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Exploring financial resilience and well-being in college students: a mixed-method analysis using orthogonal and oblique rotation techniques

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Abstract

Purpose – This study aimed to identify the key factors constituting financial resilience (FR) and financial well-being (FWB), to explore their interrelationships, to examine demographic differences in perceptions, and to evaluate which rotation method best explains the variance in the confirmatory model of these constructs.

Design/methodology/approach – A non-experimental, cross-sectional design was employed, utilizing both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA was conducted with both orthogonal (Varimax and Quartimax) and oblique (Oblimin and Promax) rotation methods to uncover the underlying dimensions of FR and FWB, followed by CFA using Structural Equation Modeling (SEM) to validate the models. The study targeted undergraduate students in Veracruz, Mexico, with a non-probability, self-selection sampling approach.

Findings – The results revealed that FR and FWB are multidimensional and interconnected constructs, with key factors such as savings, financial planning, debt management and financial knowledge being crucial. The oblique rotation models (Oblimin and Promax) provided a better fit for explaining the interdependence between these factors compared with orthogonal models. Financial resilience factors like savings and debt control influenced financial well-being, aligning with existing literature, while highlighting the need for integrated financial education.

Research limitations/implications – The study's sample was restricted to undergraduate students in Veracruz, limiting the generalizability of the findings. The reliance on self-selection sampling may introduce bias, and the cross-sectional design restricts causal inferences.

Practical implications – The study challenges traditional views by highlighting the interconnectedness of financial resilience factors. It calls for a multidimensional approach to financial resilience that includes not only the ability to withstand financial shocks but also factors like financial education, digital literacy, and access to financial products.

Social implications – The findings suggest that policies should promote holistic financial education and create financial products that support resilience, particularly for vulnerable populations. Additionally, integrating technology into financial services is crucial for enhancing financial inclusion and resilience.

Originality/value – This research contributes to understanding financial resilience and well-being by employing exploratory and confirmatory analysis methods to assess their interdependence. The study is among

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the few to apply orthogonal and oblique rotation methods to explain the variance in these constructs, offering a novel perspective on the interaction between financial resilience and well-being.

Keywords Financial resilience, Financial well-being, Orthogonal rotation, Varimax, Quartimax
Paper type Research article

Introduction

Financial Resilience refers to an individual's ability to cope with and adapt to financial setbacks, such as economic crises or loss of income sources, such as a job. Liu *et al.* (2025) define it as "a financial coping capability that encompasses both static performances and dynamic processes within human agency and environmental structure, enabling people to respond to and recover from adverse situations" (2025, p. 1). Resilience is crucial in maintaining financial well-being during uncertain times as it enables individuals to manage their resources effectively in the face of unexpected challenges. Financial Well-being is defined as an individual's perception that, through proper management of income and expenses, they can build a savings buffer that allows them to grow their wealth, whether through savings or small investments. This study explored these two constructs by analyzing how individuals manage their finances and navigate economic challenges. A multivariate statistical approach was used to examine these variables, incorporating both exploratory and confirmatory analysis. The objective was to identify which proposed models offered the most accurate explanation of the phenomena under study. Ultimately, the goal is to develop an integrative model combining both aspects using orthogonal rotation methods, such as Varimax and Quartimax, and oblique rotation methods. This will help identify the most significant correlations between financial resilience and financial well-being, offering a clearer understanding of how these concepts are interrelated.

Recent literature has placed the concepts of financial resilience (FR) and financial well-being (FWB) at the center of the debate, especially in the wake of the pandemic, which has altered many economic and behavioral dynamics. (Tahir *et al.*, 2021, 2022) directly linked financial education to economic well-being, while (Bialowolski *et al.*, 2022) highlighted financial education as a key factor in its development. Kulshreshtha *et al.* (2023) emphasized that resilience is essential for coping with unexpected expenses. Other elements that strengthen financial resilience include the increasing use of digital financial services and financial literacy (Kass-Hanna *et al.*, 2022; Yadav and Shaikh, 2023).

Financial resilience responds to social and cultural differences. Recent studies have emerged from different regions around the world; yet research into financial resilience in Latin America has tended to focus on businesses or even countries. Studies into individual financial resilience are lacking; this article will contribute to closing that gap.

Research into financial resilience in individuals is relatively recent, mostly as a result of the COVID-19 pandemic (Liu *et al.*, 2025). Despite a thorough review of the literature, no studies have been found that combined exploratory and confirmatory factor analysis with the explicit use of orthogonal (Varimax and Quartimax) and oblique (Oblimin and Promax) rotation methods, validated through structural equation modeling (SEM). This approach would allow for identifying behavioral patterns and analyzing how they relate based on the structures obtained in the factor analyses. Therefore, this study seeks to fill this theoretical gap by providing empirical evidence for both constructs. The following research questions are posed:

RQ1. What factors shape financial resilience and financial well-being?

RQ2. How are these factors related?

RQ3. Are there differences in perceptions of FR and FWB according to demographic variables (age, educational level, income, etc.)?

RQ4. Which rotation method (orthogonal or oblique) best explains the variance in the final confirmatory model?

The objectives of this study were as follows: Exploratory: To identify the underlying dimensions of FR and FWB using exploratory factor analysis (EFA) with principal component extraction and Varimax, Quartimax, Oblimin, and Promax rotations. Confirmatory: The obtained structure was validated using confirmatory factor analysis (CFA) and SEM to assess the model's fit to the data.

Financial resilience

Financial resilience—the ability to withstand economic shocks and maintain stability—is fundamental to achieving financial well-being (Kulshreshtha *et al.*, 2023). It supports financial inclusion, a critical global goal given that one in four people remain excluded from formal financial systems (Salignac *et al.*, 2019). Resilient individuals are better equipped to navigate crises without incurring debt, directly enhancing overall life satisfaction (Kulshreshtha *et al.*, 2023; Liu and Chen, 2024), as the recent COVID pandemic highlighted.

Drivers of resilience

Financial literacy is a key determinant of resilience, reducing vulnerability and enabling better financial decisions (Kass-Hanna *et al.*, 2022). Both financial and digital education strengthen resilience by improving individuals' capability to manage crises and access financial services (Bialowolski *et al.*, 2022). Planning and innovation, at both household and organizational levels, further enhance adaptive capacity (Glew *et al.*, 2023; Nkundabanyanga *et al.*, 2019; Tahir *et al.*, 2021; Zahedi *et al.*, 2022).

