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EDITORIAL

The *South East European Journal of Economics and Business*, Volume 21, Issue 1, brings together a set of research papers addressing a diverse range of contemporary economic and business challenges across South East Europe and beyond. The contributions cover topics including leadership and performance in non-profit organizations, SME insolvency and growth dynamics, household financial vulnerability, excessive borrowing and quality of life, top management team heterogeneity and environmental sustainability in the context of macroeconomic policy. Using a variety of empirical approaches, the papers provide both theoretical insights and policy-relevant evidence for understanding economic behavior, resilience and structural transformation.

The first paper, by Dadić Fruk, Maškarin Ribarić and Licul, examines the role of leadership styles in shaping employee motivation, creativity, and performance in non-profit organizations (NPO). Based on primary survey data from Croatian NPO employees and using PLS-SEM analysis, the study finds that transformational and transactional leadership positively influence both motivation and creativity, which in turn enhance organizational performance. In contrast, autocratic and laissez-faire leadership styles are associated with non-significant or negative outcomes. The findings highlight the importance of leadership development and structured human resource practices in improving performance within resource-constrained non-profit environments.

Focusing on firm dynamics, the second paper by Šarlija and Benšić investigates the relationship between sales growth and insolvency among small and medium enterprises. Using logistic regression with interaction effects, the study demonstrates that while sales growth generally reduces insolvency risk, its effect depends critically on the firm's leverage. Firms with balanced growth supported by adequate capital exhibit the lowest risk, whereas declining sales significantly increase insolvency probability even when other financial indicators are stable. These results underline the importance of sustainable growth strategies for SME resilience.

At the household level, Vuković and Petohlep explore the phenomenon of excessive borrowing and its implications for quality of life in Croatia. Using survey data from individuals experiencing financial distress, the study finds that over-indebtedness significantly reduces financial stability, social inclusion and overall well-being. The results emphasize the need for balanced credit use and proactive financial behavior, suggesting that sustainable debt management is important to achieving long-term economic well-being.

Complementing this perspective, Dushku examines financial fragility among Albanian households, focusing on their ability to withstand unexpected expenses. Using data from the Household Wealth Survey and multinomial regression analysis, the study finds that a majority of households lack

sufficient liquidity, with financial fragility closely linked to education levels, access to formal financial services and reliance on family support networks. The findings point to the critical role of financial inclusion and social capital in enhancing household resilience.

From a corporate governance perspective, Kokot, Tipurić and Klačmer Čalopa analyse the impact of top management team (TMT) heterogeneity on firm performance in Croatia. Using panel data for large companies over the period 2015-2020, the study finds that gender and cultural diversity within TMTs positively affect return on assets, highlighting the value of diversity in strategic decision-making and organizational outcomes.

Finally, Akın investigates the relationship between external debt and environmental sustainability in Türkiye over the period 1970-2023 within the framework of the Environmental Kuznets Curve hypothesis. Using advanced time-series techniques, among other results, the study finds that external debt can contribute to reducing carbon emissions as well as it does renewable energy consumption. The results underscore the importance of sustainable debt management and energy transition policies in achieving environmental objectives.

The contributions in this issue provide valuable empirical evidence on key economic challenges, ranging from micro-level behavioral dynamics to macroeconomic policy and sustainability. By addressing diverse yet interconnected topics, the papers contribute to a deeper understanding of economic development, resilience and policy design in a rapidly changing global environment.

On behalf of Editorial Board
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LEADERSHIP STYLES AND EMPLOYEE PERFORMANCE IN NON-PROFIT ORGANIZATIONS: THE MEDIATING ROLE OF EMPLOYEE MOTIVATION AND CREATIVITY

Lorena Dadić Fruk, Helga Maškarin Ribarić, Ivana Licul

Abstract

Non-profit organizations (NPOs) depend on employees and volunteers to deliver services and advance the NPOs' missions. This study examines how leadership styles shape employee motivation and creativity and, in turn, performance in NPOs. Primary data were collected via a structured questionnaire from 179 NPO employees in Croatia and analyzed using PLS-SEM. Results indicate that transformational and transactional leadership styles are positively associated with motivation and creativity, which both relate positively to performance. In contrast, autocratic and laissez-faire leadership styles were either non-significant or negatively associated with these outcomes (while democratic leadership was non-significant for motivation but negative for creativity). These findings suggest that emphasizing inspirational vision, individualized support, clear goals, and fair recognition can bolster day-to-day motivation and creative effort, translating into improved performance and greater organizational stability. In terms of theory, the study clarifies motivation and creativity as dual mechanisms linking leadership styles to performance within the non-profit context. In terms of practical implications, the results offer clear guidance for leadership development and HR policy in resource-constrained NPOs.

Keywords: *leadership styles, non-profit organizations, motivation, creativity, employee performance*

JEL Classification: *J24; M10*

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1. Introduction

Non-profit organisations (NPOs) create public value through service provision, advocacy, and social innovation. Since they are largely funded from public sources (state calls/tenders and local and regional government budgets), programme quality and long-term sustainability depend to a great extent on leadership that fosters their employees' motivation and creative effort. In this context, leaders are pivotal to sustaining day-to-day motivation and channelling creative effort towards programme delivery. Their core task is to communicate a clear direction, provide timely guidance and support when needed, and create conditions in

which employees can realise their potential and consistently achieve high performance.

Leadership styles, accordingly, vary in how leaders communicate, the degree of support they offer, and the extent to which they delegate duties and responsibilities. In the traditional typology, styles are commonly defined as autocratic, democratic, and laissez-faire (Bass and Stogdill 1990), each implying different assumptions about decision authority, participation, and autonomy. Beyond this traditional set, contemporary frameworks emphasise transactional and transformational leadership, with servant leadership receiving increasing attention in recent years for its follower-centred orientation (Bass and Avolio 1994; Northouse 2015). Related perspectives such as authentic, ethical, and responsible leadership underscore integrity, moral purpose, and societal accountability as central dimensions of leadership practice (Avolio and Gardner 2005). Leaders often vary their style by situation, so there is no single "best" approach. The most effective leaders flexibly adopt different styles (Kaleem, Asad, and Khan 2016). Leadership effectiveness is also context-dependent: workforce cohorts and cultural norms can shape how leadership styles are perceived and enacted. Effective leaders therefore adapt communication, support, and role expectations to the needs of different employee groups and organisational cultures (House et al. 2004; Northouse 2015).

Numerous studies, especially in for-profit organizations, link leadership to motivation, satisfaction, creativity, commitment, and performance. Autocratic leadership is associated with poorer individual and organisational performance (Mwai, Namada, and Katuse 2018), weaker culture and commitment (Rafiq Awan, and Mahmood 2010), and lower job satisfaction (Vincent and Baptiste 2021). By contrast, transformational and transactional leaderships foster innovation and creativity (Pieterse et al. 2010), support organisational learning (Zagoršek, Dimovski, and Škerlavaj 2009), and strengthen employees' work commitment (Puni, Hilton, and Quao 2021). Unlike for-profit organisations, NPOs pursue public value rather than profit and rely heavily on grants, donations, and limited commercial income, which demands continual programme improvement and robust leadership (Howell and Avolio 1993).

Leadership shapes climate and, through it, performance (Gil et al. 2005), employee motivation (Alghazo and Al-Anazi 2016), and creativity (Lutz Allen, Smith, and Da Silva 2013). This is especially salient in South-East Europe, where many NPOs are small, combine paid and voluntary work, and depend on project funding (BCSDN 2014; OECD 2023). Yet prior NPO studies typically examine either traditional or modern styles and specify a single mediator, e.g., satisfaction (Oyewobi 2024), engagement (Aboramadan and Dahleez 2020), innovation (Ebrahimi, Moosavi, and Chirani 2016), or culture (Chi, Yeh, and Yu 2008). Addressing this gap, this study jointly tests autocratic, democratic, laissez-faire, transactional, and transformational leaderships within one framework and examines dual mediation via motivation and creativity to explain how these styles indirectly affect employee performance in Croatia's non-profit sector.

