Artículos

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UN ANÁLISIS COMPARATIVO CUALITATIVO DIFUSO DE PATRONES Y RELACIONES EN VARIABLES FINANCIERAS

ENFOQUE DE CONOCIMIENTOS Y HABILIDADES FINANCIERAS

A QUALITATIVE FUZZY COMPARATIVE ANALYSIS OF PATTERNS AND RELATIONSHIPS IN FINANCIAL VARIABLES

Financial knowledge and skills approach

UMA ANÁLISE COMPARATIVA QUALITATIVA FUZZY DE PADRÕES E RELAÇÕES EM VARIÁVEIS FINANCEIRAS

Abordagem de conhecimento e habilidades financeiras

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RESUMEN

Este estudio analizó comparativamente las variables que moldean el conocimiento y las habilidades financieras mediante el análisis de componentes principales (PCA) y el análisis comparativo cualitativo de conjuntos difusos (fsQCA). Con datos de 1.837 adultos en Bogotá y Cundinamarca, Colombia, identificó factores clave como el valor temporal del dinero, la rentabilidad, regulaciones financieras, tasas de interés, estrategias de ahorro, planificación de la jubilación, seguros, acceso al crédito y oportunidades de inversión. Estas variables son esenciales para mejorar la educación y las capacidades financieras.

El enfoque combinado de PCA y fsQCA reveló patrones significativos y relaciones complejas entre variables, destacando cómo sus combinaciones contribuyen a decisiones y resultados financieros más efectivos. Este marco metodológico proporciona una comprensión integral de los determinantes del conocimiento y habilidades financieras, fundamentando la interacción entre educación financiera y competencias prácticas.

Los hallazgos tienen implicaciones prácticas, sugiriendo el diseño de programas educativos que trasciendan el conocimiento teórico y fortalezcan habilidades reales de gestión

financiera. Estos programas pueden promover la independencia financiera y el bienestar económico, respondiendo a las necesidades específicas de diferentes contextos sociales y económicos.

Palabras clave: conocimientos financieros. habilidades financieras. educación financiera. PCA. fsQCA.

ABSTRACT

This study comparatively analyzed the variables that shape financial knowledge and skills using principal component analysis (PCA) and qualitative comparative fuzzy set analysis (fsQCA). Using data from 1,837 adults in Bogotá and Cundinamarca, Colombia, it identified key factors such as the time value of money, profitability, financial regulations, interest rates, savings strategies, retirement planning, insurance, access to credit, and investment opportunities. These variables are essential for improving financial education and capabilities.

The combined approach of PCA and fsQCA revealed significant patterns and complex relationships between variables, highlighting how their combinations contribute to more effective financial decisions and outcomes. This methodological framework provides a comprehensive understanding of the determinants of financial knowledge and skills, grounding the interaction between financial education and practical competencies.

The findings have practical implications, suggesting the design of educational programs that transcend theoretical knowledge and strengthen real financial management skills. These programs can promote financial independence and economic well-being, responding to the specific needs of different social and economic contexts.

Keywords: financial knowledge. financial skills. financial literacy. PCA. fsQCA.

RESUMO

Este estudo analisou comparativamente as variáveis que moldam o conhecimento e as habilidades financeiras usando a análise de componentes principais (PCA) e a análise comparativa qualitativa de conjuntos difusos (fsQCA). Usando dados de 1.837 adultos em Bogotá e Cundinamarca, Colômbia, identificou fatores-chave como o valor do dinheiro no tempo, lucratividade, regulamentações financeiras, taxas de juros, estratégias de poupança, planejamento de aposentadoria, seguro, acesso ao crédito e oportunidades de investimento. Essas variáveis são essenciais para melhorar a educação e as capacidades financeiras. A abordagem combinada de PCA e fsQCA revelou padrões significativos e relações complexas entre as variáveis, destacando como suas combinações contribuem para decisões e resultados financeiros mais eficazes. Esse referencial metodológico proporciona uma compreensão abrangente dos determinantes do conhecimento e das habilidades financeiras, fundamentando a interação entre educação financeira e competências práticas. Os resultados têm implicações práticas, sugerindo o desenho de programas educacionais que transcendem o conhecimento teórico e fortalecem as habilidades reais de gestão financeira. Esses programas podem promover a independência financeira e o bem-estar econômico, respondendo às necessidades específicas de diferentes contextos sociais e econômicos.

Palavras-chave: conhecimento financeiro. habilidades financeiras. alfabetização financeira. PCA. fsQCA.

Introducción

The acquisition of financial knowledge and skills plays a fundamental role in the empowerment of individuals and the economic well-being of society (Netemeyer et al., 2024). Financial literacy (FL)

encompasses more than mere theoretical concepts; it also entails the cultivation of skills that empower individuals to make practical and strategic financial decisions when engaging with financial products or services (Klapper & Lusardi, 2020). This comprehensive approach to FL is valuable in an environment where financial and economic complexities are an inherent aspect of everyday life. The significance of financial literacy is evident not only in individuals' capacity to navigate economic challenges but also in their ability to leverage the opportunities presented by the financial environment (Alam & Rashid, 2023).

The reasons for acquiring financial knowledge and skills are numerous and varied. The pursuit of individual empowerment is a significant motivating factor for individuals, as people aspire to make decisions that positively impact their financial well-being and autonomy (Kaiser et al., 2022). Individuals are motivated to seek strategies that provide stable and resilient long-term security through retirement planning (Klapper & Lusardi, 2020). Furthermore, the aspiration for professional advancement encourages an interest in wealth creation and the development of financial abilities to achieve personal objectives. Participation in the economy and contributions to economic development represent additional key motivations for acquiring financial literacy (Kumar et al., 2023; Suresh G, 2024).

A lack of comprehension of financial concepts can constitute a significant impediment to individuals' ability to operate effectively in the contemporary economic milieu (Xue et al., 2021). Furthermore, a lack of comprehension of fundamental financial terminology, such as that pertaining to interest rates and investments, can impede the ability to make well-informed decisions. This unfamiliarity can result in misinterpretation of information, which may, in turn, lead to suboptimal or erroneous decisions (Bazán et al., 2021). Likewise, unfamiliarity with modern financial tools, such as asset management technologies or investment platforms, may limit access to tools that could improve efficiency in personal financial management (Lone & Bhat, 2024; Ye & Yue, 2023)

The objective of this research was to conduct a comparative qualitative analysis of the financial variables that contribute to the development of financial skills and knowledge. In order to achieve this objective, the methodologies of principal component analysis (PCA) (Cardona-Montoya et al., 2022; Li & Qian, 2020; Takmaz et al., 2024) and fuzzy set qualitative comparative analysis (fsQC) (Ammari et al., 2023; Arias-Oliva et al., 2021; Aw et al., 2023; Pappas & Woodside, 2021) were used. These techniques facilitated the identification of significant patterns, and the specification of complex relationships involved in financial knowledge and skills. This research was conducted in Bogotá and in the Department of Cundinamarca with the objective of acquiring a comprehensive understanding of the distinctive dynamics in this region. These analytical methodologies helped uncover the interconnectedness between different factors, thereby enabling a more profound comprehension of the inherent complexity of financial skills and knowledge in this context.

The results demonstrate that the most pertinent variables in the patterns and their interconnections are the time value of money, profitability, financial system regulations, interest, savings, retirement, insurance, credit, and investment. These variables enhance individuals' financial knowledge and abilities. Furthermore, this study helped clarify the variables that influence financial literacy and established a consistent methodological framework for studying factors related to financial literacy.

This paper is composed of five sections. Section 2 presents a review of the existing literature on financial literacy, knowledge, and skills. Section 3 outlines the methodology employed, including the use of principal component analysis (PCA) and fuzzy set qualitative comparative analysis (fsQCA). Section 4 presents the findings of the two analyses, including descriptive and complex analyses of the population and teaching. Section 5 offers conclusions based on these findings.

Financial literacy

Financial literacy is a vital component of contemporary life, as it provides individuals with the requisite knowledge and abilities to make well-informed and responsible decisions regarding the management of

their financial resources (Blanco-Mesa et al., 2021; Hamid & Loke, 2021). In an increasingly complex and dynamic world, where economic decisions can directly impact quality of life, financial literacy is an invaluable asset that goes beyond mere numbers and is rooted in the essence of individual and collective wellbeing (Klapper & Lusardi, 2020). The dissemination of knowledge empowers individuals to assume control of their financial affairs (Michael Collins & Urban, 2020; Romero-Muñoz et al., 2021). A grasp of the fundamentals allows individuals to formulate plans for both the immediate and long terms, thereby facilitating personal empowerment. Such empowerment not only promotes financial stability but also contributes to a sense of autonomy and confidence in decision making (Bazán et al., 2021).