External and social influences

Macroeconomic, legal, and political contexts shape resilience, while labor market disruptions, such as COVID-19-related job losses, increase vulnerability (Yao and Zhang, 2023), triggering the "financial vulnerability trap" (Hoffmann *et al.*, 2021). Gender disparities are evident, with men generally being more resilient; however, employed and educated women show improved outcomes (Chipunza and Fanta, 2022; Zeka and Alhassan, 2024). Rural contexts illustrate that financial literacy enhances well-being primarily when mediated by financial self-efficacy (Mitra and De, 2024).

Financial well-being

Financial well-being is understood as the perception that one has enough income and assets to enjoy an acceptable quality of life (Rahman *et al.*, 2021). It comprises capabilities and behaviors, as well as internal and external factors, and is an important driver of overall psychological and physical well-being (Hernandez-Perez and Cruz Rambaud, 2025).

Capability and behavior

Like resilience, financial well-being is strongly linked to individual capabilities and behaviors, including self-efficacy and self-control (Hernandez-Perez and Cruz Rambaud, 2025). Several studies have explored the connection between financial capability and well-being, although few have used long-term national data. Xiao *et al.* (2024) address this lack of information using five measures from the National Financial Capability Study (NFCS) between 2009 and 2021. Their findings indicated that financial capability indices positively relate to financial well-being, underscoring the importance of subjective knowledge and good financial habits.

Social and cultural factors

Socialization processes further shape financial well-being and often reflect cultural and gender expectations (Sollis *et al.*, 2024). For example, daughters in some contexts receive more financial education than sons (Abdul Ghafoor and Akhtar, 2024). Research also shows that

childhood economic hardship and family financial stress have long-term consequences for adult mental health and financial security (Morrissey *et al.*, 2023).

Structural and policy drivers

Broader structural and policy-related factors also play a crucial role. For example, homeownership, especially when paired with high financial literacy, substantially improves financial well-being (Gignac *et al.*, 2024). Similarly, access to pensions and healthcare systems is vital for sustaining financial security in older age (Karthika *et al.*, 2023). Perceptions of financial well-being also influence migration decisions and reveal persistent social inequalities, particularly during periods of economic crisis (El Anshasy *et al.*, 2023; Kelley *et al.*, 2023; Nasr *et al.*, 2024).

Health and productivity outcomes

The relationship between financial well-being and health outcomes has also been widely documented. Poor financial well-being is associated with adverse physical and mental health outcomes, whereas financial security is linked to improved health indicators (Birkenmaier *et al.*, 2023). Hasan *et al.* (2024) find that health is the most important factor influencing financial well-being, followed by other economic variables.

Within organizational settings, financial stress has been found to reduce employee productivity and well-being, while strong financial well-being improves job performance and satisfaction. The COVID-19 pandemic amplified these dynamics (Nykiforuk *et al.*, 2023), increasing financial anxiety—such as that associated with student loans (Xiao *et al.*, 2024)—and straining family relationships (Kelley *et al.*, 2023). These studies underscore the importance of financial resilience in times of uncertainty. At the same time, crises can lead to the development of coping and adaptation strategies that create resilience (Liu *et al.*, 2025).

Technology and digital finance

Technological innovation introduces both opportunities and risks. Fintech applications have been shown to enhance financial well-being, especially among marginalized groups, including individuals with disabilities (Gafoor and Amilan, 2024). These findings highlight the need for accessible services. However, without adequate financial education, overreliance on digital platforms may lead to adverse financial outcomes, underscoring the need for balanced technology adoption strategies. Zhang and Fan (2024) warn that excessive use of digital platforms can harm financial well-being without adequate education.

Role of financial education

Given these findings, financial education emerges as a critical tool for improving financial well-being. Studies demonstrate that parental financial education (Algarni *et al.*, 2024), formal financial literacy initiatives, and workplace financial wellness programs are consistently effective in strengthening financial outcomes and reducing stress across diverse demographic groups (Bashir *et al.*, 2024; Dhiraj *et al.*, 2023).

Integrative perspective

Collectively, these studies demonstrate that financial resilience and financial well-being are closely intertwined. While resilience emphasizes the ability to withstand short-term financial shocks, well-being addresses long-term stability and life satisfaction. Both outcomes are shaped by financial literacy, digital capability, social equality, and supportive structural systems such as healthcare and pensions. As such, improving financial outcomes requires a holistic approach that integrates education, policy reform,

and technological innovation. The present study empirically examines these dynamics within a specific population of university students.

Method

This study used a non-experimental, cross-sectional design. The target population consisted of university students from diverse areas, including finance, economics, administration, accounting, and international business, in the state of Veracruz, Mexico. This population is especially relevant for studying financial resilience and well-being, as university students are in a transition stage toward economic independence, facing significant financial decisions with limited resources (Shim *et al.*, 2010). The sample was obtained through non-probability self-selection sampling, in which participants freely decided whether to participate. Although this technique limits the statistical generalizability of the results, it is methodologically appropriate for exploratory studies and the initial validation of psychometric scales (Calderón-Garrido *et al.*, 2019). In this initial phase, 950 valid questionnaires were collected, allowing efficient access to a large and diverse sample of students, useful for identifying latent structures of financial behavior in local contexts.

Exploratory Factor Analysis (EFA) was applied to examine the underlying structure of financial resilience and well-being constructs. The basic assumptions were previously verified: in simple terms, it was found that the variables were correlated with each other (which is necessary for EFA) and that they did not present extremely skewed distributions (García-Santillán, 2017). To this end, Bartlett's test of sphericity and the KMO index were used to assess the adequacy of the analysis, along with skewness and kurtosis coefficients within acceptable ranges (skewness <2, kurtosis <7). In addition, polychoric correlation matrices, appropriate for processing ordinal scales (Holgado–Tello *et al.*, 2010), were used. Orthogonal (Varimax, Quartimax) and oblique (Oblimin, Promax) rotations were employed to facilitate factor interpretation. Oblique rotations were anticipated to be more appropriate due to the expected correlation between resilience and well-being dimensions, which are conceptually not independent of each other. Orthogonal rotations, such as Varimax and Quartimax, assume independence between factors; in contrast, oblique rotations, such as Oblimin and Promax, allow for correlation between them, which is more realistic for interrelated psychosocial variables (Fabrigar *et al.*, 1999).