2. Literature review and hypothesis development

Leadership styles and motivation

Work in the non-profit sector is closely linked to mission-driven and altruistic motives: employees are often motivated by advancing social goals and generating public value rather than by financial rewards alone (Besley and Ghatak 2005; Bacchiega and Borzaga 2003). Compared to for-profit organizations, where extrinsic incentives and career prospects tend to play a stronger role, motivation in NPOs is more strongly shaped by value congruence, meaningful work, recognition, and a supportive climate (Legnerova 2016). This distinction suggests that leadership in NPOs may need to activate and protect intrinsic and mission-oriented motives, rather than rely primarily on control or material incentives.

Across organizational settings, leaders are expected to influence motivation by articulating clear goals, providing feedback, delegating responsibility, and supporting employee growth (Lussier 2013; Herzberg, Mausner, and Snyderman 2007; Thiedke 2004; Landes 2006). Empirical studies in for-profit and public organizations show that autocratic leadership is frequently associated with lower job satisfaction, weaker commitment, and poorer performance (Rafiq Awan and Mahmood 2010; Mwai, Namada, and Katuse 2018; Vincent and Baptiste 2021), whereas transformational and transactional leaderships are linked to stronger motivation and positive work outcomes (Pieterse et al. 2010; Puni, Hilton, and Quao 2021; Judge and Piccolo 2004). In NPOs, transformational leadership in particular is found to reinforce employees' identification with organizational values, thereby enhancing intrinsic motivation (Abbasi and Zamani-Miandashti 2013; Purwanto et al. 2021; Gui, Lei, and Le 2022).

However, prior research in the non-profit context is often selective: it predominantly focuses on transformational and, to a lesser extent, transactional

leadership, while neglecting how traditional styles (autocratic, democratic, and laissez-faire) operate in mission-driven, resource-constrained organizations. Given that such styles still appear in practice and may interact differently with value-based motivation in NPOs, it is justified to examine their role in NPOs in more detail. To address this gap, the present study examines the relationships between all five leadership styles (autocratic, democratic, laissez-faire, transactional, and transformational) and employee motivation in NPOs. To that end, the following hypothesis was formulated:

H1: There is a statistically significant relationship between leadership style and employee motivation in NPOs.

Leadership styles and creativity

Creativity is a critical capability for NPOs, which must continuously design projects, secure funding, and adapt services to changing social needs. It can be defined as the generation of novel and useful ideas for products, services, or processes (Dewett 2007). Previous research indicates that creativity is shaped by individual abilities, motivation and, importantly, leadership style (Cheung and Wong 2011; King and Anderson 1990). Leaders influence whether employees feel sufficiently safe to experiment, whether they receive encouragement for new ideas, and whether the organizational climate supports innovation (Amabile et al. 2004; Lutz Allen, Smith, and Da Silva 2013).

Studies in for-profit organizations generally show that transformational leadership, through intellectual stimulation and individualized support, fosters creative behaviour, whereas transactional leadership has mixed or contingent effects, sometimes supporting creativity through clear expectations and rewards, but often less strongly than transformational styles (Bass et al. 2003; Gumusluoglu and Ilsev 2009; Shin and Zhou 2003). Similar patterns are observed in NPOs. The available evidence, however, remains limited and is predominantly focused on these two "modern" styles (Shafi et al. 2020; Żywiołek et al. 2022; Wang 2022). Much less is known about how autocratic, democratic, or laissez-faire leaderships shape creativity in organizations strongly committed to a social mission yet simultaneously confronted with resource constraints.

This imbalance raises a key analytical question about how traditional and modern leadership styles differentially affect creativity in NPOs, including the potential implications of specific styles for fostering or constraining creative behaviour. Accordingly, this study examines the relationships between different leadership styles and employee creativity in NPOs and, on this basis, formulates the following hypothesis:

H2: There is a statistically significant relationship between leadership style and employee creativity in NPOs.

Leadership styles and employee performance through motivation and creativity

Employee performance is commonly defined as the extent to which individuals successfully fulfil their tasks and contribute to organizational goals (Isaac et al. 2017; Ameen and Ahmad 2014). Previous studies across sectors indicate that leadership can influence performance directly and indirectly by shaping attitudes, work climate, and psychological states (Ng 2017; Ostroff, Kinicki, and Tamkins 2003; Sarros, Cooper, and Santora 2008). In NPOs, where mission achievement and stakeholder trust are central, motivation and creativity are frequently identified as key drivers of performance (McMurray et al. 2010; Rowold, Borgmann, and Bormann 2014; Aye, Ameen, and Nusari 2019; Noor and Tunnufus 2024; Mohamed, Matan, and Farah 2025).

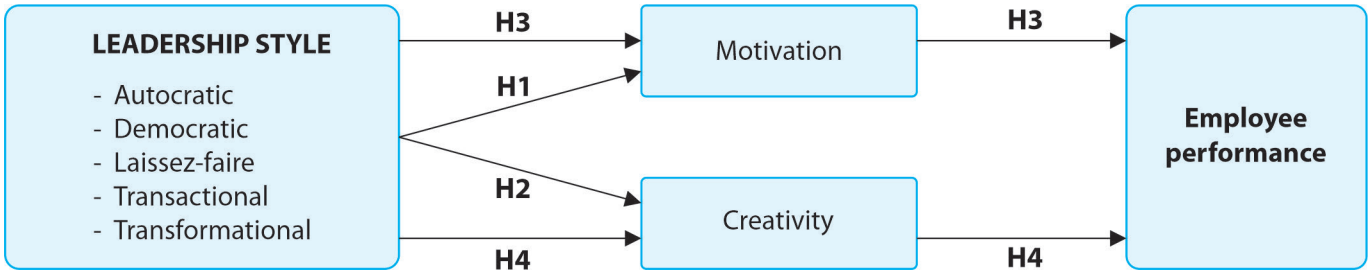
The broader leadership literature provides robust evidence that transformational and, in some cases, transactional leadership enhance performance partly by increasing intrinsic motivation, commitment, and innovative behaviour (Bass and Riggio 2006; Top, Akdere, and Tarcan 2015; Judge and Piccolo 2004). Yet many studies, including those in the NPO context, focus on single mediators such as job satisfaction, engagement, or organizational culture (Chi, Yeh, and Yu 2008; Aboramadan and Dahleez 2020; Oyewobi 2024), or on a narrow set of leadership styles. There is limited empirical work that simultaneously considers multiple leadership styles and tests whether both motivation and creativity jointly mediate their impact on employee performance in NPOs.

Addressing this gap, the present study proposes that leadership styles influence performance in NPOs primarily through their effects on employee motivation and creativity, processes that are particularly salient in mission-oriented, resource-limited environments. Accordingly, it is hypothesized that:

H3: There is a statistically significant relationship between leadership styles and employee performance in NPOs, through the mediation of employee motivation.

H4: There is a statistically significant relationship between leadership styles and employee performance in NPOs, through the mediation of employee creativity.

Figure 1. Conceptual model



Source: Authors' elaboration

3. Methodology

3.1. Research design and data collection

To test the formulated hypotheses, primary research was carried out using a structured questionnaire. The study's target group were employees in NPOs. An online survey was conducted in November and December 2024, by sending links to the questionnaire. The sampling frame was compiled from two official national sources, matched to legal form: associations were identified in the Register of Associations, while foundations and institutions were identified in the Register of Non-Profit Organizations. Organizations with publicly available official contact emails were extracted, and inactive entities and undeliverable addresses were excluded. In total, 587 unique email contacts were invited to participate. The invitation explicitly stated that organizations without paid employees should disregard the survey, as the study included only NPOs with at least one employee. By the end of December, 195 questionnaires were returned, of which 16 were not fully completed, leaving a total of 179 fully completed questionnaires for further analysis (30.5% response rate).

