Figure 1 clearly shows the interaction between the variables. It is observed that in the 95% simultaneous interval of the lower limit, a small difference is seen, while in the upper limit a considerable difference is seen.

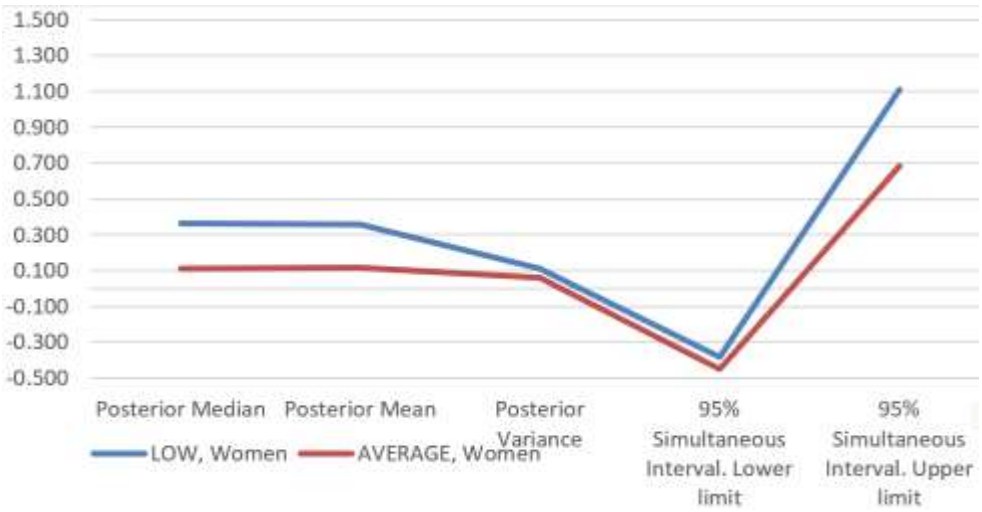

Figure 1. Posterior distribution.

Regarding the hypothesis related to financial literacy and educational level, the results (**Table 8**) show the value of the Bayes factor (0.005). This value indicates that there is a 0.005 times probability against the null hypothesis and there is more evidence for the alternative hypothesis. In other words, the data is very strongly against the null hypothesis, therefore, there is a strong association between educational level and financial literacy level, according to the criteria used to assess the importance of the evidence for H0 and for H1.

Figure 2 shows the a posteriori interaction of the study variables. It is seen that in the interval of 95% of the lower limit, there is no association between the average educational level and the average financial literacy level, nor between the average level and the low literacy level.

Table 8. Financial literacy level and educational level.

Financial literacy level / Educational level	1	2	3	4	5	Total
Low	0	4	0	18	26	48
Medium	7	39	0	26	46	118
High	4	26	11	32	61	134
Total	11	69	10	76	133	300
Factor Bayes	0.005					

Note: 1 = Middle school; 2 = High school; 3 = Technical studies; 4 = Bachelor's degree; 5 = Master's degree.
Source: Authors' results.