Those with a greater understanding of financial matters are better placed to assess and select products and services (van der Cruijsen et al., 2021). This discernment translates into higher financial returns as well as risk reduction and prevention of personal financial crises (Ankrah Twumasi et al., 2022). The ability to make informed decisions is a crucial benefit of financial literacy. Having an emergency fund and managing it properly is crucial to avoiding financial disasters caused by unforeseen events, such as job loss or unexpected medical expenses (Klapper & Lusardi, 2020).

Financial knowledge

Financial knowledge may be defined as intellectual capital acquired through experience (Goyal & Kumar, 2021). It entails an understanding of financial concepts and the capacity to develop this understanding further (Artavanis & Karra, 2020). Furthermore, it can be described as the confidence and skills one possesses with respect to the essential terms and basic knowledge of finance, which are crucial for managing financial resources (Kaiser & Menkhoff, 2020; Panos & Wilson, 2020). Financial knowledge has been defined as the understanding of issues closely related to personal and business finance, which enables one to make informed decisions (Chen et al., 2024; Oberrauch & Kaiser, 2024; Xu & Jiang, 2024). This is significant for local and national economies, as it facilitates more effective financial management by entrepreneurs engaged in economic activities (Sobaih & Elshaer, 2023).

Gaining knowledge about these regulations allows individuals to make ethical and well-informed decisions regarding their financial affairs (Kodongo, 2018). It is of utmost importance that individuals have a thorough understanding of the rules and requirements related to the establishment and operation of financial services, as this knowledge is vital to ensuring compliance with current legal mandates and avoiding any potential adverse impacts that could result from a breach (Jungo et al., 2022). In addition, promoting transparency in financial transactions plays an important role in cultivating a sense of trust within the system, which, in turn, contributes to the overall stability and efficiency of the economy (Willis, 2017).

The next variable that deserves attention is the time value of money, a fundamental financial principle that summarizes the idea that the value of a specific amount of money is not static and can fluctuate significantly due to various factors, including inflationary pressures and the prevailing interest rates in the market (Senyo & Osabutey, 2020). The concept of compound interest has emerged as a fundamental element since interest is generated not only on the initial principal amount but also on the accumulated interest, which translates into exponential growth over time (Loke, 2017). This understanding is essential for making prudent decisions regarding retirement planning, investment strategies, and comprehensive budgeting practices (Niu et al., 2020; Paraboni & da Costa Jr., 2021).

Analyzing the impacts that inflation and interest rates have on the future values of financial assets helps determine how individuals can take informed and proactive steps to protect and enhance their purchasing power in the face of economic fluctuations (Xue et al., 2019). Profitability can be determined as the ability of a particular investment or asset to generate significant returns when evaluated in relation to the associated costs that accompany it (Engström & McKelvie, 2017). A thorough understanding of the concept of profitability is essential for evaluating the effectiveness of financial decisions made by individuals or organizations, as well as for the ongoing search for optimal returns on investments (Baidoo et al., 2020). This fundamental understanding facilitates sound and well-informed decisions regarding

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the allocation of resources, which may encompass a wide range of options, such as stocks, bonds, real estate, and other viable investment avenues (Okoli & Tewari, 2020).

The importance of profitability is underscored by its essential role in guiding long-term financial decision-making processes, which are crucial for sustained economic growth and stability. To accurately assess profitability, it is necessary to have a thorough understanding of both current performance metrics and any potential future developments that may influence these assessments (Engström & McKelvie, 2017). This perspective is of great importance not only for effective financial planning but also for shaping diversification strategies within investment portfolios (Huang et al., 2015). It is of utmost importance to look for a well-thought-out mix of various assets that achieves a harmonious balance between potential risks and expected returns, thereby optimizing returns and effectively managing the associated risks (Okoli & Tewari, 2020).

On the contrary, the complexity of interest calculation plays a vital role in improving our understanding and ability to assess the economic ramifications associated with lending, investing, and saving (He et al., 2024). A thorough understanding of the methodologies on which these calculations are based is essential to accurately assessing investment returns and determining the true financial implications of loans (Graham et al., 2019). This knowledge allows individuals to anticipate the long-term effects of accrued interest on their overall financial situation, which can be crucial for strategic financial planning. Understanding how accrued interest contributes to the growth of the original capital within an investment framework can help individuals make informed and strategic decisions regarding the optimal allocations of their resources to achieve the highest possible returns on their investments (Westermann et al., 2020).

The process of calculating interest is of paramount importance in the credit landscape, as it provides debtors with a lucid understanding of the true financial consequences attached to their debt obligations, facilitating more effective planning and management of repayment strategies (Sepúlveda, 2023). In addition, having a solid understanding of interest calculation allows individuals to critically evaluate the suitability of the various financial products and services available in the market. Being well-informed about the specific conditions and interest rates associated with different financial products allows people to make smart and well-informed decisions about the strategic allocation of their funds or the most advantageous use of available lines of credit, which ultimately contributes to better financial results over time (Klapper & Lusardi, 2020).

The last variable that deserves to be considered in this analysis is the principle of risk diversification, which encompasses the strategic allocation of investments across several asset classes with the primary objective of alleviating the potential impacts of adverse developments on the financial outlook (Al-Bahrani et al., 2020). This concept inherently recognizes the volatility that is often associated with financial markets and seeks to reduce the adverse effects of potential losses by avoiding overreliance on a single investment instrument (Kovalchuk et al., 2022). The importance of diversification is highlighted by its ability to reduce uncertainty while also improving the overall stability of an investment portfolio. By diversifying investments, investors are empowered to protect their capital against a wide range of economic conditions by judiciously distributing their resources across a wide range of financial instruments (Michael Collins & Urban, 2020).

Proposition 1: A high level of knowledge about financial variables is enough to form a high level of financial knowledge.

2.2. Financial skills

Development of financial skills is of principal importance for formulating sound personal and professional decisions (Monsura, 2020). Those who possess banking skills are better able to cope with adverse circumstances, make prudent decisions, and plan for the future in a more effective manner (Purnomo, 2019). Additionally, they demonstrate an exceptional capacity to anticipate and plan for savings and investment opportunities (Acar, 2023).

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When examining the financial skills of a given population, it is essential to consider the factors that influence an individual's capacity to effectively manage economic resources. These factors result in having skills in financial interest, savings, retirement planning, financial insurance, money division, budgeting, and credit (Al-Bahrani et al., 2020; Cucinelli et al., 2019; Goyal & Kumar, 2021; Vörös et al., 2021). An understanding of financial interest is fundamental to analyzing the cost of money and its associated economic implications (Kaiser et al., 2022). It represents the supplementary remuneration levied or accrued for a financial sum, whether for the utilization of funds through borrowing or the investment of capital(dos Santos Tolomeotti & Sachs, 2023). This economic compensation reflects the remuneration provided to individuals who defer current consumption or provide capital to others, as well as the time value of money (Al-Bahrani et al., 2020).

Interest rates have a significant impact on decision-making processes related to borrowing and investment. They establish the actual cost of borrowing, which impacts budgeting and the capacity to save. Similarly, interest rates exert an influence on profitability and investment returns, which, in turn, affect decisions regarding asset allocation and the creation of wealth. Knowledge related to interest rates allows individuals to optimize their financial resources and maximize the value of their economic decisions (Palacín-Sánchez et al., 2023).

The term "savings" is used to describe a financial practice whereby a portion of income is set aside for future use. It is a strategic tool that enables individuals to accumulate resources, thereby creating financial reserves that provide security and stability (Nagore, 2022). This process encompasses not only the retention of capital but also the adoption of responsible financial habits that contribute to personal economic growth. Establishing regular savings habits provides a reserve for contingencies and facilitates investment and long-term planning (Moya-Ponce & Madrazo-Lemaroy, 2023).

Retirement is a crucial milestone in an individual's life (Adrianto, 2021). It signifies a shift in one's financial trajectory, where the steady stream of income from employment is disrupted and having a robust financial foundation becomes crucial for sustaining a desired standard of living. The ability to anticipate and prepare for retirement enables individuals to effectively manage their financial resources, thereby ensuring that they are financially equipped to meet the challenges and opportunities that retirement presents (Cupák et al., 2019).

The significance of retirement planning is rooted in the necessity to accumulate and fortify a dependable financial reserve during one's working years. The advantage of early planning is that it allows the power of compound interest to be used, which results in a higher return on investments made over an extended period of time (Boisclair et al., 2017). Effective resource management provides flexibility and financial security, which are prerequisites for a satisfactory retirement. This enables the resolution of outstanding issues and the pursuit of personal objectives (Ye & Yue, 2023).

The next variable presented here is the allocation of funds. This is a pivotal element of EF, as it entails deliberate distribution of accessible resources to fulfil a spectrum of financial requirements encompassing day-to-day expenditures, savings, and investments (Migliavacca, 2020). The ability to balance financial priorities is of paramount importance. It ensures that every available resource is used efficiently to meet the specific goals and needs of each individual or family. This section addresses the creation and maintenance of a robust budgetary framework. It is crucial to allocate funds in a prudent manner to satisfy essential needs and accomplish long-term financial objectives, such as purchasing a residence, financing children's education, or planning for retirement (Krische, 2019).