The selection of these four methods responds to complementary criteria of comparison and robustness: Varimax maximizes the variance explained by each factor. Quartimax reduces the number of factors needed to explain each item. Oblimin is useful when a certain correlation between factors is expected. Promax, for its part, combines computational efficiency with interpretability, starting from Varimax and allowing correlations. Multiple criteria were applied to factor retention: eigenvalues greater than 1 (Kaiser criterion), inspection of the scree plot, and parallel analysis, to ensure a robust and replicable factor solution. The following table shows a comparison describing the characteristics of each rotation method: (see Table 1).

Subsequently, the Structural Equation Model (SEM) was applied to confirm the factorial structure, evaluate causal relationships between latent variables, and verify the fit of the model using absolute, structural, and parsimony goodness of fit indices (Bentler and Bonett, 1980; Hair *et al.*, 2014; Jöreskog and Sörbom, 2001). Reliability was assessed using Cronbach's alpha and McDonald's omega coefficients, prioritizing the latter due to its stability and lower sensitivity to the number of items (Timmerman and Lorenzo-Seva, 2011).

Ethical considerations

All participants provided informed consent following the principles of the Declaration of Helsinki. The Ethics Committee of Cristóbal Colón University approved this study under project code UCC.2b.2025.

Table 1. Rotation method and its characteristics

Rotation method	Type	Assumption	Main features	Advantages
Varimax	Orthogonal	Independent factors	Maximizes the variance of factor loadings, facilitating the identification of a clear structure in which each variable loads strongly on a single factor	Simplifies interpretation by keeping factors uncorrelated
Quartimax	Orthogonal	Independent factors	It tends to concentrate the variance in a smaller number of factors, reducing complexity by representing each item in a few factors	It allows to simplify the factorial solution, facilitating dimensional reduction
Oblimin	Oblique	Factors that can correlate	It allows factors to be correlated, which is particularly useful when underlying dimensions are expected to be related (as in this study)	It more realistically represents interdependent relationships between psychosocial constructs
Promax	Oblique	Factors that can correlate	It starts with an initial Varimax solution and subsequently adjusts the loadings to allow for correlations between factors, combining interpretability and computational efficiency	It combines the initial clarity of an orthogonal solution with the flexibility of allowing correlations between factors

Source(s): Authors

Table 2. Criteria for indices in SEM modeling

Index		Threshold for good fit	Brief description
Chi-squared	x^2	Not significant ($p > 0.05$) or low in relation to degrees of freedom	Evaluates the overall adequacy of the model. Sensitive to sample size
Normed fit index	NFI	>0.90	Compare the proposed model with a null model with no relationships
Tucker-Lewis index	TLI/ NNFI	>0.90	Adjust the model for complexity and improve if the reduction in χ^2 is proportional to the increase in degrees of freedom
Comparative fit index	CFI	>0.90	Compares observed and predicted covariance matrices
Root mean square error of approximation	RMSEA	<0.05 (good); <0.08 (acceptable)	Evaluates the mean error per degree of freedom; includes confidence interval
Standardized root mean square residual	SRMR	<0.05	Indicates the standardized average discrepancy between the observed and modeled covariance matrices

Source(s): Authors

Table 3. Demographic characteristics of participants ($n = 950$)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Women	503	52.90%
	Man	394	41.50%
	LGBTQ+	53	5.60%
Age	18–20 years old	264	27.80%
	21–25 years old	228	24.00%
	26–30 years	117	12.30%
	30–40 years	212	22.30%
	More than 40 years	129	13.60%
Marital status	Single	595	62.60%
	Married	176	18.50%
	Free union	131	13.80%
	Separated	28	2.90%
	Divorced	10	1.10%
	Widower	10	1.10%
Employment status	Employee	534	56.20%
	Only studying	373	39.30%
	Finished studies; not working	43	4.50%
Work experience	1–3 years	218	22.90%
	5–10 years	216	22.70%
	More than 10 years	59	6.20%
	Not applicable	338	35.60%

Source(s): Authors

Table 4. Rotated component matrix[a] Varimax

Items	F1	F2	F3	F4	F5	AVE	CR
PFHI3	0.739					0.288	0.708
PFHI6	0.734						
PFHI4	0.716						
PFHI7	0.675						
PFHI8	0.651						
PFHI2	0.638						
AAFC1		0.728				0.187	0.533
LEFHI1		0.620					
LEFHI2		0.580					
LEFHI8		0.572					
AAFC2		0.544					
AAFC7			0.791			0.201	0.496
AAFC6			0.778				
AAFC8			0.691				
AAFC5			0.545				
LEFHI3				0.779		0.148	0.338
LEFHI4				0.767			
LEFHI7				0.538			
LEFHI5					0.727	0.110	0.266
PFHI5					0.539		
LEFHI6					0.532		

Note(s): Method of extraction: Principal Component Analysis. Rotation method: Varimax with Kaiser normalization, [a]The rotation has converged in 7 iterations

Source(s): Authors

Structural equation modeling (SEM)

Model fit assessment is fundamental in structural equation modeling (SEM). Various indices are used to evaluate how well the proposed model fits the observed data. The chi-square statistic (χ^2), which follows a chi-squared distribution, assesses model adequacy. This test is more reliable with samples larger than 200 participants, in complex or saturated models, and when the assumptions of multivariate normality are met (Bentler and Bonett, 1980). Additionally, incremental fit indices are calculated, such as the Normed Fit Index (NFI >0.90), which compares model improvement versus a null model; and the Tucker-Lewis Index (TLI/NNFI >0.90), which adjusts the model for complexity. It improves if the reduction in χ^2 is proportional to the increase in degrees of freedom. The Comparative Fit Index (CFI >0.90) compares the observed and predicted covariance matrices. For model comparisons, the Akaike information criterion (AIC) and Akaike consistency criterion (CAIC) were used, which penalize overparameterization; the model with the lowest values is preferred (Akaike, 1987; Bozdogan, 1987).