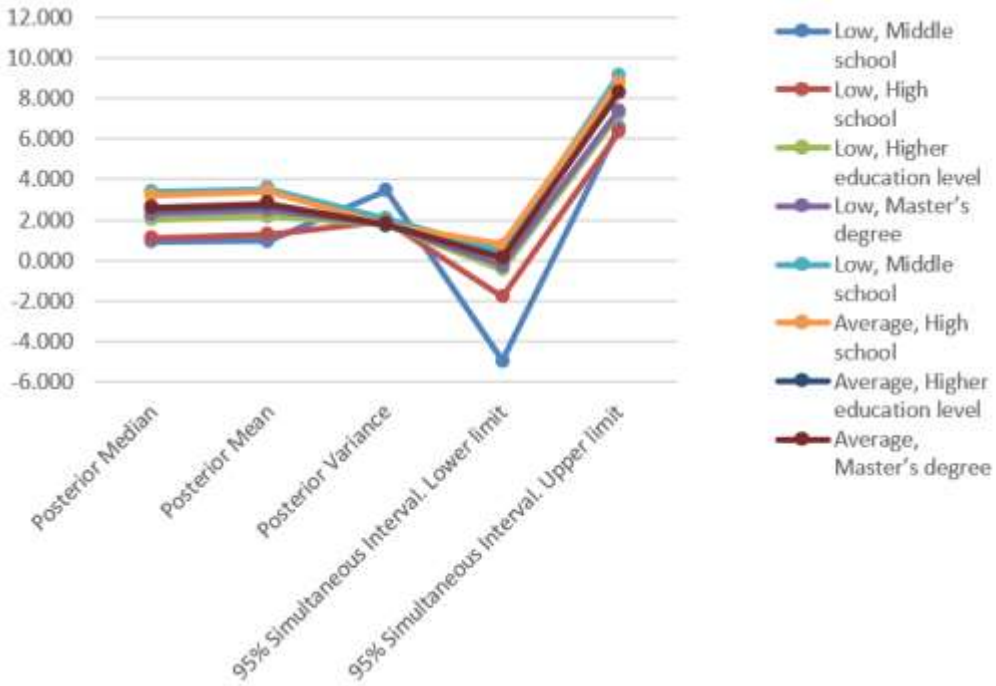

Figure 2. Posterior distribution; Educational level and financial literacy level.

Regarding the research hypothesis that corresponds to the association between the financial literacy level and age. **Table 9** shows the results that indicate that there is very strong evidence against the null hypothesis, according to the criteria used to assess the importance of the evidence for H0 and for H1. This means that there is an association between the financial literacy level and the people's age.

However, when identifying the posterior distribution, there is a difference in the mean with respect to age and financial literacy level. The financial literacy level is higher in people who were between the ages of 31 and 40. In addition, it is observed, at a 95% credible interval, the values of each category (financial literacy level and age), none of them have the possibility of being zero. This supports the conclusion that there is evidence that a relationship exists between the variables.

Table 9. Financial literacy level—age.

Financial literacy level	Age				
	≤ 30	31–40	41–50	> 51	Total
Low	4	18	11	15	48
Medium	27	36	41	14	118
High	10	98	26	0	134
Total	41	152	78	29	300
Bayes factor	0.00				

Source: Authors' results.

Table 10. Posterior distribution of simulated interactions.

	Posterior			95% Simultaneous Interval	
Interaction	Median	Mean	Variance	Lower limit	Upper limit
Low ≤ 30	−4.018	−4.179	2.053	−9.273	−1.316
Low, 31–40	−4.800	−5.002	1.807	−9.968	−2.518
Low, 41–50	−3.978	−4.159	1.852	−9.127	−1.515
Medium, ≤ 30	−2.120	−2.303	1.876	−7.339	−0.380
Medium, 31–40	−4.062	−4.257	1.785	−9.253	−1.734
Medium, 41–50	−2.607	−2.809	1.800	−7.776	−0.253

Source: Authors' results.

Regarding the research hypothesis that corresponds to the association between the financial literacy and income level, **Table 11** shows that there is evidence in favor of the alternative hypothesis (H1), since the Bayes Factor is 0.0, according to the criteria used to assess the importance of the evidence for H0 and for H1. The data are very strongly against the null hypothesis. This means that there is an association between the income and financial literacy level.

Table 11. Financial literacy level—income level.

Income level (Mexican pesos)	Low	Medium	High	Total
No income	0	0	1	1
3500–7000	2	12	4	18
7001–11000	0	17	17	34
11001–18000	8	35	33	76
18001–25000	23	34	24	81
25001–30000	7	6	2	15
30001–40000	6	4	11	21
40001–50000	1	2	8	11
50001–60000	1	2	18	21
More than 60000	0	6	16	22
Total	48	118	134	300
Bayes factor	0.00			

Source: Authors' results.