A budget is a financial tool that presents income and expenditure in a clear and detailed manner, thereby enabling effective management of financial resources. The significance of a budget lies in its capacity to offer a comprehensive perspective of the financial landscape, facilitate informed decision making, and prevent unregulated management of financial resources. The process of budgeting entails identifying financial objectives, establishing priorities, and strategic allocation of resources (Suherman et al., 2023). This framework provides a structured approach to decision-making and facilitates active control over

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personal finances. Furthermore, it prevents over-indebtedness, allowing expenditures to be aligned with income and avoiding precarious financial situations (Gebrayel et al., 2018).

Proposition 2: A combination of financial skills related to certain variables is enough to significantly improve people's financial skills.

Methodology

This study employed principal component analysis (PCA), a statistical method that synthesizes information and reduces the number of variables while retaining the maximum amount of information. The resulting principal components or factors are linear combinations of the original variables and are independent of each other. The interpretation of factors derived from PCA is of paramount importance, as it is not predetermined and must be deduced based on the relationships between the factors and the initial variables (Lalander et al., 2019; Pan et al., 2022; Sethy et al., 2023)

$$Z = XW, \tag{1}$$

Here, Z is the principal component matrix; X represents the standardized data matrix; and W is the matrix of principal component loadings, which are eigenvectors.

The general equation of PCA was adjusted for the data analyzed in this study and expressed as follows:

$$Z = [X_{FK1} \quad X_{FK2} \quad \cdots \quad X_{FKn} \quad X_{FS1} \quad X_{FS2} \quad \cdots \quad X_{FSn}] \begin{bmatrix} w_{11} & w_{12} & \cdots & w_{1k} \\ w_{21} & w_{22} & \cdots & w_{2k} \\ \vdots & \vdots & \ddots & \vdots \\ w_{14} & w_{15} & \cdots & w_{1k} \\ \vdots & \vdots & \ddots & \vdots \\ w_{86} & w_{87} & \cdots & w_{8k} \end{bmatrix}, \tag{2}$$

where FK represents the set of variables in the financial knowledge category and FS represents the set of variables in the financial skills category. It is important to assess the correlations and contributions of each variable analyzed. In terms of correlations, loadings below 0.5 are low, those between 0.5 and 0.7 are moderate, and loadings above 0.7 are considered strong (Hinton & Salakhutdinov, 2006; Jollife & Cadima, 2016) .As for the contributions of the components, the former should explain at least 70-80% of the total combined variance (Jollife & Cadima, 2016). Each component should individually explain at least 10% of the variance to be relevant.

Subsequently, comparative qualitative analysis was performed using fuzzy set theory (fsQCA), which allows for partial membership among the elements of a set, rather than requiring complete exclusivity (Pappas & Woodside, 2021; Qu et al., 2023; Yang et al., 2023) This feature allows for more realistic representations of uncertainty or imprecision in data by using fuzzy logic to model concepts that lack clear boundaries. This results in more flexible descriptions that better reflect the ambiguous nature of certain phenomena in data analysis (Blanco-Mesa et al., 2023). The results of the PCA were used as the basis for the subsequent fsQCA. The following formula represents the overall value of the set of combinations for financial literacy:

$$FL = f\,(FK, FS) \tag{3}$$

To guarantee the precision and reliability of the findings, the data were standardized in accordance with the fsQCA analytical approach. The values were placed between 0 and 1, which facilitated comparison of different causal conditions. This permitted the variables to be interpreted in terms of degrees of fuzzy set membership, which ensured the consistency and coverage of the results were appropriate. In regard to consistency values, ranges equal to or greater than 0.75 are typically deemed acceptable (Pappas & Woodside, 2021). This value indicates that the causal combination in question leads to the reflected outcome in at least 75% of cases. As it gauges the frequency with which a causal combination yields the

desired outcome, this metric is founded upon the calculation of the minimum values between the causal conditions and the outcome for each case (Paluri & Mehra, 2016). The equation representing the consistency value is presented below (Qu et al., 2023):

$$Consistency = \frac{\sum \min(X_i, Y_i)}{\sum X_i} \quad (4)$$

In contrast, coverage assesses the explanatory relevance of a causal combination by determining the proportion of cases with an outcome that are explained by the causal combination. The equation representing the coverage value is presented below (Qu et al., 2023):

$$Coverage = \frac{\sum \min(X_i, Y_i)}{\sum Y_i} \quad (5)$$

Furthermore, an evaluation questionnaire was employed to assess the target population. The questionnaire was divided into two categories of analysis: financial knowledge and financial skills. Financial knowledge encompassed six variables: the time value of money, inflation, risk diversification, interest calculation, profitability, and the rules of the financial system. Financial skills comprised eight variables: division of money, savings, investment, budgeting, credit, interest, insurance, and retirement.

Sample

This analysis focused on the regions of Cundinamarca and Bogotá, Colombia, which are home to an estimated population of 11.482.832 inhabitants (Registraduria Nacional del Estado Civil, 2023) and are of pivotal importance to the political, economic, cultural, and social development of the country. Their influence is felt both nationally and internationally, positioning them as a key epicenter of several aspects that significantly impact Colombia's economic and financial development. This study examined economically active adults that were classified according to gender, social stratum, age range, educational level, and geographic location. A stratified random sampling method was employed to obtain a representative sample of 1837 participants. The group was distributed in a proportional manner, with 1347 samples allocated to Bogotá and 490 allocated to Cundinamarca. For a detailed account of the distribution of these samples, see Table 1.

Table 1. Adult population by Cundinamarca and Bogotá

Population	Adult population	Sample	Ratio
Bogotá	6.010.616	1.347	73%
Cundinamarca	2.185.471	490	27%
Total	8.196.087	1.837	100%

Source: Own elaboration, with data obtained from (Registraduria Nacional del Estado Civil, 2023)

Reliability and validity of the instrument

The questions in the questionnaire (see Appendix) were adapted from instruments validated in previous studies of knowledge (Lusardi & Mitchell, 2014; van Rooij et al., 2011) and financial skills (Trunk et al., 2017; Vyvyan et al., 2014) Academic articles that addressed these constructs were reviewed, and items that had proven to be effective were selected (Lusardi, 2019). This adaptation was made in order to ensure that the questions used in this study maintained high content validity and aligned with the most recent and relevant research in the field of financial literacy.

The instrument's validity was evaluated through a content analysis of the questions, ensuring that each item was consistent with the study's objectives and effectively measured the key constructs related to financial literacy. The questionnaire was also subjected to a review by experts in this field to confirm that the items adequately covered the dimensions of financial knowledge and skills.

The reliability of the instrument was measured using Cronbach's alpha coefficient (Bonett & Wright, 2015; Taber, 2018)which assesses the internal consistency between items. The Cronbach's alpha obtained in the analysis was 0.812, indicating good internal consistency among the questionnaire questions. This value suggests that the questionnaire items are highly correlated with each other and that they consistently measure the same underlying constructs, such as financial knowledge and skills. An alpha value greater than 0.8 is generally considered adequate in social research, which confirms the reliability of the instrument for the analysis of the data collected (Stroe et al., 2018)

Results

Analysis of the results of the assessment on financial knowledge and skills

Table 2 presents a detailed descriptive analysis of the surveyed population. Regarding gender, 59.6% of the participants were female, 38.4% were male, and 2.1% identified as other genders, reflecting a slight predominance of females in the sample. In terms of age, seven ranges were established, with the 18-24 age group being the largest, consisting of 648 respondents, followed by the 32-38 age group with 405 participants. These two groups, representing 35.3% and 21.8% of the sample, respectively, made up most of the economically active population, suggesting a young demographic in this study.

When the social strata were analyzed, 41.6% of the respondents belonged to stratum 1, indicating that a significant portion of the population lived near the poverty line. This highlights the challenging socio-economic conditions in this region. Combining the results from strata 5 and 6, only 1.2% of the population fell within the highest levels, demonstrating marked social inequality. The concentration of the population in the lower strata suggests an unequal distribution of resources and opportunities.

In terms of the educational levels, 25 people reported having no formal education, and the level with the lowest frequency was the doctorate level, with only 10 participants. On the other hand, the most common educational level was high school, with 766 people, representing 41.7% of the sample. This shows a trend towards secondary education as the predominant level, although a considerable proportion had reached technical or professional levels. These data are crucial for understanding the educational profile of the population and its correlation with socio-economic conditions.