The questionnaire consisted of five parts. The first part referred to basic data on the type of NPO in which the respondent is employed, the respondent's educational background, the number of years of employment in the NPO, and the total number of employees in the NPO. To measure the attitudes of employees towards leadership style, creativity, motivation, and performance, in the second part of the questionnaire a 5-point Likert scale (1=strongly disagree, 5=strongly agree) was used, suggesting that the higher the rating of a specific statement, the stronger the employees' motivation and creativity and the better their work performance. In this part of the questionnaire, the respondents were asked to rate their level of agreement with each of the 24 statements referring to the leadership style of their leaders. The statements were jumbled, so the respondents could not tell which statement belonged to what type of leadership style. In

Table 1. Sources of variables in the questionnaire

Construct	Number of items	Source of variable
Autocratic leadership style	5	Northouse (2015)
Democratic leadership style	6	
Laissez-faire leadership style	4	
Transactional leadership style	4	Bass and Avolio (2000) Ismail et al. (2010)
Transformational leadership style	5	Bass and Avolio (2000) Ismail et al. (2010)
Employee motivation	5	Word and Park (2015) Farmer, Tierney, and Kung-McIntyre (2003)
Employee creativity	8	Farmer, Tierney, and Kung-McIntyre (2003) Tierney, Farmer, and Graen (1999)
Employee performance	5	Williams and Anderson (1991)

Source: Authors' elaboration

the third part of the questionnaire, focused on the attitudes of employees regarding their work motivation in the NPO in which they are employed, the respondents were asked to rate their level of agreement with 5 statements, while in the fourth part they rated their level of agreement with 8 statements measuring the employees' attitudes towards their creativity in their jobs. The questionnaire's fifth and last part measured the employees' attitudes towards their work performance, using a set of 5 statements.

For all constructs, items were directly adopted from prior validated instruments (Table 1), translated into Croatian, and the survey was administered in Croatian. A translation–back-translation procedure was implemented: two bilingual subject-matter experts produced the forward translation, discrepancies were reconciled, and an independent translator performed the back-translation. Conceptual equivalence was confirmed by the research team. For transparency, item wordings in this manuscript are presented in English as back-translations of the Croatian survey items.

3.2. Methods

Partial least squares structural equation modelling (PLS-SEM) was employed to analyze the data and test the hypotheses, using SmartPLS 4.0. PLS-SEM is widely used across disciplines including leadership research, because it can handle complex latent-variable models, is robust to violations of multivariate normality, and performs well with small-to-medium sample sizes (Hair et al. 2014). Prior to estimation, data screening and distribution diagnostics were conducted: univariate normality was examined via Shapiro–Wilk tests together with skewness/kurtosis and visual checks (histograms/Q–Q plots). Several indicators exhibited departures from normality ($p < 0.05$), which is typical for Likert-type measures. Univariate normality was not supported for the items (100%; $p < 0.05$) by the Shapiro–Wilk test, and across indicators, skewness ranged from −1.712 to 0.022 and excess kurtosis from −1.260 to 4.462. As PLS-SEM does not assume multivariate normality and relies on nonparametric bootstrapping for inference, estimation under these conditions is appropriate.

Following recommended practice, the analysis proceeded in two stages. First, the measurement model was assessed by examining indicator reliability, internal consistency (Cronbach's alpha composite reliability), convergent validity (average variance extracted, AVE), and discriminant validity (HTMT criterion). Second, the structural model was evaluated by checking collinearity (VIF), estimating path coefficients via bootstrapping, and reporting coefficients of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2). Complementary descriptive statistics (frequencies, means, standard deviations) were computed to profile respondents and summarize item-level responses, using SPSS 20.0.

4. Results

4.1. Descriptive statistics results

This section presents a descriptive profile of the sample (n = 179) and the central tendencies of the key constructs. Table 2 summarizes NPO type and size (by number of employees), respondents' educational qualifications and gender, as well as the mean scores for leadership styles and employee outcomes. These

Table 2. Descriptive statistics results

Type of NPO	Absolute number (n=179)	Share (100%)
Association	42	23%
Foundation	21	13%
Collective	40	22%
Institution	76	42%
Number of employees in the NPO		
Up to 5 employees	52	29%
From 6 to 10 employees	94	53%
More than 10 employees	33	18%
Educational qualification		
Unskilled worker	3	2%
Skilled worker	3	2%
Secondary school qualification	84	47%
College degree	54	30%
University degree	25	14%
MSc or PhD	10	5%
Gender		
Male	77	43%
Female	102	57%
Measurement construct	Average score*	
Autocratic leadership style		3.07
Democratic leadership style		3.35
Laissez-faire leadership style		3.30
Transactional leadership style		3.22
Transformational leadership style		3.71
Employee creativity		4.17
Employee motivation		3.72
Employee performance		4.22

* Means on 5-point Likert-type scales are labelled as very low (1.00–1.50), low (1.51–2.50), moderate (2.51–3.50), high (3.51–4.50), and very high (4.51–5.00), following Lindner and Lindner (2024).

Source: Authors' elaboration

results provide a baseline context for the subsequent measurement and structural analyses.

Most of the respondents are employed in institutions (42%) and associations (23%). Regarding the size of the NPOs, 53% of the respondents work in an organization employing between 6 and 10 employees, while 29%, in an organization with up to 5 employees. With regard to demographic data, male respondents account for 43% of the sample, and female respondents for 57%. Forty-seven percent of the respondents hold secondary school qualifications, while 44% have college or university degrees (bachelor or master's degree). Using the set of statements referring to leadership styles, the respondents were asked to rate their level of agreement with each statement. From the average scores it can be concluded that leaders apply autocratic leadership (score 3.07, moderate) and transactional leadership (score 3.22, moderate) to the smallest extent, while they most often apply transformational leadership (score 3.71, high) and democratic leadership (score 3.30, moderate). The respondents were also asked to assess their own motivation, creativity, and performance, resulting in a high average score of 4.22 for performance, a slightly lower score of 4.17 (high) for creativity, and a high score of 3.72 for motivation.

In the Croatian NPO landscape, associations are the most prevalent legal form, with recent estimates indicating over 49,000 associations nationally (OECD 2023). At the same time, a large share of organizations is small-scale and often volunteer-based, with evidence showing that many Croatian NPOs operate with few or no paid employees (BCSDN 2014). Against this backdrop, the sample, limited to NPOs with at least one paid employee, is naturally skewed toward staffed entities. Accordingly, the higher share of institutions (42%) in the data and the concentration of small staff sizes (≤10 employees in 81.6%) are explained, which is broadly consistent with evidence that Croatian Civil Society Organizations (CSOs) are predominantly small and often operate with limited paid staff. (BCSDN 2014; OECD 2023).

4.2. Assessment of the reflective measurement model

According to Hair et al. (2017), the following tests should be carried out to assess the reflective measurement model:

- indicator reliability - Factor loading
- convergent validity - Average variance extracted (AVE)
- construct reliability - Cronbach's alpha, Dillon-Goldstein's rho and Dijkstra-Henseler's rho
- discriminant validity - Heterotrait-monotrait ratio (HTMT) and Fornell-Larcker criterion

Table 3 shows the aggregated results of the assessment of indicator reliability, convergent validity, and construct reliability. The results of discriminant validity assessment using the HTMT criterion and the Fornell-Larcker criterion are shown in Table 4 and Table 5, respectively.