Table 12 shows the a posteriori interaction of the study variables. The credible interval, from the relationship of the variable to 95%, indicates that only two of the 18 relationships between the literacy-income level are on a continuum, where they do not have the possibility of being zero. This indicates that the observed data support the association between the financial literacy level and income.

Table 12. Posterior distribution of financial literacy level and income level interaction.

	Posterior			**95% Simultaneous Interval**	
Interaction (Mexican pesos)	**Median**	**Mean**	**Variance**	**Lower limit**	**Upper limit**
Low, No income	2.379	2.399	3.895	−4.063	8.897
Medium, No income	0.021	−0.083	2.522	−6.559	4.368
Low, 3500–7000	2.676	2.814	2.387	−0.972	9.272
Low, 7001–11000	−0.049	−0.044	3.400	−6.472	6.370
Low, 11001–18000	1.838	2.026	1.930	−0.997	8.102
Low, 18001–25000	3.145	3.355	1.852	0.559	9.411
Low, 25001–30000	4.353	4.500	2.308	1.005	10.851
Low, 30001–40000	2.659	2.835	2.028	−0.322	8.985
Low, 40001–50000	1.550	1.676	2.519	−2.721	7.955
Low, 50001–60000	0.786	0.904	2.467	−3.612	7.191
Medium, 3500–7000	1.844	1.873	0.518	−0.047	4.175
Medium, 7001–11000	0.916	0.933	0.331	−0.598	2.747
Medium, 11001–18000	0.967	0.997	0.273	−0.440	2.624
Medium, 18001–25000	1.264	1.276	0.284	−0.149	3.003
Medium, 25001–30000	1.870	1.894	0.774	−0.587	4.879
Medium, 30001–40000	0.000	0.000	0.524	−2.298	2.097
Medium, 40001–50000	−0.267	−0.283	0.716	−2.933	2.114
Medium, 50001–60000	−1.021	−1.049	0.665	−3.778	1.280

Source: Authors' results.

As for the hypothesis: financial literacy level and marital status, **Table 13** presents the value of the Bayes Factor (2.1) indicating that the null hypothesis is twice as likely to occur. In other words, the association between the two variables marital status and financial literacy level is anecdotal (weak) according to the criteria used to assess the importance of the evidence for H0 and H1.

Table 13. Financial literacy level—marital status.

Financial literacy level	**Single**	**Married**	**Divorced**	**Common-law marriage**	**Total**
Low	17	16	11	4	48
Medium	34	62	7	14	117
High	33	73	10	19	135
Total	84	151	28	37	300
Bayes factor	2.1				

Source: Authors' results.

Table 14 shows the a posteriori interaction of the study variables. The financial literacy level is higher in married people. Furthermore, with a 95% credible interval the distribution of the mean values of each of the ratios, zero may be present, indicating that there is not much evidence to support the alternative hypothesis.

Table 14. Posterior distribution of financial literacy level and marital status interaction.

Interaction	Median	Mean	Variance	Lower limit	Upper limit
Low, single	0.790	0.809	0.361	−0.691	2.580
Low, married	−0.055	−0.039	0.340	−1.470	1.602
Low, divorced	1.638	1.647	0.473	−0.067	3.586
Medium, single	0.323	0.327	0.177	−0.771	1.471
Medium, married	0.128	0.128	0.147	−0.880	1.206
Medium, divorced	0.062	0.055	0.352	−1.541	1.593

Source: Authors' results.

Regarding the hypothesis related between the financial literacy level and the variable children, the value of the Bayes Factor (1.696) indicates that there are 1.696 more probabilities that the null hypothesis will occur. In other words, there is no association between the children variable and the financial literacy level, according to the criteria used to assess the importance of the evidence for H0 and H1. **Table 15** shows the results.

Table 15. Financial literacy level—children.