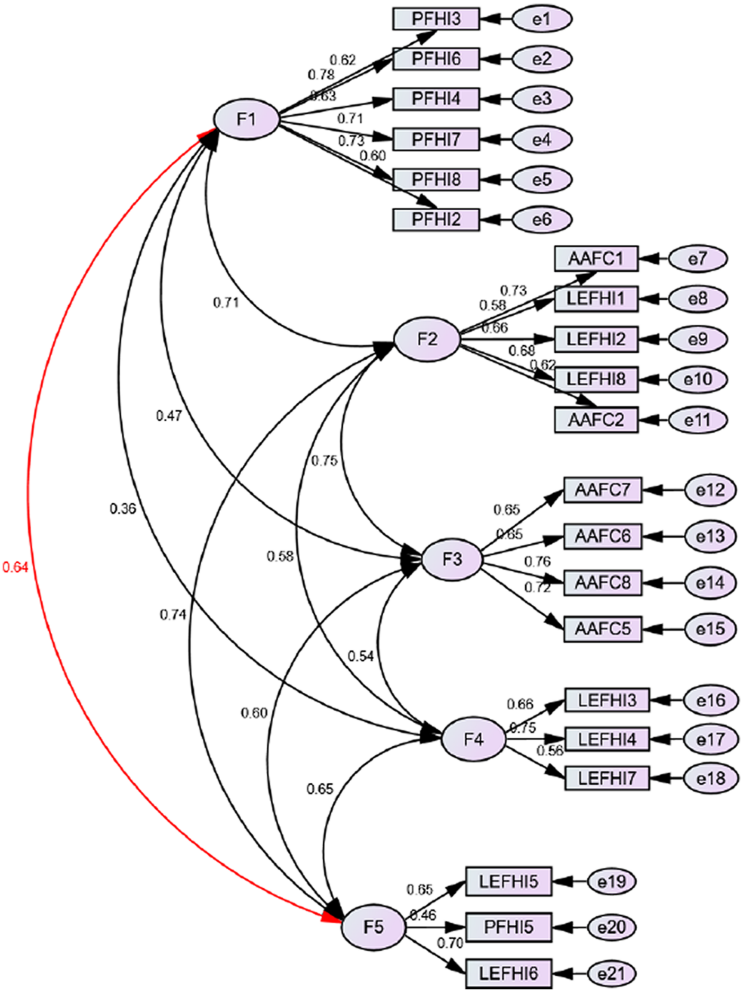

Figure 1. Initial model. Figures by authors

The root mean square error of approximation (RMSEA) evaluates the mean error per degree of freedom, and values less than 0.05 indicate a good fit. Hu and Bentler (1999) recommend that the RMSEA confidence interval not exceed 0.08. The standardized root mean square residual (SRMR) standardizes the RMSEA by dividing it by its standard deviation, and values less than 0.05 suggest a good fit. However, Hu and Bentler (1999) caution that indices such as SRMR, RMSEA, NNFI, and CFI may reject valid models in small samples, so the use of multiple indicators is recommended for a more robust assessment. Regarding scale reliability, McDonald's omega coefficient was prioritized over Cronbach's alpha because omega offers a more stable estimate and is less dependent on the number of items and the homogeneity of factor loadings (Timmerman and Lorenzo-Seva, 2011). Since this study combines exploratory and confirmatory analysis, in the event of a suboptimal model fit, respecification steps are considered, such as the review of problematic items, the correlation of theoretically justifiable errors, and the evaluation of modifications indicated by the fit indices, always respecting theoretical coherence.

This study validated the factor structure through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), using orthogonal (Varimax and Quartimax) and oblique

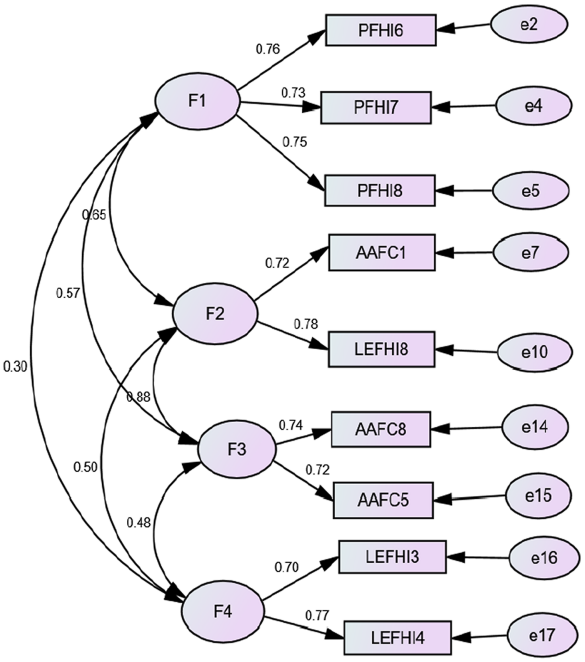

Figure 2. Final adjusted model. Figures by authors

Table 5. Models obtained

	RMSEA	CMIN/DF	RMR	GFI	AGFI	PGFI	TLI	CFI	PRATIO	PNFI	PCFI
Model 1	0.073	6.043	0.06	0.904	0.876	0.712	0.856	0.877	0.852	0.731	0.748
Model 2	0.054	3.757	0.025	0.981	0.960	0.458	0.964	0.979	0.583	0.567	0.571

Source(s): Authors

(Oblimin and Promax) rotations according to Hair *et al.* (2014), Jennrich and Bentler (2011) and Kaiser (1985). The analyses were performed using SPSS v. 29 and IBM SPSS AMOS v. 29. The scale showed high reliability, with a Cronbach's alpha of 0.909 and a McDonald's omega of 0.906. The SEM criteria are described in Table 2.

Participant characteristics

The sample consisted of 950 university students of diverse ages, genders, and employment situations, allowing for a variety of conditions that influence financial resilience and subjective well-being. Complete demographic characteristics are presented in Table 3.