Table 2. Statistical descriptive

Variables		Frequency	Percentage	CP
Gender	Female	1094	59.6	59.6
	Male	705	38.4	97.9
	Other	38	2.1	100.0
Age	18-24	648	35.3	35.3
	25-31	401	21.8	57.1
	32-38	445	24.2	81.3
	39-45	170	9.3	90.6
	46-52	84	4.6	95.2
	53-59	49	2.7	97.8
	60 the but	40	2.2	100.0
Social Stratum	0	16	.9	.9
	1	764	41.6	42.5
	2	521	28.4	70.8
	3	334	18.2	89.0
	4	180	9.8	98.8

	5	16	.9	99.7
	6	6	.3	100.0
Educational Level	None	25	1.4	1.4
	Primary	194	10.6	11.9
	High school	766	41.7	53.6
	Technician	257	14.0	67.6
	Technologist	189	10.3	77.9
	Professional	221	12.0	89.9
	Specialist	119	6.5	96.4
	Magister	56	3.0	99.5
	Doctor	10	.5	100.0

Source: Own elaboration CP: Cumulative percentage.

The results of the evaluation questionnaire (see Appendix A) were collated, and correct answers were assigned a value of one, while incorrect answers were assigned a value of zero. An evaluation scale was established, ranging from five to zero, with five representing excellence, four representing outstanding performance, three representing acceptable performance, and two representing insufficient performance. A score between 0 and 1 was indicative of a deficient performance. Table 3 illustrates that the variable 'Value of money over time' received the highest number of correct responses (1775) and obtained the best mean score of 4.8 among the variables in the financial literacy category.

The second highest number of correct responses was received for the question on interest calculation, with 1471 responses for an outstanding average score of 4. In contrast, the lowest average score of 3 was received for the question on the rules of the financial system, with only 1096 correct responses.

In the financial skills category, the variable designated as 'Interest' received the highest number of correct responses, with a total of 1431, achieving an average score of 3.9. In contrast, the variable 'Investment' received only 1031 correct responses and a lower score of 2.8, indicating that it was the variable with the lowest number of correct responses (see Table 4).

Table 3. Results in the financial knowledge category.

Variables	C	INC	%C	% INC	Q
Value of money over time	1775	62	97%	3%	4.8
Interest calculation	1471	366	80%	20%	4.0
Inflation	1307	530	71%	29%	3.6
Risk diversification	1304	533	71%	29%	3.5
Profitability	1098	739	60%	40%	3.0
Financial System Standards	1096	741	60%	40%	3.0

Source: Own elaboration. C: Correct; INC: Incorrect; %C: Percentage correct; % INC: Percentage Incorrect; Q: Qualification.

Table 4. Results in the financial skills category.

Variables	C	INC	%C	% INC	Q
Interest	1432	405	78%	22%	3.9
Savings	1282	555	70%	30%	3.5

Retirement	1251	586	68%	32%	3.4
Insurance	1201	636	65%	35%	3.3
Division of money	1140	697	62%	38%	3.1
Budget	1109	728	60%	40%	3.0
Credit	1066	771	58%	42%	2.9
Investment	1031	806	56%	44%	2.8

Source: Own elaboration. C: Correct; INC: Incorrect; %C: Percentage correct; % INC: Percentage Incorrect; Q: Qualification.

Principal component analysis in financial knowledge

To ascertain the dimensionality of the data within each variable of the categories under analysis, the principal statistical values were initially calculated. When the eigenvalue of a given dimension exceeded 1, this signified that the data within that dimension exhibited elevated variability in comparison to the observed mean. Table 5 illustrates that dimension 1 had the highest eigenvalue of 1.761, which accounted for 51.7% of the data across all dimensions. The objective of this study was to analyze the correlations and contributions of the variables in dimension 1 to determine new principal components.

Table 5. Main statistical data on financial knowledge

Dimensions	PE	PV	CPV
Dim.1	1.761	0.517	0.517
Dim.2	0.894	0.133	0.650
Dim.3	0.826	0.114	0.764
Dim.4	0.792	0.104	0.868
Dim.5	0.654	0.071	0.940
Dim.6	0.602	0.060	1

Source: Own elaboration, with results from R and RStudio software. PE: Percentage of eigenvalues; PV: Percentage of variance; CPV: Cumulative percentage of variance.

The variables that contributed most to dimension 1 were the time value of money (20.186), financial system standards (19.166), profitability (18.455), risk diversification (15.537), and interest calculation (14.268). Conversely, inflation exerted the least influence, contributing only 12.387% (see Table 6).

Table 6. Contributions to financial knowledge.

Variables	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
Value of money over time	20.186	0.994	11.119	2.909	56.561
Interest calculation	14.268	35.633	1.976	27.115	20.035
Inflation	12.387	52.059	3.144	21.691	5.306

Risk diversification	15.537	1.810	61.943	0.624	6.468
Profitability	18.455	8.060	21.381	10.512	1.165
Financial System Standards	19.166	1.443	0.437	37.149	10.464

Source: Own elaboration, with results from R and RStudio software.

Table 7 presents the correlation levels of each variable with respect to the dimensions. It is notable that dimension 1 exhibited the highest correlation, with the variable 'Value of money over time' demonstrating the strongest correlation at 0.626, followed by 'Financial system regulations' at 0.595. The variable 'inflation' exhibited the lowest correlation level, at 0.384.

Table 7. Financial knowledge correlations.

Variables	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
Value of money over time	0.626	0.008	0.076	0.018	0.242
Interest calculation	0.443	0.285	0.013	0.170	0.086
Inflation	0.384	0.416	0.021	0.136	0.023
Risk diversification	0.482	0.014	0.423	0.004	0.028
Profitability	0.572	0.064	0.146	0.066	0.005
Financial System Standards	0.595	0.012	0.003	0.233	0.045

Source: Own elaboration, with results from R and RStudio software.

The results of the principal component analysis (PCA) indicated that a latent variable could be derived from the six initial variables that were subjected to investigation. The latent variable was primarily constituted by three principal variables: the time value of money, profitability, and the regulations governing the financial system. These three variables collectively constitute an underlying dimension that accounts for a significant portion of the variability observed in the dataset (see Table 8).

Table 8. Correlations of the new latent variable on financial knowledge

Variables	Dim.1	Dim.2	Dim.3
Value of money over time	0.671	0.251	0.077
Profitability	0.715	0.000	0.285
Financial System Standards	0.671	0.255	0.074

Source: Own elaboration, with results from R and RStudio software

Principal component analysis in financial skills

Table 9 illustrates that dimension 1 had the highest eigenvalue of 4.117, thereby establishing it as the most significant dimension within the analytical framework. This indicates that dimension 1 provided approximately 51.5% of the information present in the data from all assessed dimensions. This finding emphasizes the importance and considerable influence of dimension 1 on the overall structure and variability of the data, thereby highlighting its dominant role in the information analyzed as a whole.

It should be noted that the following constitutes an objective observation and not a subjective assessment. Table 10 illustrates that investment (16.968), insurance (15.299), savings (14.314), and credit (14.260) had the greatest impacts on dimension 1, whereas budgeting (10.064) and money division (2.360) had the lowest.

Table 9. Main statistical data on financial skills

Dimensions	PE	PV	CPV
Dim.1	4.117	51.457	51.457
Dim.2	0.948	11.855	63.311
Dim.3	0.759	9.483	72.794
Dim.4	0.617	7.715	80.509
Dim.5	0.486	6.075	86.584
Dim.6	0.401	5.007	91.591
Dim.7	0.328	4.523	96.114
Dim.8	0.208	3.886	100

Source: Own elaboration, with results from R and RStudio software. PE: Percentage of eigenvalues; PV: Percentage of variance; CPV: Cumulative percentage of variance.

Table 10. Contributions to financial skills.

Variables	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
Interest	13.437	1.611	15.425	24.414	2.929
Savings	14.314	0.046	6.738	0.020	62.165
Retirement	13.298	0.002	3.686	36.593	18.711
Insurance	15.299	0.463	6.014	8.135	1.219
Division of money	2.360	88.329	7.511	0.607	0.084
Budget	10.064	6.451	52.961	2.560	1.868
Credit	14.260	0.532	6.906	27.401	11.730
Investment	16.968	2.565	0.760	0.270	1.295

Source: Own elaboration, with results from R and RStudio software

Table 11 presents the results of the analysis of the correlations between each variable and the dimensions. The results demonstrate a significant correlation level of 0.698 for the variable investment, followed by insurance at 0.630, savings at 0.589, and credit at 0.587. Nevertheless, the variables budget and division of money exhibited the lowest correlation levels, at 0.414 and 0.097, respectively.

To identify the latent variables associated with dimension 1, variables with correlation indices greater than 0.5 were selected, as illustrated in table 10. To construct a new latent variable within the financial skills category, it was necessary to include the variables of interest, namely savings, retirement,

insurance, credit, and investment. These variables are detailed in Table 12 and were fundamental to the construction of dimension 1, which pertains to financial skills, due to their considerable correlation indices.

Table 11. Financial skills correlations.