Financial literacy level	Without children	With children	Total
Low	12	36	48
Medium	32	85	117
High	54	81	135
Total	98	202	300
Bayes factor	1.696		

Source: Authors' results.

The identification of the posterior distribution of interactions is different with respect to whether people have children or not. The interaction between the children variable and financial literacy level shows a difference in the mean and with a 95% credible interval, the values within those limits have the possibility of being zero, which supports the conclusion that there is no plenty of evidence that the alternative hypothesis occurs.

Table 16. Posterior distribution of financial literacy level—having children interaction.

	Posterior			95% Simultaneous Interval	
Interaction	**Median**	**Mean**	**Variance**	**Lower limit**	**Upper limit**
Low, Without children	−0.626	−0.630	0.139	−1.472	0.181
Medium, Without children	−0.524	−0.527	0.074	−1.162	0.078

Source: Authors' results.

Regarding the hypothesis related between financial literacy level and the type of retirement, **Table 17** shows the results. The value of the Bayes Factor (0.00) is appreciated, which indicates that there is very strong evidence against the null hypothesis. That is, there is an association between the type of retirement and the literacy level, according to the criteria used to assess the importance of the evidence for H0 and for H1.

Table 17. Financial literacy level—type of retirement.

Financial literacy level	Don't have	Pension	Afore	I don't know	Total
Low	3	45	0	0	48
Medium	31	65	11	10	117
High	43	50	39	3	134
Total	77	160	50	13	300
Bayes factor	0.000				

Source: Authors' results.

5. Discussion

Financial literacy is an essential life skill and high on the policy agenda in some countries (OECD, 2014). In order to increase the levels of financial literacy, the design of strategies based on the evidence derived from scientific analysis is required. The objective of this research is to analyze whether there is an association between sociodemographic variables and financial literacy level of the Mexican state-owned Petroleum Company's employees. The results show that there is an association between Pemex employees' level of financial literacy and their level of education, income, age and type of retirement saving. No association is found between their level of financial literacy and gender, marital status and whether or not they have children. The results of this research contribute to the existing evidence on financial literacy in Latin America, a context less explored than the European or Asian one.

Of the sociodemographic variables analyzed among Pemex employees, those that showed an association with the financial literacy level are: educational level, income level, age, and type of retirement. No association is found between gender, marital status and having children. Regarding gender, the evidence found in the literature is conclusive regarding the lower financial literacy level that women have compared to men. However, the results of this study show that in the Pemex employee population, these two variables are not related. A possible explanation for this result could have to do with a similar social and cultural environment where this population grew up, similar to what Bottazzi and Lusardi (2020) refer to.

In the literature, there is strong evidence on the significant and positive relationship that exists between the financial literacy level and the educational level. The results of this study coincide with the literature in the sense of the strong association found between the educational level of Pemex employees and their financial literacy level.

The results show an association between participants age and their financial literacy level. In agreement with findings of Antonio-Anderson et al. (2020) the age group with the highest financial literacy level was between 31 and 40 years. Another

result of strong association is found between financial literacy and income level. In this variable analysis, it is evident that there are no low financial literacy levels among people with higher incomes, although in the lowest incomes, there is a percentage of the population that has high financial literacy levels. The results also show that there is no association between the participants' marital status and having children with their financial literacy levels. Regarding marital status, the results of no association with financial literacy of the population coincide with Filipiak and Walle (2015) and with García (2021), as well as with Hernández et al. (2022) who also identified in a population of Mexicans that the highest financial literacy level is found among married people. Regarding having children, the results of this study contrast with those found by Oton and Torrento (2017) and Hernández et al. (2022), who identified that there is a significant relationship between the two variables.

Finally, the results show an association between the financial literacy of Pemex employees and their type of retirement. This result aligns with the strong evidence in the literature regarding how a higher level of financial literacy favors positive behavior towards savings and particularly towards retirement savings.