Overall, female participants predominated (52.9%), followed by male students (41.5%), and a smaller proportion of those who identified as LGBTQ+ (5.6%). The majority of respondents were between 18 and 25 years old, consistent with the typical profile of university students, although some people over 30 were also represented. Regarding marital status, more than 60% were single, while almost a third were in formal relationships (married or in a

Table 6. Rotated component matrix[a] Quartimax

Items	F1	F2	F3	F4	AVE	CR
AAFC1	0.766				0.386	0.849
LEFHI8	0.703					
AAFC8	0.673					
AAFC5	0.658					
AAFC2	0.654					
AAFC4	0.628					
AAFC3	0.616					
LEFHI2	0.590					
LEFHI1	0.583					
PFHI6		0.741			0.313	0.760
PFHI3		0.735				
PFHI4		0.698				
PFHI7		0.666				
PFHI2		0.639				
PFHI8		0.630				
PFHI5		0.552				
LEFHI3			0.735		0.135	0.315
LEFHI4			0.730			
LEFHI7			0.529			
AAFC7				0.710	0.141	0.330
AAFC6				0.655		
LEFHI5				0.693		

Note(s): Method of extraction: Principal Component Analysis. Rotation method: Quartimax with Kaiser normalization, [a]The rotation has converged in 13 iterations

Source(s): Authors

Table 7. Models obtained

	RMSEA	CMIN/DF	RMR	GFI	AGFI	PGFI	TLI	CFI	PRATIO	PNFI	PCFI
Model 1	0.077	6.652	0.067	0.876	0.846	0.703	0.837	0.857	0.879	0.735	0.753
Model 2	0.048	3.162	0.023	0.989	0.971	0.385	0.971	0.986	0.500	0.490	0.493

Source(s): Authors

common-law relationship). Regarding employment status, 56.2% were working and 39.3% were exclusively studying, while the rest had completed their studies but were not employed. These data are relevant because they allow us to analyze how working conditions (or their lack) can affect financial resilience.

Finally, more than 45% of employed participants had between 1 and 10 years of work experience, reflecting active career paths from early stages. These factors, such as age, employment status, and experience, are factors that, as will be discussed in the results, can significantly influence levels of well-being and financial resilience as perceived by students. This profile suggests that a considerable proportion of participants combine study and employment, which may affect their levels of financial resilience and well-being. For example, working students may face greater financial and time burdens, but also have an income, which affects both their perception and management of their well-being. Similarly, age and marital status may reflect different life stages that modify financial priorities and strategies.

Results

Bartlett's test of sphericity showed a statistically significant result ($\chi^2 = 8943.353$, gl = 276, $p < 0.001$), and the Kaiser-Meyer-Olkin (KMO) index of sampling adequacy was 0.921, indicating excellent factorability. Furthermore, all Sampling Adequacy (SA) values exceeded

Table 8. Pattern matrix[a] Oblimin

Items	F1	F2	F3	F4	F5	AVE	CR
AAFC1	0.715					0.397	0.143
LEFHI1	0.614						
LEFHI2	0.537						
LEFHI8	0.507						
PFHI3		0.802				0.304	0.722
PFHI4		0.771					
PFHI6		0.715					
PFHI7		0.695					
PFHI8		0.641					
PFHI2		0.629					
LEFHI3			0.805			0.153	0.344
LEFHI4			0.783				
LEFHI7			0.521				
AAFC6				0.818		0.205	0.500
AAFC7				0.817			
AAFC8				0.682			
AAFC5				0.503			
LEFHI5					0.705	0.076	0.139
PFHI5					0.515		

Note(s): Method of extraction: Principal Component Analysis. Rotation method: Oblimin with Kaiser normalization, [a]The rotation has converged in 19 iterations

Source(s): Authors

Table 9. Models obtained

	RMSEA	CMIN/DF	RMR	GFI	AGFI	PGFI	TLI	CFI	PRATIO	PNFI	PCFI
Model 1	0.073	6.099	0.059	0.907	0.878	0.691	0.86	0.882	0.842	0.726	0.743
Model 2	0.054	3.757	0.025	0.981	0.960	0.458	0.964	0.979	0.583	0.567	0.571

Source(s): Authors

the recommended threshold of 0.50, and the correlation matrix presented a determinant close to zero. These indicators support the robustness and suitability of the data for exploratory factor analysis (EFA), reinforcing internal consistency and shared variance among items.

The EFA revealed a five-factor solution that explained 57.815% of the total variance, consistent with previous studies on financial resilience and psychological well-being in student populations, where explained variance typically ranges between 50% and 60% (e.g. Joo, 2008; Prawitz *et al.*, 2006; Xiao *et al.*, 2024). The factor structure was obtained using orthogonal and oblique rotation techniques; however, oblique rotations (Promax and Oblimin) showed more significant and theoretically interpretable factor loadings, confirming the presence of correlated latent constructs. Factor loadings greater than 0.50 were considered significant and are presented in Table 4, along with the contribution of each item to the identified dimensions. Figures 1 and 2 visually display the scree plot and factor loadings. The subsequent tables and figures (Tables 5 through 11, Figures 3–8) detail the factor structure by dimension, relating each extracted component to specific items and constructs such as adaptive financial behavior, emotional resilience, *and* subjective well-being. All tables and figures were clearly labeled and integrated into the logical sequence of the analysis, facilitating the traceability of each factor and item.

The following section describes the main results of the final confirmatory model, based on the rotation method used in each case.

Table 10. Pattern matrix[a] Promax

Items	F1	F2	F3	F4	F5	AVE	CR
PFHI3	0.838					0.312	0.729
PFHI4	0.788						
PFHI6	0.713						
PFHI7	0.703						
PFHI2	0.629						
PFHI8	0.629						
AAFC1		0.832				0.225	0.587
LEFHI1		0.714					
LEFHI2		0.622					
LEFHI8		0.578					
AAFC2		0.575					
AAFC7			0.879			0.422	0.198
AAFC6			0.868				
AAFC8			0.673				
LEFHI3				0.835		0.362	0.164
LEFHI4				0.808			
LEFHI7				0.537			
LEFHI5					0.723	0.251	0.103
PFHI5					0.506		
LEFHI6					0.503		

Note(s): Method of extraction: Principal Component Analysis. Rotation method: Promax with Kaiser normalization, [a]The rotation has converged in 7 iterations

Source(s): Authors

Table 11. Models obtained

	RMSEA	CMIN/DF	RMR	GFI	AGFI	PGFI	TLI	CFI	PRATIO	PNFI	PCFI
Model 1	0.074	6.154	0.059	0.908	0.88	0.692	0.856	0.879	0.842	0.723	0.74
Model 2	0.047	3.079	0.033	0.981	0.962	0.490	0.963	0.978	0.600	0.581	0.587