Indicator reliability assessment is based on standardized external factors and factor loadings, and it describes the size of the correlation between the indicators and their constructs, which ranges from 0.641 to 0.933. Although it is recommended that factor loading should be above 0.708 (Hair et al. 2017), weaker factor loadings can be accepted in social science studies (Hulland 1999). Accordingly, all indicators with factor loadings ≥ 0.600 were retained, whereas those with loadings <0.600 were removed (two from autocratic leadership, two from democratic, and one each from laissez-faire, transactional, and transformational leadership). The results of convergent validity based on AVE show that the values of all latent constructs are above the threshold of 0.5, confirming that the constructs' convergent validity is adequate. The Cronbach's alpha coefficients of the latent constructs are in the range of 0.601 to 0.745, while composite reliability Rho_a ranges from 0.703 to 0.916, and composite reliability Rho_c ranges from 0.804 to 0.934. The values of all latent constructs are above the critical value (below 1), and within the acceptance range, indicating good internal consistency reliability.

The HTMT correlation ratio is below the recommended value of 0.9, thus confirming the discriminant validity of the reflective measurement model.

The results of discriminant validity assessment using the Fornell-Larcker criterion show that the square roots of AVE indicators of each of the constructs are overall greater than the correlation of those constructs in the model, thus meeting the Fornell-Larcker criterion.

Hence, based on the assessment results presented in the previous tables, the validity of the reflective measurement model is confirmed.

Table 3: Model assessment

Construct	Indicator	Factor loading	Status*	AVE	Cronbach's Alpha	Rho_A	Rho_C
Autocratic	autocr_1	0.757	Retained	0.581	0.792	0.703	0.804
	autocr_2	0.641	Retained				
	autocr_3	0.870	Retained				
	autocr_4	*0.189*	*Removed*				
	autocr_5	0.408	*Removed*				
Democratic	democr_1	0.847	Retained	0.714	0.867	0.871	0.909
	democr_2	0.890	Retained				
	democr_3	0.830	Retained				
	democr_4	0.812	Retained				
	democr_5	*0.412*	*Removed*				
	democr_6	0.385	Removed				
Laissez-faire	lf_1	0.818	Retained	0.739	0.830	0.879	0.895
	lf_2	0.892	Retained				
	lf_3	0.868	Retained				
	lf_4	*0.409*	*Removed*				
Transactional	transac_1	0.754	Retained	0.668	0.752	0.857	0.857
	transac_2	0.933	Retained				
	transac_3	0.753	Retained				
	transac_4	*0.425*	*Removed*				
Transformational	transf_1	0.884	Retained	0.780	0.906	0.916	0.934
	transf_2	0.888	Retained				
	transf_3	0.886	Retained				
	transf_4	0.874	Retained				
	transf_5	*0.377*	*Removed*				
Creativity	cr_1	0.697	Retained	0.550	0.883	0.889	0.907
	cr_2	0.807	Retained				
	cr_3	0.760	Retained				
	cr_4	0.697	Retained				
	cr_5	0.686	Retained				
	cr_6	0.801	Retained				
	cr_7	0.772	Retained				
	cr_8	0.700	Retained				
Motivation	mot_1	0.724	Retained	0.627	0.853	0.880	0.893
	mot_2	0.823	Retained				
	mot_3	0.841	Retained				
	mot_4	0.780	Retained				
	mot_5	0.786	Retained				
Performance	perf_1	0.696	Retained	0.564	0.714	0.742	0.808
	perf_2	0.695	Retained				
	perf_3	0.781	Retained				
	perf_4	0.734	Retained				
	perf_5	0.810	Retained				

*Following Hulland (1999), all indicators with outer loading ≥ 0.600 were retained; indicators < 0.600 were removed. Construct reliability/validity indices are computed after item deletion.

Source: Authors' elaboration

Table 4. Heterotrait Monotrait Correlation

	CR	Autocr.	Democr.	Lf.	Motiv.	Perf.	Transac.	Transf.
Creativity								
Autocratic	0.274							
Democratic	0.591	0.875						
Laissez-faire	0.579	0.787	0.890					
Motivation	0.571	0.300	0.438	0.472				
Performance	0.806	0.526	0.465	0.400	0.439			
Transactional	0.344	0.658	0.832	0.690	0.384	0.427		
Transformational	0.509	0.777	0.850	0.820	0.420	0.383	0.885	

CR = creativity, Autocr = autocratic, Democr = Democratic, Lf = Laissez-faire, Transac = Transactional, Transf = Transformational, Mot = Motivation, Perf = Performance

Source: Authors' elaboration

Table 5. Fornell-Larcker criterion

	CR	Autocr.	Democr.	Lf.	Motiv.	Perf.	Transac.	Transf.
Creativity	0.742							
Autocratic	0.257	0.762						
Democratic	0.527	0.757	0.929					
Laissez-faire	0.534	0.678	0.845	0.860				
Motivation	0.504	0.262	0.407	0.438	0.792			
Performance	0.688	0.342	0.395	0.355	0.370	0.681		
Transactional	0.277	0.735	0.681	0.566	0.338	0.294	0.818	
Transformational	0.467	0.699	0.863	0.807	0.400	0.334	0.734	0.883

CR = creativity, Autocr = autocratic, Democr = Democratic, Lf = Laissez-faire, Transac = Transactional, Transf = Transformational, Mot = Motivation, Perf = Performance

Source: Authors' elaboration

4.3. Structural model estimation

Structural model assessment was conducted by first checking for multicollinearity between latent constructs by calculating the Variance Inflation Factor (VIF) for each latent construct. The results are presented in Table 6.

The VIF values range from 1.125 to 4.712, below the critical value (VIF < 5), confirming that multicollinearity is not a problem.

Table 7 presents the assessment of relationships in the structural model according to significance and relevance. To assess the significance of path coefficients, bootstrapping with 5000 subsamples was used, as recommended by Hair et al. (2017). The "Complete Bootstrapping" option was also used.

A hypothesis is considered supported when the effect is statistically significant (two-tailed $p < 0.05$, bootstrapping with 5,000 resamples) and when a direction was predicted in the expected direction. When a hypothesis encompasses multiple paths (e.g., each leadership style → motivation/creativity), the overall hypothesis is deemed supported if all paths are significant, partially supported if some but not all are significant, and not supported if none are significant. For mediation (style → mediator → performance), the indirect effect is considered supported if it is significant ($p < 0.05$). Partial mediation is concluded when both the indirect and the direct effects are significant, and full mediation when the indirect effect is significant while the direct effect is not.

There is a negative statistical relationship between autocratic leadership (β=0.326) and laissez-faire leadership (β=0.141), and motivation, suggesting that the application of these two leadership styles has a negative effect on employee motivation. On the other hand, there is a positive relationship between transactional (β=0.968) and transformational (β =0.276) leadership styles, and motivation, indicating that

Table 6. Multicollinearity Test – VIF values

	Mediator variables		Dependent variable
	Creativity	Motivation	Performance
Independent variables			
Autocratic leadership style	1.584	2.584	
Democratic leadership style	4.604	4.712	
Laissez-faire leadership style	2.713	3.245	
Transactional leadership style	3.116	4.484	
Transformational leadership style	3.506	1.125	
Mediator variables			
Motivation			1.481
Creativity			1.481

Source: Authors' elaboration

Table 7. Hypotheses testing (5% significance level)

Hypothesis		β	Standard deviation (STDEV)	T values	P values	Decision
Direct effects						
H1	autocratic → motivation	-0.326	0.052	0.873	0.031	Partially supported
	democratic → motivation	1.542	0.035	1.095	0.074	
	laissez-faire → motivation	-0.141	0.028	2.298	0.041	
	transactional → motivation	0.968	0.062	5.877	0.000	
	transformational → motivation	0.276	0.050	10.652	0.000	
H2	autocratic → creativity	-0.182	0.030	12.652	0.000	supported
	democratic → creativity	-0.511	0.061	2.135	0.012	
	laissez-faire → creativity	-0.441	0.023	1.984	0.025	
	transactional → creativity	0.216	0.082	3.568	0.000	
	transformational → creativity	0.124	0.097	2.658	0.001	
Indirect effects						
Hypothesis		β	Standard deviation (STDEV)	T value	P values	Decision
H3	autocratic → motivation → performance	0.126	0.125	4.352	0.000	Partially supported
	democratic → motivation → performance	1.006	0.128	2.091	0.054	
	laissez-faire → motivation → performance	0.081	0.094	2.165	0.024	
	transactional → motivation → performance	0.112	0.081	3.874	0.000	
	transformational → motivation → performance	0.080	0.100	10.552	0.000	
H4	autocratic → creativity → performance	0.251	0.082	1.967	0.012	Supported
	democratic → creativity → performance	0.158	0.089	8.655	0.000	
	laissez-faire → creativity → performance	0.383	0.092	2.112	0.031	
	transactional → creativity → performance	0.188	0.024	7.254	0.000	
	transformational → creativity → performance_	0.108	0.054	1.973	0.008	

Source: Authors' elaboration

the application of these two leadership styles has a positive influence on employee motivation in NPOs. Considering there is no statistical significance regarding democratic leadership style (β =1.542, p=0.074 > 0.05), the first hypothesis, stating "*There is a statistically significant relationship between leadership style and employee motivation in NPOs*", is partially supported.