6. Conclusion

Until 2015, Pemex employees were guaranteed full payment of their pension by the company. However, as of 2016, the incorporation of new employees is carried out under the defined contribution plan. Besides this, the retirement age in the Company was increased from 55 to 60 years. With the change in the retirement conditions, Pemex employees need a good level of financial literacy that allows them to generate the necessary savings to maintain their standard of living at the time of retirement. In this sense, the result of this research becomes relevant, by providing evidence that allow Pemex authorities the design of strategies aim to improve financial literacy level of the Company employees.

The results of the study also provide evidence to the Pemex authorities about the importance of supporting its employees academic training since the educational level is a variable strongly associated with the financial literacy level. If people increase their educational levels, it will undoubtedly be to the benefit of the company and the work they do there, and at the same time, it gives them opportunities to improve their living conditions, based on more effective decision-making in financial matters. Based on the results, financial training for older workers should also be considered.

The limitations of the study were in the possibility of including a greater number of low-paid workers in the analysis. Those who perform the simplest functions in the organization because due to their activity it is more complicated to survey them. An analysis of the incidence of financial literacy on workers' financial satisfaction and their levels of well-being is proposed as a future line of research.

Author contributions: Conceptualization, EMG and MBDAF; methodology, MEEC; software, MEEC; validation, EMG, MBDAF and MEEC; formal analysis, MEEC; investigation, EMG; resources, MBDAF; data curation, MEEC; writing—original draft preparation, EMG; writing—review and editing, EMG; visualization, MEEC;

supervision, MEEC; project administration, EMG; funding acquisition, MBDAF. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

References

Adam, A. M., Boadu, M. O., & Frimpong, S. (2018). Does gender disparity in financial literacy still persist after retirement? Evidence from Ghana. International Journal of Social Economics, 45(1), 18–28. https://doi.org/10.1108/ijse-06-2016-0159

Alamilla-López, N. & Jiménez, J. (2010). Hypothesis Contrast: Classical vs Bayesian (Spanish). Revista digital Matemática, Educación e Internet. 1(1), 1–13.

Amari, M., Salhi, B., & Jarboui, A. (2020). Evaluating the effects of sociodemographic characteristics and financial education on saving behavior. International Journal of Sociology and Social Policy, 40(11/12), 1423–1438. https://doi.org/10.1108/ijssp-03-2020-0048

Antonio-Anderson, C., Peña Cárdenas, M. C., & López Saldaña, C. del P. (2020). Determinants of financial literacy (Spanish). Investigación Administrativa, 49–1, 1–16. Internet Archive. https://doi.org/10.35426/iav49n125.05

Bağci, H., & Kahraman, Y. E. (2020). THE EFFECT OF GENDER ON FINANCIAL LITERACY. Finans Ekonomi ve Sosyal Araştırmalar Dergisi. https://doi.org/10.29106/fesa.615866

Bawre, S., & Kar, S. (2019). An investigation of the demographic factors affecting financial literacy and its components among urban Indians. International Journal of Education Economics and Development, 10(4), 398. https://doi.org/10.1504/ijeed.2019.102749

Bhushan, P., & Medury, Y. (2013). Financial literacy and its determinants. International Journal of Engineering, Business and Enterprise Applications, 42(2), 155–160.

Bottazzi, L., & Lusardi, A. (2021). Stereotypes in financial literacy: Evidence from PISA. Journal of Corporate Finance, 71, 101831. https://doi.org/10.1016/j.jcorpfin.2020.101831

Chen, H. & Volpe, R. (2002). Gender Differences in Personal Financial Literacy among College Students. Financial Services Review, 11(3), 289–307.