Variables	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
Interest	0.553	1.528	0.117	0.151	0.014
Savings	0.589	4.358	0.051	0.000	0.302
Retirement	0.547	1.944	0.028	0.226	0.091
Insurance	0.630	0.004	0.046	0.050	0.006
Division of money	0.097	0.838	0.057	0.004	0.000
Budget	0.414	0.061	0.402	0.016	0.009
Credit	0.587	0.005	0.052	0.169	0.057
Investment	0.698	0.024	0.006	0.002	0.001

Source: Own elaboration, with results from R and RStudio software

Table 12. Correlations of the new latent variable on financial skill

Variables	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
Interest	0.597	0.062	0.124	0.179	0.009
Savings	0.611	0.008	0.175	0.152	0.022
Retirement	0.561	0.226	0.076	0.027	0.111
Insurance	0.652	0.074	0.000	0.018	0.238
Credit	0.571	0.248	0.103	0.000	0.002
Investment	0.696	0.009	0.037	0.093	0.009

Source: Own elaboration with results from R and RStudio software

Fuzzy analysis of the financial knowledge category

Comparative qualitative fuzzy set analysis was employed to examine the latent variables to determine the assumptions and coverages of variables exhibiting high correlation rates that made significant contributions to dimension 1.

Table 13 presents an analysis of adequacy among key financial knowledge variables, such as the value of money over time (VM), profitability (PR), and financial system standards (FSs). These combinations reflect how different conditions interacted to explain the level of financial knowledge in the individuals. According to the results, the combination of these variables was sufficient to explain financial knowledge, with hedging values ranging from 0.715 to 0.744, indicating that 71.5% to 74.4% of cases could be explained by these combinations. The consistency of the combinations, which varied between 0.886 and 0.910, showed high reliability in predicting financial knowledge.

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This implies that the relationships between the evaluated variables are solid and consistent, which reinforces the importance of these variables in the formation of financial knowledge. In addition, these results support Proposition 1, which states that a high level of knowledge about the value of money over time, interest calculation, inflation, risk diversification, profitability, and financial system standards is sufficient to form a high level of financial knowledge. The consistency and coverage observed in the table demonstrate that these combinations are indeed sufficient to explain and form a high level of financial knowledge in individual.

Table 13. Sufficiency analysis of conditions between financial knowledge variables

Dimension	Assumptions	Coverage	Consistency
Value of money over time	PR*FS	0.715	0.910
Profitability	VM*FS	0.742	0.910
Financial System Standards	VM*PR	0.744	0.886

Source: Own elaboration, with the results of the fsQCA software. VM: Value of money over time; PR: Profitability; FS: Financial System Standards.

These findings underscore the necessity of comprehending the combinations that influence the analysis of financial variables within the studied population. This information is of value for designing effective financial education strategies. The identification and analysis of variables with high consistency and coverage enables researchers and practitioners in the financial sector to develop more accurate and effective programs and policies that address the specific needs of the population in terms of financial literacy.

Fuzzy analysis of the financial skills category

Table 14 illustrates a sufficiency analysis of various combinations of financial skill variables, including interest (IT), savings (SA), retirement (RE), insurance (IN), credit (CR), and investment (INV). Each dimension presents a series of assumptions (combinations of variables) that were evaluated for their ability to sufficiently explain the levels of financial skills. The coverage values in this table exhibit considerable variability, ranging from 0.002 to 0.749. This suggests that certain combinations were more effective than others in explaining the observed cases. The combinations with high coverage values, such as SA*INV*IT*RE for the credit dimension (0.749), indicate that these variables were highly effective in explaining a significant proportion of the observed cases.

In terms of consistency, the values were high for all combinations, with most of the assumptions reaching consistency values close to 1.0, indicating strong relationships between the combinations of variables and financial skills. This suggests that combinations of variables such as SA*INV*IT*RE not only covered many cases but did so consistently, indicating that individuals presenting these combinations tended to demonstrate high levels of financial skills

Table 14. Sufficiency analysis of conditions between financial skills variables.

Dimension	Assumptions	Coverage	Consistency
Interest	SA*CR	0.646	0.986
	INV*CR	0.607	0.989
	CR*IN	0.627	0.991

	INV*RE	0.645	0.988
	CR*RE	0.628	0.987
	SA*INV*IN	0.619	0.990
	SA*IN*RE	0.668	0.980
Saving	CR*~IT*IN*~RE	0.002	1
	INV*CR*IT*RE	0.622	0.972
	INV*IT*IN*RE	0.665	0.972
	INV*~CR*~IT*~IN*RE	0.001	1
	INV*CR*~IT*IN	0.005	1
	INV*CR*IN*RE	0.601	0.976
Retirement	SA*INV*CR*~IT	0.006	1
	SA*INV*IT*IN	0.682	0.963
	~SA*~INV*CR*~IT*IN	0.001	1
Insurance	SA*INV*IT*RE	0.710	1
	INV*CR*IT*RE	0.653	0.955
	~SA*INV*~CR*~IT*RE	0.001	1
	SA*INV*CR*~IT*~RE	0.001	1
Credit	SA*INV*IT*RE	0.749	1
	SA*INV*IN*RE	0.722	0.896
	~SA*INV*~IT*~IN*RE	0.001	1
Investment	SA*CR*IN*RE	0.747	0.954

Source: Own elaboration, with the results of the fsQCA software. IT: Interest; SA: Savings; RE: Retirement; IN: Insurance; CR: Credit; INV: Investment.

These results support Proposition 2, which states that a combination of financial skills in variables such as interest, savings, retirement, insurance, credit, and investment is sufficient to significantly improve the level of financial skill in individuals. Combinations of variables with high coverage and consistency, such as those observed in the investment dimension (coverage of 0.747 and consistency of 0.954), show that, indeed, the interaction of these variables leads to a notable improvement in financial skills.

Discussion and Conclusions

This study focused on the financial literacy of the adult population in Cundinamarca and Bogotá, regions that stand out due to their economic relevance in Colombia. The importance of improving financial literacy has been recognized by various actors, including in academia, government, and business

(Kramer, 2016; Stolper & Walter, 2017; Yong et al., 2018). Providing people with the skills and knowledge needed to make informed financial decisions is crucial for efficient resource management (Aggarwal & Sangal, 2022; Bai, 2023; Chaudhry et al., 2024) which reduces financial stress and improves individual and collective economic well-being This study was based on a robust and multidimensional approach that used principal component analysis (PCA) and qualitative comparative analysis with fuzzy sets (fsQCA) to analyze how variables interact with each other.

Principal component analysis (PCA) identified that only three of the six original variables of financial knowledge the value of money over time, profitability, and the rules of the financial system are sufficient to generate a composite latent variable that explains a significant part of the observed variability. This reinforces the idea that there is a synergistic relationship between these three factors, suggesting that by interacting they contribute to the formation of an underlying dimension of financial knowledge. In terms of financial skills, the fsQCA results identified multiple combinations of variables, such as interest, savings, retirement, insurance, credit, and investment, that were highlighted as key determinants for improving financial skills. The consistency observed in these combinations suggests that these factors are not only important individually but interact efficiently to influence the financial skill levels of individuals.

In relation to the results of the fsQCA, it was observed that the combinations of variables analyzed in the financial skills dimension allow the identification of complex patterns that support people's ability to manage their financial resources prudently. Variables related to interest, savings, retirement, insurance, credit, and investment proved to be sufficient to improve individuals' financial skill levels. This supports Proposition 2, which states that a combination of these skills is sufficient to generate a positive impact on financial decision-making and the management of personal resources. The findings obtained in this study offer a solid basis for the development of effective strategies that promote comprehensive improvements in financial literacy and skills.

In conclusion, this study demonstrated that both financial knowledge and skills can be significantly improved by focusing on a key set of variables. For financial knowledge, the value of money over time, profitability, and the rules of the financial system are essential to forming a solid foundation of financial understanding. These results coincide with Proposition 1, which indicates that a combination of these variables is sufficient to form a high level of financial knowledge. Regarding financial skills, a combination of variables such as interest, savings, retirement, insurance, credit, and investment was proven to be an appropriate approach to improving the financial capabilities of individuals. These results underscore the importance of designing educational programs that focus on theoretical knowledge as well as the development of practical skills to effectively manage financial resources. In this way, they contribute to both individual and collective economic well-being, strengthening people's ability to make informed and strategic financial decisions.

The sample analyzed consists predominantly of individuals from low socioeconomic strata (70% from levels 1 and 2) and with a medium level of formal education (41.7% with secondary education and 24.3% with technical or technological training). This composition highlights the need for differentiated financial education strategies tailored to contexts characterized by limited cultural and economic capital. In such settings, the assimilation and application of financial concepts demand pedagogical approaches that are both accessible and context sensitive. Although the findings are constrained by the sample size and the limited timeframe for data collection, the results underscore the urgency of implementing inclusive programs that address these structural conditions. Future research should explore the role of financial skills and family traditions, given that financial literacy is often shaped by knowledge and practices transmitted within the household environment.