There is a negative statistical relationship between autocratic leadership (β= -0.182), democratic leadership (β=0.511), and laissez-faire leadership (β =0.441), and creativity, suggesting that the application of these leadership styles has a negative impact on employee creativity in NPOs. There is, however, a positive statistical relationship between transactional (β=0.216) and transformational (β = 0.124) leadership styles, and creativity, indicating that the application of these two leadership styles has a positive effect on employee creativity. Thus, the second hypothesis, stating "There is a statistically significant relationship between leadership style and employee creativity in NPOs", is supported.

The next two hypotheses tested the significance of relationships through two mediators. It can be noted that there is a positive statistical relationship between autocratic (β=0.126), laissez-faire (β=0.081), transactional (β=0.081), and transformational (β=0.080) leadership styles, and employee performance, with employee motivation as a mediator. Considering there is no statistical significance regarding democratic leadership style, the third hypothesis, stating "*There is a statistically significant relationship between leadership styles and employee performance in NPOs, through the mediation of employee motivation*", is partially supported. Furthermore, there is a positive statistical relationship between autocratic (β=0.251), democratic (β=0.158), laissez-faire (β=0.383), transactional (β=0.188), and transformational (β=0.108) leadership styles, and employee performance, with employee creativity as a mediator, thus supporting the fourth hypothesis stating "*There is a statistically significant relationship between leadership styles and employee performance in NPOs, through the mediation of employee creativity*".

Table 8. Model testing

	R-squared	R-squared adjusted
Creativity	0.371	0.357
Motivation	0.257	0.236
Performance	0.719	0.716

Source: Authors' elaboration

The R-squared value of the dependent variable "Performance" is 0.719 (R-squared adjusted=0.716), meaning that this model explains 71% of the total variance in employee performance. Concerning the mediators, the model explains 35% of variance (R-squared= 0.371, R-squared adjusted=0.357) in employee creativity, and 23% of variance (R-squared=0.257, R-squared adjusted=0.236) in employee motivation.

5. Discussion and conclusion

This research examined how five leadership styles shape employee motivation, creativity, and job performance in Croatian NPOs, with particular emphasis on the mediating roles of motivation and creativity. The findings largely confirm previous research, while at the same time indicating several specific limitations and contextual conditions characteristic of mission-oriented organizations operating under resource constraints.

The negative effects of autocratic and laissez-faire leadership on motivation and creativity are consistent with studies showing that overly controlling or absent leaders undermine intrinsic motivation, trust, and innovative behaviour (Lutz Allen, Smith, and Da Silva 2013; Almarakshi, Singh, and Kularajasingam 2019; Reyaz 2024). In NPOs, where employees are strongly attached to the social mission, such leadership styles conflict with employee expectations. Nevertheless, job performance does not fully deteriorate under these styles, which may indicate that some employees achieve results despite leadership, partly due to professional norms, identification with beneficiaries, and strong commitment to the mission, as highlighted by authors who emphasize the importance of mission orientation and altruistic motivation in the non-profit sector (Besley and Ghatak 2005; Word and Park 2015). This interpretation builds on previous findings on the role of organizational commitment a nd professional values as protective factors and suggests that, in smaller Croatian NPOs, alignment with the mission may to some extent compensate for shortcomings in leadership, although potentially at the expense of employee motivation and creativity (McMurray et al. 2012; Rowold, Borgmann, and Bormann 2014).

Democratic leadership is typically associated with higher levels of satisfaction, engagement, and job performance (Caillier 2020; Hamze and Sadiq 2025). However, the results do not indicate a significant relationship with motivation and, at the same time, point to a negative association with creativity. This divergence may suggest that what is perceived as "democratic" leadership in the observed organizations, in practice, involves slow decision-making, diffusion of responsibility, or symbolic consultation without securing the necessary resources for implementing proposals. Under such circumstances, participation takes on the characteristics of superficial involvement, which may frustrate employees and reduce their willingness to engage in creative risk-taking. The findings therefore indicate that participatory practices in NPOs contribute to positive outcomes only when accompanied by clear strategic direction, timely decision-making,

and genuine support for implementation.

The positive relationships between transformational leadership and both motivation and creativity are in line with previous findings that emphasize vision, inspiration, individualized consideration, and intellectual stimulation as key drivers of innovative behaviour (Bass et al. 2003; Vera and Crossan 2004; Shafi et al. 2020; Żywiołek et al. 2022; Wang 2022). In the context of NPOs, framing tasks through mission and public value proves particularly effective. Transactional leadership based on clear expectations and fair rewards also shows beneficial effects and supports the argument that structured, contingent reinforcement complements rather than contradicts transformational behaviours (Jacobsen and Andersen 2017; Judge and Piccolo 2004). The observed pattern indicates that effective leadership in Croatian NPOs entails a combination of transformational inspiration and consistent transactional clarity, while avoiding both authoritarian approaches and laissez-faire detachment.

By modelling motivation and creativity as mediators, the analysis shows that leadership styles influence job performance primarily through psychological states and creative behaviours rather than solely through direct control. Creativity thus emerges as a particularly important mechanism in project-based, innovation-dependent work in NPOs. Overall, the findings extend the existing research by integrating traditional and contemporary leadership styles into a single model in the non-profit context and by empirically confirming dual mediation effects relevant for explaining employee job performance.

5.1. Limitations

The study's findings should be interpreted with caution due to several methodological boundaries. One limitation is foremost reflected in the sample size (n = 179), which limits statistical power for smaller effects and makes it impossible to draw general conclusions about most employees in the non-profit sector. The use of a single-source, single-wave self-report survey introduces potential common method bias, despite procedural safeguards such as anonymity and mixed item order. Control variables (e.g., organizational size, gender, education) were not included in the structural paths, which may leave residual confounding. The cross-sectional design also constrains causal inference and the interpretation of mediated relationships; longitudinal or multi-wave designs and multi-source data (e.g., supervisor ratings or administrative records) are recommended to bolster robustness and external validity. Finally, the model does not explicitly test generational or cultural moderators. Future research could examine whether the indirect effects of leadership via motivation and creativity differ across age cohorts and cultural contexts (e.g., multi-group PLS-SEM).

5.2. Directions for future research

It is recommended that future studies use larger samples and stratified designs to compare NPO types (associations, foundations, institutions) and organizational characteristics (e.g., size, age, funding mix). To strengthen inference and reduce common method bias, multi-wave and multi-source designs are suggested (for instance, leaders provide leadership-style ratings, employees report motivation/creativity, and supervisors or records supply performance indicators). The model could be extended with additional mediators (e.g., job satisfaction, affective commitment, innovativeness, organizational culture) and moderators (e.g., resource constraints, leader–member exchange, tenure, gender) to delineate boundary conditions. It is further suggested to compare leaders' self-perceived styles with employees' perceptions and relate both to organizational performance, including objective metrics. Finally, including relevant control variables (e.g., organizational size, education structure) and assessing measurement invariance across subgroups would enhance generalizability.