Clark, R., Lusardi, A., & Mitchell, O. (2015). Employee Financial Literacy and Retirement Plan Behavior: A Case Study. National Bureau of Economic Research. https://doi.org/10.3386/w21461

CM, I., MP, A., AV, G., et al. (2017). Financial Literacy of Professional and Pre-Service Teachers in the Philippines. Journal of Global Economics, 05(04). https://doi.org/10.4172/2375-4389.1000267

Cupák, A., Fessler, P., Schneebaum, A., et al. (2018). Decomposing gender gaps in financial literacy: New international evidence. Economics Letters, 168, 102–106. https://doi.org/10.1016/j.econlet.2018.04.004

Dewi, V. I. (2022). How do demographic and socioeconomic factors affect financial literacy and its variables? Cogent Business & Management, 9(1). https://doi.org/10.1080/23311975.2022.2077640

Felipe, I. J. dos S., Ceribeli, H. B., & Lana, T. Q. (2017). Investigating the level of financial literacy of university students. RACE - Revista de Administração, Contabilidade e Economia, 16(3), 845–866. https://doi.org/10.18593/race.v16i3.13458

Filipiak, U. & Walle, Y.M. (2015). The financial literacy gender gap: a question of nature or nurture? Discussion Papers No. 176, Courant Research Centre: Poverty, Equity and Growth.

García Mata, O. (2020). A Regional Approach to Financial Literacy in Mexico (Spanish). Economía Sociedad y Territorio, 21(65), 147–177. https://doi.org/10.22136/est20211641

Gudjonsson, S., Minelgaite, I., Kristinsson, K., et al. (2022). Financial Literacy and Gender Differences: Women Choose People While Men Choose Things? Administrative Sciences, 12(4), 179. https://doi.org/10.3390/admsci12040179

Gutti, P. (2020). Assessing the Impact of Socio-Demographic Factors on Financial Literacy of PG Management students in Hyderabad. Psychology and Education, 57(9): 1653–1658.

Hendrawaty, E., Irawati, N., & Sadalia, I. (2020). Financial literacy, demographic differences and financial risk tolerance level: A case study. Journal of Security and Sustainability Issues, 9(May), 187–201. https://doi.org/10.9770/JSSI.2020.9.M https://doi.org/10.9770/jssi.2020.9.M(15)

Hernández, S., García-Santillán, A., & Moreno-García, E. (2022). Financial literacy and its relationship with sociodemographic variables. Economics and Sociology, 15(1), 40-55. https://doi.org/10.14254/2071-789X.2022/15-1/3

Hoijtink, H., Mulder, J., van Lissa, C., et al. (2019). A tutorial on testing hypotheses using the Bayes factor. Psychological Methods, 24(5), 539–556. https://doi.org/10.1037/met0000201

Irman, M., Suwitho, S., & Fadrul, F. (2020). Sociodemographic Factors on Financial Literacy of University Students in Pekanbaru, Indonesia. International Journal of Economics Development Research (IJEDR), 1(3), 225–242. https://doi.org/10.37385/ijedr.v1i3.120

Kaiser, T., & Menkhoff, L. (2017). Does Financial Education Impact Financial Literacy and Financial Behavior, and If So, When? The World Bank Economic Review, 31(3), 611–630. https://doi.org/10.1093/wber/lhx018

Kalmi, P., & Ruuskanen, O.-P. (2017). Financial literacy and retirement planning in Finland. Journal of Pension Economics and Finance, 17(3), 335–362. https://doi.org/10.1017/s1474747217000270

Kamakia, M. G., Mwangi, C. I., & Mwangi, M. (2017). Financial Literacy and Financial Wellbeing of Public Sector Employees: A Critical Literature Review. European Scientific Journal, ESJ, 13(16), 233. https://doi.org/10.19044/esj.2017.v13n16p233

Kaur, S., Mullainathan, S., Oh, S., et al. (2021). Do Financial Concerns Make Workers Less Productive? National Bureau of Economic Research. https://doi.org/10.3386/w28338

Kiliyanni, A. L., & Sivaraman, S. (2016). The perception-reality gap in financial literacy: Evidence from the most literate state in India. International Review of Economics Education, 23, 47–64. https://doi.org/10.1016/j.iree.2016.07.001