Source(s): Authors

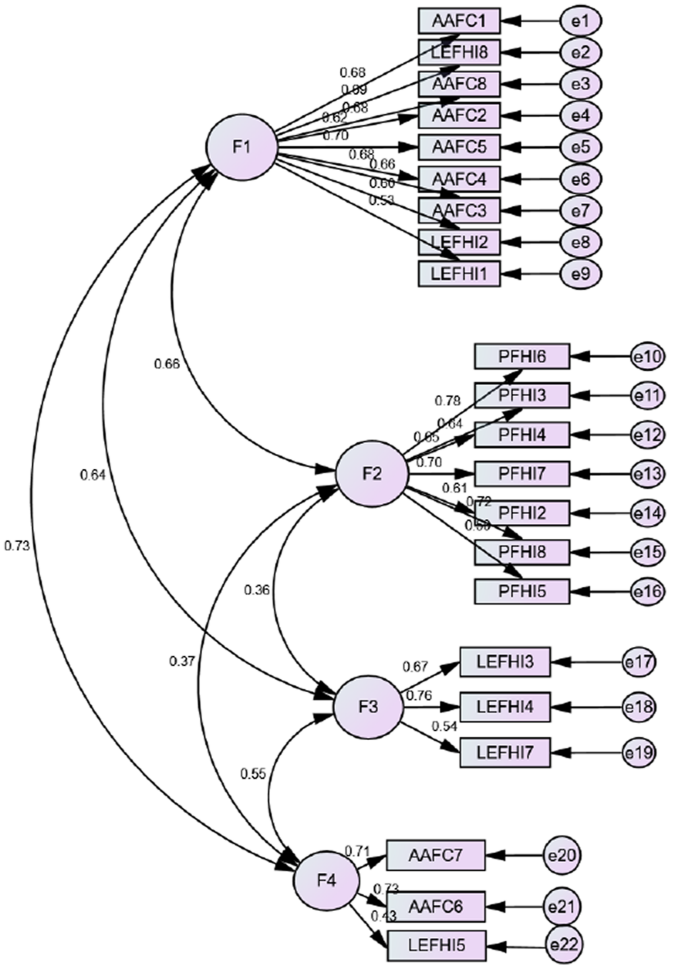

Figure 3. Initial model. Figures by authors

Comparison of rotation models

Qualitative interpretation of the factors extracted using orthogonal and oblique rotations revealed consistent patterns and specific nuances in the perception of financial well-being. The evaluated models are detailed below, incorporating examples of items with significant loadings, consistent academic language, and observations on their applicability.

Varimax model

This model reflects a structure in which individuals value the fundamentals of financial stability. For example, the item “I maintain a healthy credit history” showed a high factor loading, indicating its relevance to the dimension. Responsible spending strategies, immediate expense planning, and cash savings are also highlighted. The approach is structured, useful for educational contexts where the goal is to teach basic principles of financial education.

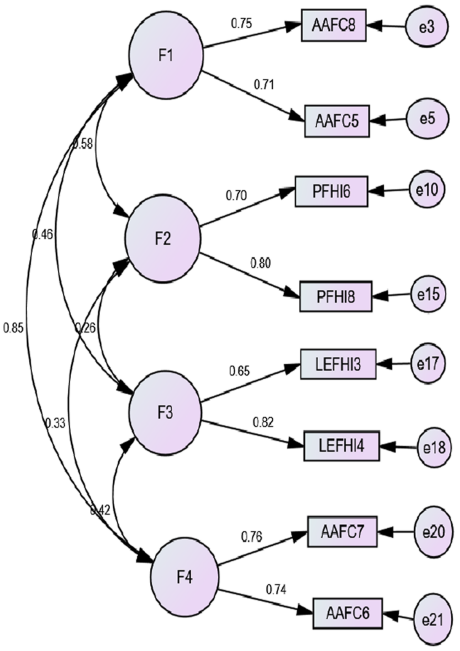

Figure 4. Final adjusted model. Figures by authors

Quartimax model

In this model, the emphasis is on present and future financial security. Items such as "I have liquid savings available for emergencies" had high loadings, indicating their role in well-being perceptions. The importance of planning short- and long-term expenses and properly assessing insurance coverage is emphasized. This model can be especially useful in public policy interventions seeking to encourage precautionary savings.

Oblimin model

By allowing for correlations between factors, this model shows how individuals understand the interdependence of their financial decisions. The item "I have developed strategies to avoid debt" loads highly, illustrating its centrality in the dimension. It emphasizes the coordinated management of income, savings, debt, and insurance. This model is suitable for research that assumes a comprehensive and dynamic conception of financial resilience.

Promax model

Similar to the previous model in terms of correlations, this model delves deeper into the reflective assessment of interrelated aspects. It highlights items such as "I have implemented habits to spend less than I earn," which reflects a complex understanding of financial self-control. Its application is relevant in advanced educational contexts or longitudinal assessments.

Common points between models

All models identify common elements, such as the importance of maintaining a healthy credit history, planning expenses, sustainably managing debt, having adequate insurance, and having liquid savings and long-term assets. This convergence suggests a shared foundation in the conceptualization of financial well-being.

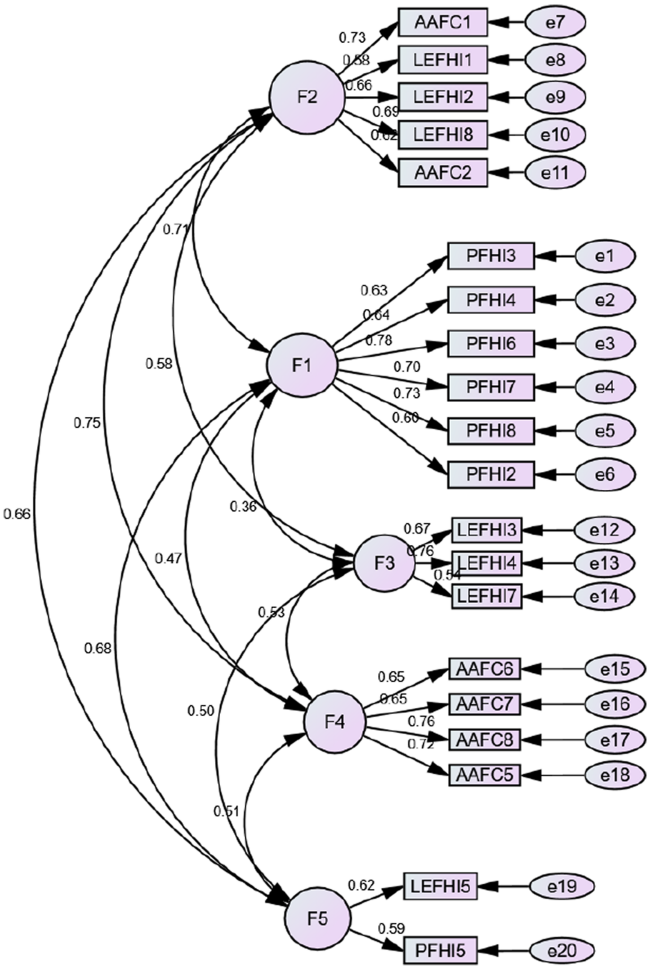

Figure 5. Initial Model. Figures by authors

Main differences between models

For clarity, these key differences are presented in the following comparison table: (see Table 12).