5.3. Contributions and Implications

The scientific contribution of this study lies in its identification of ways in which the application of various leadership styles affects employee motivation and creativity in the non-profit sector and, consequently, employee work performance. Considering that studies on this topic in the non-profit sector are under-represented, particularly with regard to poorly researched mediator effects, this paper's further contribution is that it explores two mediator effects (employee creativity and motivation) to understand whether they generate a strong relationship between leadership styles and employee performance in NPOs.

This study demonstrates that leadership style is not a marginal concern in NPOs but a central lever for shaping employee motivation and creativity and, through them, performance. By clarifying which styles matter and how they operate in the non-profit setting, the findings offer actionable guidance for leadership development and HR practices that can strengthen day-to-day operations. In resource-constrained

organizations, even modest improvements in leadership can translate into greater organizational stability, a stronger capacity for innovation, and more sustainable mission delivery. These insights have practical implications for NPO leaders, boards, and stakeholders seeking to build resilient, innovative, and sustainable organizations. For managers, a few practical priorities can be noted: greater emphasis on transformational behaviours and the constructive elements of transactional leadership (clear goals, fair recognition), with minimal reliance on autocratic and laissez-faire tendencies. Motivation and creativity may be supported through bounded autonomy and brief, regular opportunities for idea generation, and progress may be monitored using a small set of routine indicators (e.g., short periodic pulses on motivation and creativity alongside a few mission-linked performance measures) to guide steady, incremental improvement.

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THE DOUBLE-EDGED SWORD OF SALES GROWTH: IMPLICATIONS FOR SMES INSOLVENCY RISK

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Abstract

Research on SME insolvency is one of the most important areas in economy because it is crucial for economic growth which would not be possible without growing firms. These two phenomena - insolvency and growth are typically studied independently. This study brings them together by examining the interaction between sales growth and insolvency among small and medium enterprises (SMEs). On the dataset of financial ratios for Croatian SMEs by applying logistic regression with interaction effects, it is investigated how sales growth, leverage and liquidity affect the probability of insolvency. The results showed that sales growth decreases the risk of insolvency, but that it depends on the level of indebtedness of SMEs. The least risky are those SMEs whose sales growth is supported by an adequate level of capital. SMEs with high sales decline have the highest probability of insolvency even when leverage and liquidity are suitable.

Keywords*: SMEs growth, insolvency risk, sales growth, logistic regression with interaction effects*

JEL classification: *G3, G32, L26*

1. Introduction

One of the most relevant and most intriguing phenomenon in studies dealing with small and medium enterprises (SMEs) is insolvency. The reason is obvious – enterprises in insolvency cannot continue with their business activities and people are losing jobs. Therefore, understanding factors that influence insolvency is essential for improving SME resilience. Traditionally, research on enterprise insolvency has relied on models utilizing standard financial ratios such as liquidity, activity, leverage and profitability. In most studies, various financial ratios are observed statically, and less often the dynamic aspects of enterprise performance are investigated. One such indicator is sales growth. Although sales are used in the creation of various financial indicators, less attention is paid to understanding how sales growth affects insolvency risk. One of the reasons for this is that sales growth and insolvency are studied as two independent phenomena.

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It is known that sales growth is a driver of firm development. On the other hand, in order to achieve sales growth, financial resources are needed, which often implies borrowing, and this can create pressure on the liquidity of the company. This paradox according to which sales can have a positive, but at the same time negative effect on the company, makes it an important and relevant research topic. This is particularly significant because previous research rarely examines in which interactions with other financial indicators, sales growth has a positive and in which negative effect on enterprise insolvency.

Our research addresses this gap by examining whether and how sales growth affects insolvency, both directly and through interactions with other financial indicators. Unlike traditional models that treat financial indicators as they work independently, this study examines how they interact with one another. In particular, it explores how the effect of leverage on insolvency changes depending on liquidity and how liquidity matters under different levels of leverage. Initial modeling procedure included broader set of financial ratios, but three indicators consistently emerged as the most relevant in explaining insolvency risk among SMEs – sales growth, leverage and liquidity. So, the research ultimately focuses on these indicators which jointly capture enterprises' growth dynamics and financial structure. The aim is therefore not to build a comprehensive prediction model but to better understand how growth and financial stability combine to influence probability of insolvency.

The next section provides reviews of the theoretical mechanisms connecting growth and financial stability.

2. Theoretical foundation

This study brings together two streams of theory – those related to firm growth and those focusing on financing constraints and growth-related vulnerabilities.

One of the most influential theories of SME growth is Penrose's Theory of the Growth of the Firm (Penrose 1959). According to this theory, each firm is viewed as a unique combination of material, human, financial and managerial resources together with the services these resources provide. Growth originates primarily from the firm, through the use of managerial knowledge and capabilities that enable new ways of combining existing resources. As the firm grows and managers gain experience, they develop additional capacity which can stimulate further growth and innovation. However, Penrose points out that growth has its limits. If growth happens too quickly, management may struggle to coordinate new resources and processes effectively, creating inefficiencies and organizational tension. This situation, often called Penrose trap, occurs when rapid growth undermines internal coordination and financial stability. Fast growth usually requires substantial external financial resources which can cause liquidity pressures or financial distress if cash flows or operational efficiency fail to keep pace. In this sense, although growth is generally seen as a sign of success, it can also become a source of vulnerability when it exceeds the firm's managerial or financial capacities.

While Penrose focused on resources and internal capacities, Greiner (1972) emphasized the organizational and managerial dimensions of growth. His model describes firm development through a sequence of predictable phases of growth each followed by a period of crises that moves organization into the next stage. According to Greiner, firms typically begin with 'growth through creativity' when innovation and informality dominate. As they expand, the need for clearer direction and structure emerges leading to a crisis of leadership. The next phase 'growth through direction', introduces hierarchy, specialization and formal control systems. As managers seek greater independence, this leads to crisis of autonomy. The next phase is 'growth through delegation' where decision making becomes decentralized, but this can create a crisis of control due to coordination weakening. The subsequent phase 'growth through coordination' restores order through planning and systems. However, the emphasis on these structures of the generates bureaucracy that can ultimately result in a crisis of red tape. Finally, 'growth through collaboration' highlights teamwork, trust and adaptability, but firms may face a crisis of internal growth that calls for strategic renewal or partnerships.

From the perspective of insolvency risk, Greiner's model illustrates how each stage of growth brings new structural and managerial challenges that can affect financial stability. Periods of crisis are particularly critical as they often involve inefficiencies, rising costs and declining responsiveness, all of which can erode profitability and liquidity. If firms fail to adapt successfully these pressures can accumulate, increasing their exposure to financial distress and insolvency.

In the context of insolvency, the Pecking Order Theory (Myers and Majluf 1984) can be linked to growth theories. The theory suggests that firms follow a hierarchy of financing preferences. They first rely on internal funds such as retained earnings since this avoids the costs of external financing and reflects managerial confidence in the firm's profitability. The

next preferred source is debt, used when internal funds are insufficient. Equity financing is least preferred as issuing new shares may be interpreted by investors as a sign of uncertainty about the firm's value. This theory is particularly relevant for SMEs which typically have limited access to external capital and rely heavily on funds and debt. As firms grow, they often increase their leverage which in turn can enhance their risk of insolvency.

Combining these theoretical perspectives provides a more complete understanding of how growth and financial instability interact in shaping insolvency risk. The Penrose theory indicates internal limitations to growth due to managerial capacities and efficient use of resources. Greiner's model connects organizational and managerial crises with different stages of growth. On the financial side, Pecking Order Theory explains external growth constraints such as limited access to capital, dependence on debt and increasing leverage.