Kim, N., & Mountain, T. P. (2019). Financial Knowledge and "Don't Know" Response. Journal of Consumer Affairs, 53(4), 1948–1969. Portico. https://doi.org/10.1111/joca.12275

Kimiyagahlam, F., Safari, M., & Mansori, S. (2019). Influential Behavioral Factors on Retirement Planning Behavior: The Case of Malaysia. Journal of Financial Counseling and Planning, 30(2), 244–261. https://doi.org/10.1891/1052-3073.30.2.244

Klapper, L. Lusardi, A. & Van Oudheusden. (2014). Financial Literacy around the World: Insights from the S&P Global FINLIT Survey. Financial Literacy around the World. 1–28

Klapper, L., & Lusardi, A. (2019). Financial literacy and financial resilience: Evidence from around the world. Financial Management, 49(3), 589–614. Portico. https://doi.org/10.1111/fima.12283

Lecoutre, B. (2001). Bayesian predictive procedure for designing and monitoring experiments. In: Bayesian methods with applications to science, policy and official statistics. Luxembourg: Office for Official Publications of the European Communities. pp. 301–310

Lotto, J. (2020). Understanding sociodemographic factors influencing households' financial literacy in Tanzania. Cogent Economics & Finance, 8(1), 1792152. https://doi.org/10.1080/23322039.2020.1792152

Lusardi, A. (2019). Financial literacy and the need for financial education: evidence and implications. Swiss Journal of Economics and Statistics, 155(1). https://doi.org/10.1186/s41937-019-0027-5

Lusardi, A., & de Bassa Scheresberg, C. (2013). Financial Literacy and High-Cost Borrowing in the United States. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2585243

Lusardi, A., & Mitchell, O. (2011). Financial Literacy and Retirement Planning in the United States. National Bureau of Economic Research. https://doi.org/10.3386/w17108

Lusardi, A., & Mitchell, O. (2011). Financial Literacy and Retirement Planning in the United States. National Bureau of Economic Research. https://doi.org/10.3386/w17108

Lusardi, A., & Mitchell, O. S. (2014). The Economic Importance of Financial Literacy: Theory and Evidence. Journal of Economic Literature, 52(1), 5–44. https://doi.org/10.1257/jel.52.1.5

Lusardi, A., & Mitchell, O. S. (2017). How Ordinary Consumers Make Complex Economic Decisions: Financial Literacy and Retirement Readiness. Quarterly Journal of Finance, 07(03), 1750008. https://doi.org/10.1142/s2010139217500082

Lusardi, A., & Tufano, P. (2009). Debt Literacy, Financial Experiences, and Overindebtedness. National Bureau of Economic Research. https://doi.org/10.3386/w14808

LUSARDI, A., & TUFANO, P. (2015). Debt literacy, financial experiences, and overindebtedness. Journal of Pension Economics and Finance, 14(4), 332–368. https://doi.org/10.1017/s1474747215000232

Niu, G., Zhou, Y., & Gan, H. (2020). Financial literacy and retirement preparation in China. Pacific-Basin Finance Journal, 59, 101262. https://doi.org/10.1016/j.pacfin.2020.101262

OECD. (2014). The importance of financial literacy. In: Education at a Glance 2014: Highlights. OECD Publishing. https://doi.org/10.1787/eag_highlights-2014-32-en

OECD. (n.d.). Working Papers on Finance, Insurance and Private Pensions. Available online: https://www.oecd.org/finance/financial-markets/oecdworkingpapersonfinanceinsuranceandprivatepensions.htm (accessed on 7 January 2024).

Oton Parcia, R. (2017). Employees' Financial Literacy, Behavior, Stress and Wellness. Journal of Human Resource Management, 5(5), 78. https://doi.org/10.11648/j.jhrm.20170505.12

Palella, S. & Martins, F. (2003). Metodología de la Investigación cuantitativa. Caracas: Fedupel.