Discussion in relation to theory

The results obtained from the analyzed models are largely consistent with the literature on financial resilience (FR) and financial well-being (FWB), although they also reveal important distinctions.

Similarities

All models align with prior research by identifying core components such as credit history, savings (both liquid and long-term), and financial planning. These findings resonate with Bialowolski *et al.* (2022), who emphasize financial education as a pillar of resilience. The

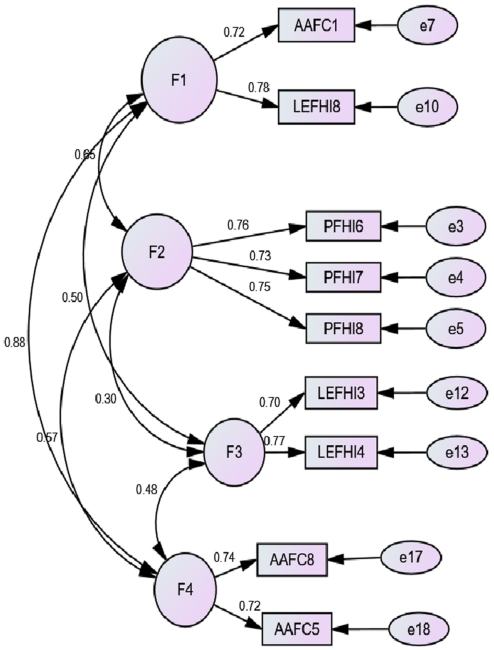

Figure 6. Final adjusted model. Figures by authors

models also reinforce the connection between FR and FWB by highlighting individuals' capacity to navigate unexpected financial challenges, as discussed by Kulshreshtha *et al.* (2023) and Tahir *et al.* (2021). Insurance as a protective mechanism is also consistently present, in line with Bialowolski *et al.* (2022).

Differences and practical implications

Each rotation technique reveals unique structural and practical emphases. Varimax prioritizes independent dimensions, making it particularly useful for contexts where targeted interventions are needed (e.g. specific savings behavior or budgeting practices). Quartimax highlights debt sustainability more prominently, offering insights for public policy in over-indebted populations. Oblimin and Promax allow for correlations between factors, reflecting a more holistic and systemic view of financial resilience—as noted by Yadav and Shaikh (2023). These models may guide interventions aimed at strengthening interconnected financial capacities, such as linking planning, debt management, and savings behavior in integrated programs. Despite these strengths, all models fail to explicitly capture the roles of financial education and digital financial literacy, despite their relevance as highlighted by Kass-Hanna *et al.* (2022) and Bialowolski *et al.* (2022). This omission represents a conceptual limitation. Future iterations of the scale may benefit from the incorporation of these dimensions, especially given the increasing digitization of financial services and its impact on inclusion and resilience.

Moreover, although the models include both liquid and long-term savings, the distinction between them is not always conceptually or empirically clear. As Tahir *et al.* (2022) suggest, this differentiation is essential in understanding the temporal dynamics of resilience strategies.

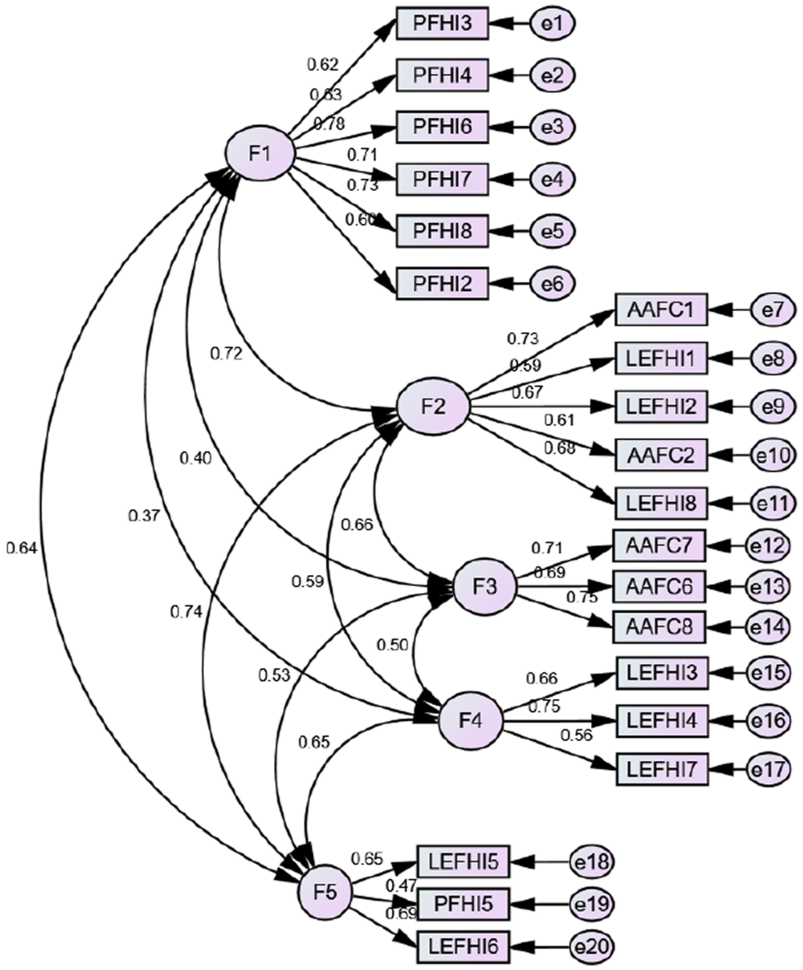

Figure 7. Initial model. Figures by authors

Conceptual integration and limitations

Taken together, the Varimax, Quartimax, Oblimin, and Promax models capture multiple facets of financial resilience and well-being, such as saving, planning, and managing credit. However, they differ in terms of factor structure, interactions among dimensions, and practical scope. Models with oblique rotations (Oblimin, Promax) more accurately reflect the interconnectedness of financial capacities, aligning with a systems-theory approach to resilience. Nonetheless, some models showed signs of cross-loadings and overlapping factor content, which could affect discriminant validity. This highlights a methodological limitation, especially for models based on orthogonal rotation, and should be addressed in future refinements of the scale. Improved item wording or additional constructs may help reduce this overlap.