When a firm grows rapidly, these internal and external pressures can reinforce one another. Limited managerial capacities and a weak coordination system combined with limited access to financing and growing debt can significantly increase the exposure to insolvency. In this way, growth, which is normally a sign of business prosperity, can actually become a source of fragility if it is not accompanied by adequate resource management and a sustainable financial structure. The theoretical framework created in this way can serve as a basis for understanding the interaction between growth and insolvency and serve as a conceptual basis for the empirical analysis made in this paper.

3. Previous research

3.1. Insolvency prediction models in SMEs

Models Based on Financial Indicators

Most studies on SME default prediction rely predominantly on quantitative variables, particularly financial ratios. Since the introduction of the Altman Z-score (Altman 1968), such models have consistently included financial indicators that capture liquidity, profitability, leverage, solvency and activity. Numerous studies have employed the original Altman Z-score variables to predict financial distress (Sulub 2014; Celli 2015; Tung and Phung 2019; Bogdan, Bareša, and Hađina 2019; Cindik and Armutlulu 2021). There are also studies that develop models to find a combination of financial ratios that provide good predictions. Although many studies have shown excellent predictive power, the perfect combination of financial ratios has not yet been found. Researchers typically aim to select variables that are both statistically significant and economically meaningful, acknowledging that model accuracy depends on factors such as sample characteristics, data availability, data quality and the analytical method applied.

Wang, Ma, and Yang (2014) point out that special attention should be paid to the selection of variables. Hernandez and Wilson (2013) reported that when developing robust insolvency prediction model, it is necessary to test different combinations of financial ratios in order to achieve optimal predictive performance. Chen and Shimerda (1981) reviewed 26 articles that classified 65 financial ratios incorporated in predictive studies between 1966 and 1975 and reported 41 financial ratios that were considered to be important in one or more of the 26 articles. More recently, Cheraghali and Molnar (2024) analyzed 145 studies dealing with default models and found that as many as 120 studies used financial ratios. Their analysis showed that the most commonly used were current ratio, quick ratio, cash to total assets, working capital to total assets, net income to total assets, retained earnings to total assets and net income to equity. Karas and Reznakova (2020) pointed to the importance of cash flow indicators, among which they indicated that operating cash flow ratios combined with short-term debt metrics significantly improve distress prediction.

Models Combining Financial and Non-Financial Variables

Since financial indicators alone are often not sufficient to explain and predict insolvency, especially in SMEs, numerous studies combine them with non-financial indicators. Such indicators include macroeconomic, firm-related and market-related variables.

Altman et al. (2023) added variables related to payment behavior, employee structure and management board characteristics to financial indicators to test how this affects insolvency prediction for SMEs. They found that employee turnover, average employee tenure and changes in management significantly increase predictive accuracy. Lee, Choi, and Yoo (2023) also integrated traditional financial indicators and company characteristics. They showed that financial indicators are still significant for prediction, but that the quality of prediction increases when management and operational indicators, as well as technological and market-related variables, are included in the model.

Some researchers advocate the use of macroeconomic variables in insolvency prediction. This was confirmed by Bofim (2009), whose risk model performance improved by adding macroeconomic variables to financial indicators. Similarly, Beck, Jakubik, and Piloiu (2015) identified key macroeconomic indicators that influence default - GDP growth, exchange rates, leading rates and share prices. Filipe, Grammatikos, and Michala (2016) suggested that, in addition to accounting-based indicators, the models should be enriched by adding macroeconomic indicators and firm location, which significantly affects bankruptcy rates among European SMEs. They showed that as SMEs grow in size, their sensitivity to macroeconomic fluctuations is lower. In addition, they emphasized that it is necessary to use economic models that are precisely calibrated for specific regional and local conditions.

Campbell, Hilscher and Szilagyi (2008) and Maffett, Owens, and Srinivasan (2017) explored the integration of accounting and equity market variables to increase predictive accuracy. In their comprehensive analysis of 145 reviewed studies, Cheraghali and Molnár (2024) showed that 109 of them included at least one category of non-financial variables. Non-financial characteristics refer to the owner and the company, credit records and relational data, and macroeconomic indicators. Among them, the most frequently used are firm size, firm age and managerial attributes, and GDP growth as a macroeconomic indicator.

Ciampi et al. (2021) also analyzed over 100 studies published between 1986 and 2019. They concluded that SME default prediction models should be regularly calibrated to take into account changes related to the weighting of predictive variables in order to emphasize the importance of forward-looking and qualitative variables in times of financial distress. They also investigated the survival of SMEs in the post-COVID period and came to the conclusion that it increasingly depends on innovation capacity and human and relational capital. Based on the analysis, they gave guidelines for future research, among which they emphasize the expansion of the set of qualitative variables, the integration of innovation-based indicators, credit-relationship measures, the implementation of cross-county studies and the use of big data.

Overall, it can be concluded that combining financial and non-financial variables significantly improves the quality of the model for assessing the insolvency of SMEs and increases the explanatory and predictive power. However, there are still challenges related to the availability of data, methods of measuring qualitative constructs such as innovation capacity or quality of management, and data collection, as well as mutual comparability of models. This opens up space for future research that could contribute to the integration of multidimensional databases and the application of artificial intelligence in discovering hidden patterns in data.

Models Based on Non-Financial Variables

Recently, there have been studies in which models are developed exclusively on qualitative information and non-financial variables. Such an approach is particularly interesting for SMEs that often do not have audited financial statements, which can result in poor quality accounting data. Berzani and Shema Zlatokrilov (2024) developed an insolvency prediction model for SMEs where they used firm characteristics and macroeconomic data. In their model, it was shown that the age of the company, multiple banking relationships and sectoral insolvency rates increase the risk of insolvency, while operating as a chain business reduced it. Of the macroeconomic variables, the inflation rate, which is negatively related to insolvency, proved to be significant.

Lee, Choi, and Yoo (2020) developed an SME insolvency prediction model that is based on non-financial data from technological feasibility assessments. According to their model, the key indicators that most influence the prediction of insolvency are factors of management and business feasibility, including management ability, financing and competitive position.

Krasniqi, Kotorri, and Aliu (2023) examined the impact of bank relationships, collateral requirements, and banking sector characteristics on the probability of default. Although stronger relationship between the firm and the bank reduced default risk, and higher collateral and interest rates increased it, this effect disappeared after market concentration and bank profitability were taken into account. This suggests that the importance of bank relationships is expressed mainly in competitive markets.

This research shows that it is possible to estimate insolvencies based solely on non-financial variables, using variables related to managerial quality, but also those related to technological capabilities and contextual factors. However, as already pointed out, challenges related to measurement and data collection need to be addressed.

3.2. The role of sales growth in insolvency prediction models

The central part of this research relates to the relationship between sales growth and insolvency, which is complex and very often non-linear. Penrose (1959) in

the Theory of the Growth of the Firm explained that the growth of a firm brings advantages in efficiency and market position, but it inevitably creates pressures in management and finance that can threaten its survival. This paradox, which we also deal with in our research, is especially present in SMEs that face the above-mentioned limitations. This mechanism aligns with the Pecking Order Theory (Myers and Majluf 1984), according to which growing firms often seek debt financing when they no longer have internal sources, which can lead to an increase in indebtedness and the risk of insolvency. Growth, therefore, generates both opportunities and risks, and previous research has shown diverse evidence. Some research has shown a positive impact of sales growth on insolvency risk, some a negative one, while there are also those that have shown that sales growth does not have a significant impact on insolvency.