References

Acar, T. O. (2023). Breaking the cycle: The mediating effects of reading, mathematical and ICT literacy skills on financial success in youth. *Review of Education*, *11*(3). https://doi.org/10.1002/rev3.3421

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Adrianto, F. (2021). The prospect of indonesian government retail sukuk: From the perspective of sharia financial knowledge, education, and behavior. *DLSU Business and Economics Review*, *30*(2), 50–60. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85111083892&partnerID=40&md5=bd2a45534cc9e38900b66b9e14152976

Aggarwal, P. K., & Sangal, A. (2022). Determinants of Financial Literacy and its Influence on Financial Wellbeing — a Study of the Young Population in Haryana, India. *Finance: Theory and Practice*, *26*(5), 121–131. https://doi.org/10.26794/2587-5671-2022-26-5-121-131

Al-Bahrani, A., Buser, W., & Patel, D. (2020). Early Causes of Financial Disquiet and the Gender Gap in Financial Literacy: Evidence from College Students in the Southeastern United States. *Journal of Family and Economic Issues*, *41*(3), 558–571. https://doi.org/10.1007/s10834-020-09670-3

Alam, T., & Rashid, M. (2023). Efficacy of Financial Inclusion and Economic Well-Being: A Case Study of Kashmir Valley. *Indian Journal of Agricultural Economics*, *78*(4), 608–622.

Ammari, A., Allodi, E., Salerno, D., & Stella, G. P. (2023). An asymmetrical approach to understanding consumer characteristics in banking trust during the COVID-19 pandemic in Italy. *Research in International Business and Finance*, *64*. https://doi.org/10.1016/j.ribaf.2023.101903

Ankrah Twumasi, M., Jiang, Y., Adhikari, S., Adu Gyamfi, C., & Asare, I. (2022). Financial literacy and its determinants: the case of rural farm households in Ghana. *Agricultural Finance Review*, *82*(4), 641–656. https://doi.org/10.1108/AFR-06-2021-0078

Arias-Oliva, M., de Andrés-Sánchez, J., & Pelegrín-Borondo, J. (2021). Fuzzy set qualitative comparative analysis of factors influencing the use of cryptocurrencies in spanish households. *Mathematics*, *9*(4), 1–19. https://doi.org/10.3390/math9040324

Artavanis, N., & Karra, S. (2020). Financial literacy and student debt. *European Journal of Finance*, *26*(4–5), 382–401. https://doi.org/10.1080/1351847X.2019.1711435

Aw, E. C.-X., Zha, T., & Chuah, S. H.-W. (2023). My new financial companion! non-linear understanding of Robo-advisory service acceptance | **我的新**财务伙伴!**从非**线性观点理解智能投资顾问服务接受程度. *Service Industries Journal*, *43*(3–4), 185–212. https://doi.org/10.1080/02642069.2022.2161528

Bai, R. (2023). Impact of financial literacy, mental budgeting and self control on financial wellbeing: Mediating impact of investment decision making. *PLoS ONE*, *18*(11 November). https://doi.org/10.1371/journal.pone.0294466

Baidoo, S. T., Yusif, H., & Ayesu, E. K. (2020). Improving loan repayment in Ghana: Does financial literacy matter? *Cogent Economics and Finance*, *8*(1). https://doi.org/10.1080/23322039.2020.1787693

Bazán, J. E. L., Torres, O. V. D. la T., & Alfaro-Calderón, G. G. (2021). Educación Financiera: Origen, análisis y evolución de las aportaciones científicas utilizando técnicas bibliométricas en la Web of Science. *Inquietud Empresarial*, *21*(2), 35–49. https://doi.org/10.19053/01211048.11475

Blanco-Mesa, F., León-Castro, E., & Romero-Muñoz, J. (2021). Pythagorean Membership Grade Aggregation Operators: Application in Financial knowledge. *Mathematics 2021, Vol. 9, Page 2136*, *9*(17), 2136. https://doi.org/10.3390/MATH9172136

Blanco-Mesa, F., Vinchira, O., & Cuy, Y. (2023). Forgotten Factors in Knowledge Conversion and Routines: A Fuzzy Analysis of Employee Knowledge Management in Exporting Companies in Boyaca. *Mathematics 2023, Vol. 11, Page 412*, *11*(2), 412. https://doi.org/10.3390/MATH11020412

Boisclair, D., Lusardi, A., & Michaud, P.-C. (2017). Financial literacy and retirement planning in Canada. *Journal of Pension Economics and Finance*, *16*(3), 277–296. https://doi.org/10.1017/S1474747215000311

Bonett, D. G., & Wright, T. A. (2015). Cronbach's alpha reliability: Interval estimation, hypothesis testing, and sample size planning. *Journal of Organizational Behavior*, *36*(1), 3–15. https://doi.org/10.1002/job.1960

Cardona-Montoya, R. A., Cruz, V., & Mongrut, S. A. (2022). Financial fragility and financial stress during the COVID-19 crisis: evidence from Colombian households. *Journal of Economics, Finance and Administrative Science*, *27*(54), 376–393. https://doi.org/10.1108/JEFAS-01-2022-0005

Chaudhry, N., Akhter, W., & Roubaud, D. (2024). Financial literacy, personality traits and financial wellbeing: A preliminary evidence. *Economics Bulletin*, *44*(1), 190–210. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85196048024&partnerID=40&md5=57af4ae252ea1b2efcf5c0b8e74d7a47

Chen, F., Jiang, G., & Gu, M. (2024). Financial knowledge and responsible credit card behavior: exploring mediators and moderators. *International Journal of Bank Marketing*, *42*(5), 1092–1113. https://doi.org/10.1108/IJBM-07-2023-0404

Cucinelli, D., Trivellato, P., & Zenga, M. (2019). Financial Literacy: The Role of the Local Context. *Journal of Consumer Affairs*, *53*(4), 1874–1919. https://doi.org/10.1111/joca.12270

Cupák, A., Kolev, G. I., & Brokešová, Z. (2019). Financial literacy and voluntary savings for retirement: novel causal evidence. *European Journal of Finance*, *25*(16), 1606–1625. https://doi.org/10.1080/1351847X.2019.1641123

dos Santos Tolomeotti, L. G., & Sachs, L. (2023). A marxist approach to financial education in a rural school. *Prometeica*, *27*, 274–284. https://doi.org/10.34024/prometeica.2023.27.15294

Engström, P., & McKelvie, A. (2017). Financial literacy, role models, and micro-enterprise performance in the informal economy. *International Small Business Journal: Researching Entrepreneurship*, *35*(7), 855–875. https://doi.org/10.1177/0266242617717159

Gebrayel, E., Jarrar, H., Salloum, C., & Lefebvre, Q. (2018). Effective association between audit committees and the internal audit function and its impact on financial reporting quality: Empirical evidence from Omani listed firms. *International Journal of Auditing*, *22*(2), 197–213. https://doi.org/10.1111/ijau.12113

Goyal, K., & Kumar, S. (2021). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, *45*(1), 80–105. https://doi.org/10.1111/ijcs.12605

Graham, J. E., Lassala, C., & Ribeiro-Navarrete, B. (2019). A fuzzy-set analysis of conditions influencing mutual fund performance. *International Review of Economics and Finance*, *61*, 324–336. https://doi.org/10.1016/j.iref.2018.01.017

Hamid, F. S., & Loke, Y. J. (2021). Financial literacy, money management skill and credit card repayments. *International Journal of Consumer Studies*, *45*(2), 235–247. https://doi.org/10.1111/ijcs.12614

He, L., Liang, Z., Ren, Z., & Song, Y. (2024). Optimal mix among PAYGO, EET and individual savings. *Scandinavian Actuarial Journal*, *2024*(5), 463–505. https://doi.org/10.1080/03461238.2023.2274096

Hinton, G. E., & Salakhutdinov, R. R. (2006). Reducing the dimensionality of data with neural networks. *Science*, *313*(5786), 504–507. https://doi.org/10.1126/science.1127647

Huang, J., Nam, Y., & Lee, E. J. (2015). Financial Capability and Economic Hardship Among Low-Income Older Asian Immigrants in a Supported Employment Program. *Journal of Family and Economic Issues*, *36*(2), 239–250. https://doi.org/10.1007/s10834-014-9398-z

Jollife, I. T., & Cadima, J. (2016). Principal component analysis: A review and recent developments. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *374*(2065). https://doi.org/10.1098/rsta.2015.0202

Jungo, J., Madaleno, M., & Botelho, A. (2022). Financial Regulation, Financial Inclusion and Competitiveness in the Banking Sector in SADC and SAARC Countries: The Moderating Role of Financial Stability. *International Journal of Financial Studies*, *10*(1). https://doi.org/10.3390/ijfs10010022

Kaiser, T., Lusardi, A., Menkhoff, L., & Urban, C. (2022). Financial education affects financial knowledge and downstream behaviors. *Journal of Financial Economics*, *145*(2), 255–272. https://doi.org/10.1016/j.jfineco.2021.09.022

Kaiser, T., & Menkhoff, L. (2020). Financial education in schools: A meta-analysis of experimental studies. *Economics of Education Review*, *78*. https://doi.org/10.1016/j.econedurev.2019.101930