Theoretical implications

The findings reinforce the multidimensional and interrelated nature of financial resilience (FR) and financial well-being (FW). In particular, oblique rotation models (Oblimin and Promax) reveal the correlation between dimensions, challenging previous approaches that

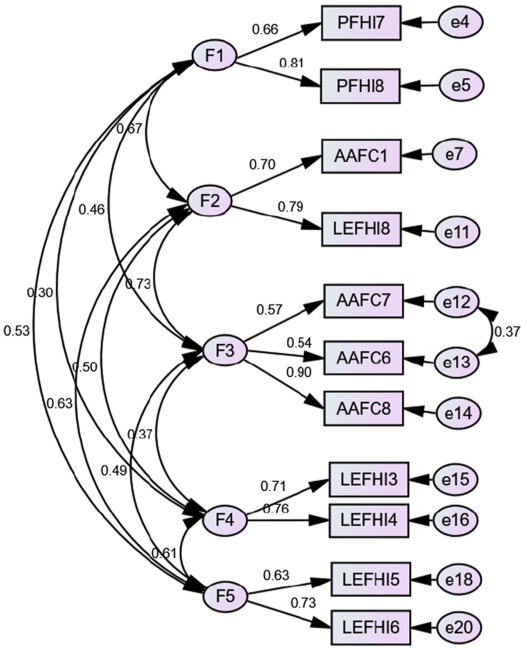

Figure 8. Final adjusted model. Figures by authors

Table 12. Summary of differences by rotation type

Aspect	Varimax	Quartimax	Oblimin	Promax
Type of rotation	Orthogonal	Orthogonal	Oblique	Oblique
Relationship between factors	Independent	Independent	Correlated	Correlated
Main focus	Basic principles of financial stability	Comprehensive financial security	Interconnection of financial decisions	Reflection on complex financial habits
Example of relevant item	"I maintain a healthy credit history"	"I have liquid savings available for emergencies"	"I have developed strategies to avoid getting into debt."	"I have implemented habits to spend less than I earn."
Suggested applicability	Basic financial education	Prevention and savings policies	Research with a systemic approach	Advanced educational programs

Source(s): Authors

have treated these factors as independent. This evidence supports a more integrated and systemic conceptual framework, consistent with contemporary perspectives on resilience as a dynamic and adaptive phenomenon. Furthermore, the results can be interpreted through behavioral economics frameworks, which explain certain observed patterns. For example, the use of "mental accounts," the presence of present bias, or bounded rationality (Kahneman, 2011; Thaler and Sunstein, 2008) can influence decisions such as prioritizing immediate savings over long-term savings, or the underutilization of insurance despite knowing its importance. These approaches complement traditional economic understanding and open new avenues for exploring resilience from a psychological and behavioral perspective.

Based on these findings, a modified theoretical model is suggested that integrates four pillars: savings, planning, credit management, and insurance, all linked and modulated by contextual variables such as financial education and digital literacy. This model can be visualized as a system of interdependent gears, where the alteration of one component can affect the stability of the others (see Figure 9). Finally, it is necessary to recognize that this framework can vary depending on the cultural or socioeconomic context. In informal economies or low-income communities, for example, debt sustainability may depend more on family networks or informal credit than on formal financial mechanisms. Cross-cultural validation of the proposed scale will be a fundamental step to ensure its applicability beyond the Mexican university context.

Practical implications

The results obtained suggest the urgent need to rethink approaches to financial education, especially at the university level. Theoretical modules or informative talks are not enough; experiential strategies such as budget simulations, savings games with immediate feedback, and case studies on over-indebtedness must be incorporated. Programs such as *Junior Achievement*, *Edufinet* (Spain), or platforms such as *Kahoot Finance* can serve as references for a more effective curriculum redesign.

Additionally, mobile banking and fintech can play a key role in operationalizing financial resilience. Apps that allow people to set savings goals, receive personalized payment reminders, or access low-cost digital insurance represent tools with high potential for transforming knowledge into habits. These solutions are especially valuable in young populations with high technological penetration but limited financial support. The reference to "vulnerable contexts" is made specific here to economically disadvantaged students with limited access to support networks and low digital familiarity. For example, students who work part-time to support their studies and their households face daily decisions between immediate spending and future planning. For them, effective intervention requires a combination of education, subsidies, and tailored digital tools.

Finally, the findings of this study should be strategically shared with financial institutions, educational authorities, and decision-makers. This can be achieved through the development of policy documents, presentations in inter-institutional forums, and collaboration with central banks or financial inclusion agencies, to integrate resilience as a key dimension into education programs and financial products.

Conclusion

The findings indicate that financial resilience goes beyond coping with unforeseen events and encompasses interrelated factors, such as savings, spending planning, debt management, and

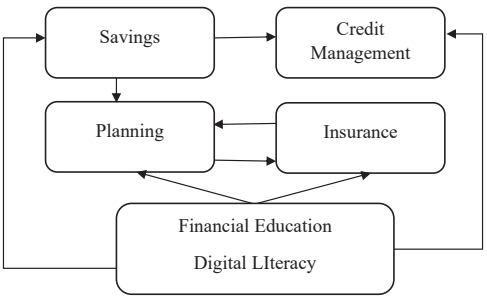

Figure 9. Proposed model

credit history, all of which are essential for financial well-being. Planning strategies should integrate these dimensions in an articulated manner. The literature and models analyzed also highlight the central role of financial education, which must be comprehensive, adapted to each individual's reality, and oriented toward savings and understanding credit and long-term planning. Oblique rotation models (Oblimin and Promax) reinforce this view by highlighting the interconnectedness of the factors that influence resilience and the challenging approaches that analyze them in isolation. In the context of increasing digitalization, financial inclusion policies must facilitate access to and the use of technological tools, especially for vulnerable populations. Technology is key to improving financial resilience by expanding management possibilities, savings, and access to appropriate products. Therefore, public policies should focus on a more personalized approach that combines financial education, access to affordable products, adequate insurance, and responsible credit to promote a comprehensive vision of economic stability.

Data availability

Data are available at http://doi.org/10.17632/gk4dspkzf2.1.

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