Petróleos Mexicanos. (2020). Informe de Sustentabilidad 2020. Available online: https://www.pemex.com/etica_y_transparencia/transparencia/informes/Documents/inf_sustentabilidad_2020_esp.pdf (accessed on 5 January 2024).

Philippas, N. D., & Avdoulas, C. (2019). Financial literacy and financial well-being among generation-Z university students: Evidence from Greece. The European Journal of Finance, 26(4–5), 360–381. https://doi.org/10.1080/1351847x.2019.1701512

Poblacion, J. & Manigo, J. (2022). Influence of Financial Literacy and Money Attitude to Employees' Financial Well-Being in the Midst of Pandemic. The International Journal of Business Management and Technology, 6(2), 267–280.

Poldrack, R. (2024). Statistical Thinking for the 21st Century. Available online: https://libretexts.org/ (accessed on 5 January 2024).

Ramos-Vera, C. A. (2021). The use of the Bayes factor in clinical cardiology research (Spanish). Revista Española de Cardiología, 74(7), 641–642. https://doi.org/10.1016/j.recesp.2021.01.013

Rasool, N., & Ullah, S. (2020). Financial literacy and behavioural biases of individual investors: empirical evidence of Pakistan stock exchange. Journal of Economics, Finance and Administrative Science, 25(50), 261–278. https://doi.org/10.1108/jefas-03-2019-0031

Rieger, M. O. (2020). How to Measure Financial Literacy? Journal of Risk and Financial Management, 13(12), 324. https://doi.org/10.3390/jrfm13120324

Rizaldy Insan Baihaqqy, M., Disman, Nugraha, Sari, M. (2020). The Correlation between Education Level and Understanding of Financial Literacy and its Effect on Investment Decisions in Capital Markets. Journal of Education and E-Learning Research, 7(3), 306–313. https://doi.org/10.20448/journal.509.2020.73.306.313

Roa, M. Garrón, I. & Barboza, J. (2018). Cognitive characteristics, personality traits and financial literacy: role in financial decisions (Spanish). Centro de Estudios Monetarios Latinoamericanos, 203–255.

Santini, F. D. O., Ladeira, W. J., Mette, F. M. B., et al. (2019). The antecedents and consequences of financial literacy: a meta-analysis. International Journal of Bank Marketing, 37(6), 1462–1479. https://doi.org/10.1108/ijbm-10-2018-0281

Secretaría de Energía. (2020). Mexico ranks as the 12th largest oil producer in the world (Spanish). Available online: https://shorturl.at/kqNP7 (accessed on 5 January 2024).

Struckell, E. M., Patel, P. C., Ojha, D., et al. (2022). Financial literacy and self-employment – The moderating effect of gender and race. Journal of Business Research, 139, 639–653. https://doi.org/10.1016/j.jbusres.2021.10.003

Tinghög, G., Ahmed, A., Barrafrem, K., et al. (2021). Gender differences in financial literacy: The role of stereotype threat. Journal of Economic Behavior & Organization, 192, 405–416. https://doi.org/10.1016/j.jebo.2021.10.015

van Rooij, M., Lusardi, A., & Alessie, R. (2007). Financial Literacy and Stock Market Participation. National Bureau of Economic Research. https://doi.org/10.3386/w13565

Villagómez, F. A. (2016). Financial literacy among high school students in the Metropolitan Zone of the Valley of Mexico (Spanish). El Trimestre Económico, 83(331), 677. https://doi.org/10.20430/ete.v83i331.215

Xu, L., & Zia, B. (2012). Financial Literacy around the World: An Overview of the Evidence with Practical Suggestions for the Way Forward. In Policy Research Working Papers. The World Bank. https://doi.org/10.1596/1813-9450-6107

Zait, A. & Berthea, P. (2014). Financial Literacy—Conceptual Definition and Proposed Approach for a Measurement Instrument. Journal of Accounting and Management, 4(3), 37–42.