Klapper, L., & Lusardi, A. (2020). Financial literacy and financial resilience: Evidence from around the world. *Financial Management*, *49*(3), 589–614. https://doi.org/10.1111/fima.12283

Kodongo, O. (2018). Financial Regulations, Financial Literacy, and Financial Inclusion: Insights from Kenya. *Emerging Markets Finance and Trade*, *54*(12), 2851–2873. https://doi.org/10.1080/1540496X.2017.1418318

Kovalchuk, V., Maslich, S., Tkachenko, N., Shevchuk, S., & Shchypska, T. (2022). Vocational Education in the Context of Modern Problems and Challenges. *Journal of Curriculum and Teaching*, *11*(8), 329–338. https://doi.org/10.5430/jct.v11n8p329

Kramer, M. M. (2016). Financial literacy, confidence and financial advice seeking. *Journal of Economic Behavior and Organization*, *131*, 198–217. https://doi.org/10.1016/j.jebo.2016.08.016

Krische, S. D. (2019). Investment Experience, Financial Literacy, and Investment-Related Judgments. *Contemporary Accounting Research*, *36*(3), 1634–1668. https://doi.org/10.1111/1911-3846.12469

Kumar, P., Pillai, R., Kumar, N., & Tabash, M. I. (2023). The interplay of skills, digital financial literacy, capability, and autonomy in financial decision making and well-being. *Borsa Istanbul Review*, *23*(1), 169–183. https://doi.org/10.1016/j.bir.2022.09.012

Lalander, C., Diener, S., Zurbrügg, C., & Vinnerås, B. (2019). Effects of feedstock on larval development and process efficiency in waste treatment with black soldier fly (Hermetia illucens). *Journal of Cleaner Production*, *208*, 211–219. https://doi.org/10.1016/j.jclepro.2018.10.017

Li, R., & Qian, Y. (2020). Entrepreneurial participation and performance: the role of financial literacy. *Management Decision*, *58*(3), 583–599. https://doi.org/10.1108/MD-11-2018-1283

Loke, Y. J. (2017). Financial vulnerability of working adults in Malaysia. *Contemporary Economics*, *11*(2), 205–218. https://doi.org/10.5709/ce.1897-9254.237

Lone, U. M., & Bhat, S. A. (2024). Impact of financial literacy on financial well-being: a mediational role of financial self-efficacy. *Journal of Financial Services Marketing*, *29*(1), 122–137. https://doi.org/10.1057/s41264-022-00183-8

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., & 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, Annamaria, & Mitchell, O. S. (2008). Planning and Financial Literacy: How Do Women Fare? *American Economic Review: Papers & Proceedings*, *98*(2), 1–8. https://doi.org/10.3386/W13750

Michael Collins, J., & Urban, C. (2020). Measuring financial well-being over the lifecourse. *European Journal of Finance*, *26*(4–5), 341–359. https://doi.org/10.1080/1351847X.2019.1682631

Migliavacca, M. (2020). Keep your customer knowledgeable: financial advisors as educators. *European Journal of Finance*, *26*(4–5), 402–419. https://doi.org/10.1080/1351847X.2019.1700148

MONSURA, M. P. (2020). The Importance of Financial Literacy: Household's Income Mobility Measurement and Decomposition Approach. *Journal of Asian Finance, Economics and Business*, *7*(12), 647–655. https://doi.org/10.13106/JAFEB.2020.VOL7.NO12.647

Moya-Ponce, C., & Madrazo-Lemaroy, P. (2023). Beliefs that provide a foundation for heuristics and biases in financial decision-making. *Cuadernos de Gestion*, *23*(2), 69–80. https://doi.org/10.5295/CDG.221703PM

Nagore, I. A. (2022). Educación financiera en píldoras: jeroglíficos financieros y posts en el Portal del Cliente Bancario. *Tecnología, Ciencia y Educación*, *21*, 81–114. https://doi.org/10.51302/TCE.2022.634

Netemeyer, R. G., Lynch, J. G., Lichtenstein, D. R., & Dobolyi, D. (2024). Financial Education Effects on Financial Behavior and Well-Being: The Mediating Roles of Improved Objective and Subjective Financial Knowledge and Parallels in Physical Health. *Journal of Public Policy and Marketing*. https://doi.org/10.1177/07439156241228197

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

Oberrauch, L., & Kaiser, T. (2024). Financial Education or Incentivizing Learning-By-Doing? Evidence from an RCT with Undergraduate Students. *Journal of Behavioral and Experimental Finance*, *43*. https://doi.org/10.1016/j.jbef.2024.100954

Okoli, T. T., & Tewari, D. D. (2020). An empirical assessment of probability rates for financial technology adoption among african economies: A multiple logistic regression approach. *Asian Economic and Financial Review*, *10*(11), 1342–1355. https://doi.org/10.18488/journal.aefr.2020.1011.1342.1355

Palacín-Sánchez, M. J., Alencar-García, A., & Canto-Cuevas, F. J. (2023). Financial distress and corporate restructuring: a case study. *Cuadernos de Gestion*, *23*(2), 81–91. https://doi.org/10.5295/CDG.221759FC

Paluri, R. A., & Mehra, S. (2016). Financial attitude based segmentation of women in India: an exploratory study. *International Journal of Bank Marketing*, *34*(5), 670–689. https://doi.org/10.1108/IJBM-05-2015-0073

Pan, W., Xie, T., Wang, Z., & Ma, L. (2022). Digital economy: An innovation driver for total factor productivity. *Journal of Business Research*, *139*, 303–311. https://doi.org/10.1016/j.jbusres.2021.09.061

Panos, G. A., & Wilson, J. O. S. (2020). Financial literacy and responsible finance in the FinTech era: capabilities and challenges. *European Journal of Finance*, *26*(4–5), 297–301. https://doi.org/10.1080/1351847X.2020.1717569

Pappas, I. O., & Woodside, A. G. (2021). Fuzzy-set Qualitative Comparative Analysis (fsQCA): Guidelines for research practice in Information Systems and marketing. *International Journal of Information Management*, *58*. https://doi.org/10.1016/J.IJINFOMGT.2021.102310

Paraboni, A. L., & da Costa Jr., N. (2021). Improving the level of financial literacy and the influence of the cognitive ability in this process. *Journal of Behavioral and Experimental Economics* , *90*. https://doi.org/10.1016/j.socec.2020.101656

Purnomo, B. R. (2019). Artistic orientation, financial literacy and entrepreneurial performance. *Journal of Enterprising Communities*, *13*(1–2), 105–128. https://doi.org/10.1108/JEC-09-2018-0065

Qu, X., Qin, X., & Hu, H. (2023). Research on the Improvement Path of Regional Green Technology Innovation Efficiency in China Based on fsQCA Method. *Sustainability (Switzerland)*, *15*(4). https://doi.org/10.3390/su15043190

Registraduria Nacional del Estado Civil. (2023, October 30). *Elecciones Territoriales 2023*. https://resultadosprec2023.registraduria.gov.co/alcalde/0/colombia

Romero-Muñoz, J., Fonseca-Cifuentes, G., & Blanco-Mesa, F. (2021). Análisis de los niveles de conocimiento financiero usando el operador OWA: caso Boyacá, Colombia. *Revista Escuela de Administración de Negocios*, *91*. https://doi.org/10.21158/01208160.N91.2021.3091

Senyo, P. K., & Osabutey, E. L. C. (2020). Unearthing antecedents to financial inclusion through FinTech innovations. *Technovation*, *98*. https://doi.org/10.1016/j.technovation.2020.102155

Sepúlveda, H. A. Á. (2023). Financial education for sustainable development Curricular analysis of a secondary education program in Chile. *Prometeica*, *28*, 233–243. https://doi.org/10.34024/prometeica.2023.28.14972

Sethy, S. K., Mir, T. A., Gopinathan, R., & Joshi, D. P. P. (2023). Exploring the socio-economic attributes of financial inclusion in India: a decomposition analysis. *International Journal of Social Economics*, *50*(7), 941–955. https://doi.org/10.1108/IJSE-08-2021-0451

Sobaih, A. E. E., & Elshaer, I. A. (2023). Risk-Taking, Financial Knowledge, and Risky Investment Intention: Expanding Theory of Planned Behavior Using a Moderating-Mediating Model. *Mathematics*, *11*(2). https://doi.org/10.3390/math11020453

Stolper, O. A., & Walter, A. (2017). Financial literacy, financial advice, and financial behavior. *Journal of Business Economics*, *87*(5), 581–643. https://doi.org/10.1007/s11573-017-0853-9

Stroe, S., Parida, V., & Wincent, J. (2018). Effectuation or causation: An fsQCA analysis of entrepreneurial passion, risk perception, and self-efficacy. *Journal of Business Research*, *89*, 265–272. https://doi.org/10.1016/J.JBUSRES.2018.01.035

Suherman, S., Kurniawati, H., & Mohidin, R. (2023). Determinants of financial risk tolerance: Evidence from the Indonesian millennials. *Humanities and Social Sciences Letters*, *11*(1), 67–82. https://doi.org/10.18488/73.v11i1.3300

Suresh G. (2024). Impact of Financial Literacy and Behavioural Biases on Investment Decision-making. *FIIB Business Review*, *13*(1), 72–86. https://doi.org/10.1177/23197145211035481

Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, *48*(6), 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Takmaz, S., Sarı, E., & Alataş, S. (2024). Financial inclusion in Turkey: unpacking the provincial inequality and its determinants. *Applied Economics Letters*, *31*(7), 661–669. https://doi.org/10.1080/13504851.2022.2141442

Trunk, A., Koeàr, S., & Širca, N. T. (2017). Education and training for financial Literacy: The role of banks-case study Slovenia. *International Journal of Innovation and Learning*, *22*(3), 385–406. https://doi.org/10.1504/IJIL.2017.086735

van der Cruijsen, C., de Haan, J., & Roerink, R. (2021). Financial knowledge and trust in financial institutions. *Journal of Consumer Affairs*, *55*(2), 680–714. https://doi.org/10.1111/joca.12363

van Rooij, M., Lusardi, A., & Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics*, *101*(2), 449–472. https://doi.org/10.1016/j.jfineco.2011.03.006

Vörös, Z., Szabó, Z., Kehl, D., Kovács, O. B., Papp, T., & Schepp, Z. (2021). The forms of financial literacy overconfidence and their role in financial well-being. *International Journal of Consumer Studies*. https://doi.org/10.1111/ijcs.12734

Vyvyan, V., Blue, L., & Brimble, M. (2014). Factors that influence financial capability and effectiveness: Exploring financial counsellors' perspectives. *Australasian Accounting, Business and Finance Journal*, *8*(4), 3–22. https://doi.org/10.14453/aabfj.v8i4.2

Westermann, S., Niblock, S. J., Harrison, J. L., & Kortt, M. A. (2020). Financial Advice Seeking: A Review of the Barriers and Benefits. *Economic Papers*, *39*(4), 367–388. https://doi.org/10.1111/1759-3441.12294

Willis, L. E. (2017). Finance-informed citizens, citizen-informed finance: An essay occasioned by the international handbook of financial literacy. *Journal of Social Science Education*, *16*(4), 16–27. https://doi.org/10.4119/UNIBI/jsse-v16-i4-1761

Xu, S., & Jiang, K. (2024). Knowledge creates value: the role of financial literacy in entrepreneurial behavior. *Humanities and Social Sciences Communications*, *11*(1). https://doi.org/10.1057/s41599-024-03201-3

Xue, R., Gepp, A., O'Neill, T. J., Stern, S., & Vanstone, B. J. (2019). Financial literacy amongst elderly Australians. *Accounting and Finance*, *59*(S1), 887–918. https://doi.org/10.1111/acfi.12362

Xue, R., Gepp, A., O'Neill, T. J., Stern, S., & Vanstone, B. J. (2021). Financial literacy and financial strategies: The mediating role of financial concerns. *Australian Journal of Management*, *46*(3), 437–465. https://doi.org/10.1177/0312896220940762

Yang, X., Yang, J., Hou, Y., Li, S., & Sun, S. (2023). Gamification of mobile wallet as an unconventional innovation for promoting Fintech: An fsQCA approach. *Journal of Business Research*, *155*. https://doi.org/10.1016/j.jbusres.2022.113406

Ye, X., & Yue, P. (2023). Financial literacy and household energy efficiency: An analysis of credit market and supply chain. *Finance Research Letters*, *52*. https://doi.org/10.1016/j.frl.2022.103563

Yong, C.-C., Yew, S.-Y., & Wee, C.-K. (2018). Financial knowledge, attitude and behaviour of young working adults in Malaysia. *Institutions and Economies*, *10*(4), 21–48. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85059622221&partnerID=40&md5=5baa4f34d9f7d539df309c9ecc2e704c

Appendix A. Applied Questionnaire.

	Variables	Questions	References
Demographics	Gender	Male	N/A
		Female	
		Other	
	Age Range	18-24 25-31 32-38 39-45 46-52 53-59 60 the but	
	Social stratum	0 1 2 3 4 5 6	
	Educational level	Non-Primary Bachelor Technical Technologist	
		Professional Specialist Magister Doctor	
	Localization	Bogotá Cundinamarca	
Financial knowledge category	Profitability	An investment with a high return is likely to be high-risk	Atkinson & Messy (2012).
		a. True	
		b. False	
		c. Don't know/No answer	
	Risk diversification	Rate the following statement as true or false: Investing in shares of a single company usually generates a safer return than investing in units of a mutual fund.	Lusardi & Mitchell (2007;2008)
		a. True	
		b. False	
	Inflation	Assume that the interest rate on your savings account is 1% per year and the annual inflation rate is 2%. At the end of one-year, what amount of goods do you think you could buy with the money in that account?	Lusardi & Mitchell (2007;2008)
		a. More than today.	
		b. Exactly the same as today.	
		c. Less than today	
		d. Don't know/No answer	
	Interest calculation	Suppose you put $1,000,000 in a savings account with a guaranteed interest rate of 2% per year. You make no further payments on this account and do not withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made? :	Atkinson & Messy (2012).
		a. 1.010.000	
		b. 1.020.000	
		c. 1.050.000	
		d. Don't know/ No answer	
	Time value of money	Imagine you have 1,000,000 pesos in a savings account that earns an annual interest rate of 2%. At the end of 5 years, what balance do you think you would have in the account if you kept the money on deposit earning interest?	Lusardi & Mitchell (2007;2008)
		a. More than $1,100.00	
		b. Exactly $1,100,000	
		c. Less than $ 1,100,000	
		d. Don't know/ No answer	
	Financial system rules	Which of the following investments requires you to keep your invested money for a specific period or face an early withdrawal penalty?	Chen & Volpe, (1998)
		a. Term Certificate of Deposit.	
		b. Interest-paying checking account.	
		c. Government Savings Bond.	
		d. Money Market Mutual Fund.	
		e. Passbook savings account	
Financial skills category	Credit	What is FALSE about credit cards?	Chen & Volpe, (1998).
		a. You can use your credit card to receive a cash advance.	
		b. If your credit card balance is $1,000,000 and you pay $300,000, interest is charged on the unpaid balance of $700,000.	
		c. Your credit card interest rate is normally higher than what you can earn on a certificate of deposit.	
		d. A credit card company doesn't charge you interest if you pay off the balance in full by the due date.	
		e. You can't spend more than your credit quota	
	Intereses	You lend X to a friend one night and he gives you X back the next day. How much interest have you paid on this loan?	Atkinson & Messy (2012).

		a. 10.000	
		b. 20.000	
		c. 0	
		d. Don't know/ Don't answer	
	Insurance	The main reason to buy insurance is:	Chen & Volpe, (1998)
		a. Protect you from a recent loss.	
		b. Provide an excellent return on investment.	
		c. Protect you from catastrophic loss.	
		d. Protect you from small accidental losses.	
		e. Improve your standard of living by filing fraudulent claims.	
	Retirement	Let's say you're in your early twenties and would like to build up your savings for a secure retirement in 30 years. Which of the following approaches would best fit your needs?	Chen & Volpe, (1998)
		a. Start building your savings account at a bank.	
		b. Save money on term certificates of deposit.	
		c. Put Monthly Savings in a Diversified Growth Mutual Fund.	
		d. Invest in long-term treasury bonds.	
		e. Accumulate money in a safe deposit box at the bank.	
	Saving	The Gutiérrez family urgently needs to change the refrigerator in their house, and they are $2,000,000 short of acquiring it. Every month they need to pay the market, service and rent expenses; They also spend money on clothes, amusement parks, and eating at restaurants. What should the Gutierrez do to buy the refrigerator as soon as possible, without getting into debt?	ICFES (2014)
		a. Not paying a month's rent and buying the fridge.	
		b. Decrease money for the market and save for the fridge.	
		c. Spend less on clothes, entertainment, restaurants, and save for the fridge.	
		d. Request a loan of money from a bank or a neighbor and buy the refrigerator.	
		e. Don't know/Don't answer	
	Investment	The benefit of owning diversified investments is:	Finke et al., (2016)
		a. Reduce risk	
		b. Increase profitability	
		c. Reduce tax liabilities	
		d. Don't know/Don't answer	
	Division of monet	Consider the scenario in which five siblings receive a gift of $10,000,000. If the siblings are required to divide the money equally, what is the amount that each receives?	Atkinson & Messy (2012).
		a. 1.000.000	
		b. 2.000.000	
		c. 5.000.000	
		d. Don't know/ No answer	
	Budget	Financial planning involves:	Chen & Volpe, (1998).
		a. Establish an adequate financial record keeping system.	
		b. Develop a sound annual budget of expenses and income.	
		c. Minimize taxes and insurance expenses.	
		d. Prepare plans for future financial needs and goals.	
		e. Examine their investment portfolios to maximize returns.	

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