Amaral (2008) showed that fast-growing small firms face higher failure risk due to overextension and limited adaptive capacity. Kanani, Moradi, and Valipour (2013) assessed real and sustainable growth concerning financial and business risk, defining sustainable growth as the maximum attainable sales growth rate without amortizing resources. Their research indicated a significant link between the discrepancy in firms' real and sustainable growth and financial risk, but no such relationship with business risk. Lin, Ansell, and Andreeva (2012) explore the impact of four different default definitions on the choice of financial predictors and the model's accuracy. They find that profit, growth and employee efficiency are prevalent in all default definitions and that growth in profitability, annual sales and operating revenue are always key variables to predict SME default.

Bonaccorsi di Patti et al. (2015) highlighted that a decline in sales, combined with high leverage, raises the probability of default and reduces firm resilience. Furthermore, the effect of sales growth on insolvency is influenced by liquidity. Higher liquidity at the same level of sales is associated with a lower probability of insolvency. Hussain et al. (2020) investigated growth opportunities' role in insolvency within a mediating framework encompassing capital structure and debt maturity decisions. They demonstrated a negative correlation between growth opportunities and insolvency risk, with growth opportunities adversely impacting capital structure but positively affecting debt maturity. Šarlija, Šimić, and Đanković (2023) identified sales growth as one of the most significant predictors of insolvency risk for SMEs, in addition to total assets turnover and the ratio of liabilities to equity.

Nordal and Næs (2010) modeled future sales growth by using insolvency risk as a predictor. They discovered a positive correlation between sales growth and bankruptcy risk. Namely, companies that have a high risk of bankruptcy are similar to those companies that expect to achieve a large increase in sales in the future. Specifically, smaller firms and those with low equity, profitability, and sales per unit of capital showed higher anticipated growth rates, suggesting a trade-off between upside potential and downside insolvency risk.

There are other studies where no significant relationship between insolvency and growth was found. Putri and Arifin (2021) investigated the impact of liquidity, leverage, institutional ownership and sales growth on financial distress, finding that sales growth did not influence financial distress, unlike liquidity, leverage and institutional ownership. Similarly, Nazaruddin and Daulay (2019) and Pindado and Rodrigues (2004) showed that variables related to sales and production in their insolvency models were not statistically significant. A recent study conducted on Moroccan SMEs (Lahcen and Amgar 2025) also tested sales growth among 27 financial indicators related to liquidity, efficiency and profitability. Sales growth was not identified as a key indicator either. Instead, three important ratios were economic profitability, commercial profitability and inventory turnover. Cheraghali and Molnár (2024) conducted a comprehensive survey of predictors used in SME default and insolvency models. They made an interesting discovery related to sales growth. Namely, although sales-related ratios are among the most frequently used ratios, especially the sales to assets ratio and the logarithm of sales, the sales growth indicator itself was not included in any of the studies they reviewed. This is important because it shows that researchers are relying more on a static sales measure rather than trying to use a dynamic sales approach.

In summary, the presented theories show the importance of growth and indicate a pattern of connection between growth and insolvency. Empirical research sometimes shows a positive and sometimes a negative relationship, while some research does not confirm any relationship. All this opens space for new research that can contribute to understanding the relationship between growth and insolvency. Although our research initially covered 31 financial ratios, through modeling it was shown that sales growth consistently appears as a key determinant in explaining insolvency, either independently or in combination with liquidity and leverage. Therefore, this research will try to contribute to the understanding of how growth dynamics affects financial vulnerability in the interplay between liquidity and indebtedness.

3.3. Methods used in insolvency prediction studies

In addition to the different selection of variables used, the success of insolvency prediction is also influenced by the applied modeling methodology. Classification methods are mostly used in predicting SME insolvency. Early studies relied mainly on statistical techniques, with discriminant analysis (Altman 1968) as the pioneering method, later followed by logistic and probit regression (Tabachnick and Fidell 1996; Tinoco and Wilson 2013). Among the new methods of machine learning and artificial intelligence, neural networks, decision trees, support vector machines, random forests and XGBoost stand out. Regardless of the development of new methods and approaches to modeling, traditional statistical methods, among which logistic regression stands out, are still most often used. (Shi and Li 2019; Kuizinienė et al., 2022). According to Cheraghali and Molnár (2024), neural networks and discriminant analysis were applied in 14 studies, support vectors machines in 13, random forest in 11 and logistic regression in 77 studies.

Recently researchers have investigated hybrid and non-linear approaches to integrate multiple data sources and improve predictive power, such as fuzzy clustering, cognitive mapping, multi-criteria decision making, non-linear programming, decision tree-based models using the Harmonic Support and Confidence (HSC) rule selection method (Corazza, Funari, and Gusso 2016; Oliveira et al. 2017.; Lee, Choi, and Yoo 2023).

3.4. Formulation of hypotheses

Building on Penrose's (1959) theory of firm growth and Greiner's (1972) growth model, we conceptualize growth as a dynamic process that simultaneously generates opportunities and constraints for SMEs. Penrose views firm expansion as a function of internal resource utilization and managerial capabilities, emphasizing that rapid growth can stretch these resources and create organizational inefficiencies. Similarly, Greiner's model assumes that each stage of firm growth brings specific managerial and organizational challenges, which, if not effectively managed, can lead to crisis or decline. Additionally, the Pecking Order Theory (Myers & Majluf, 1984) emphasizes that growth increases the need for external financing, which can then increase the risk of financial distress. In this context, sales growth captures both the firm's capacity to exploit market opportunities and the financial pressures that arise from expansion. Sales growth can initiate opportunities through revenue expansion and strengthening the market position, but it can simultaneously create vulnerability through increased needs for financing and organizational pressure. Conversely, a sales decline disturbs revenue stability and increases insolvency risk through profitability loss. Thus, growth should be understood not only as a performance indicator but also as a potential source of financial vulnerability.

Accordingly, we formulate two key hypotheses:

H1: Sales growth significantly influences the probability of insolvency among SMEs.

H2: The effect of sales growth on insolvency is moderated by financial conditions, specifically leverage and liquidity in a way that the risk of insolvency is heightened when firms combine rapid growth with financial constraints.

To empirically test these hypotheses, a logistic regression model including both main and interaction effects of sales growth and key financial ratios is developed.

4. Data variables and methodology

4.1. Data and sample selection

The empirical research is based on Croatian SMEs. has been an EU member since 2013 and has the population of 3.88 million (Census, 2021), GDP per capita of 12410 EUR, exports of goods and services of 42.1% (as % of GDP), external debt of 79.8% (as % of GDP) and unemployment rate of 7.5 (Croatian National Bank 2021). Croatian economy is characterized by high external debt where the main sources of SMEs financing are bank loans and leasing while equity funding as well as other funding sources are poorly represented (CEPOR 2020). We believe that this research could be relevant for economies characterized by dependence on external financing and its structural exposure to liquidity and leverage pressures.

All financial statements of SMEs in Croatia were available for sample creation. First, all SMEs that were insolvent in 2019 were selected, resulting in 3207 cases. After that, the same number of solvent SMEs was randomly selected. For this total number of 6414 SMEs, sales growth was calculated for the period 2018 and 2019. 4271 SMEs that had complete data on insolvency and growth were retained in the sample. After that, an additional 613 cases were dropped due to missing data for the calculation of key financial ratios. Therefore, the final modeling sample contained a

total of 3658 SMEs, 1924 solvent and 1734 insolvent. Listwise deletion was applied due to incomplete reporting for some firms. While this step was technically necessary, it may have introduced bias if firms with missing statements systematically differ from those with complete data. Given that the standard practice in modeling defaults is to have a balanced sample, such a methodological approach was also applied in this research. Although such a design does not reflect the actual distribution of defaults, the balanced sample ensures that the model captures characteristics of insolvent firms that are relatively rare in the entire population. In addition, in this research, the goal was not to calibrate the probability of default, but to examine the relationship between various financial indicators and insolvency, so the balanced design deemed appropriate for the stated goal.

4.2. Description of variables

Financial indicators were calculated for the year 2018. An SME is classified as insolvent if it failed to meet its obligations for a period exceeding 90 days at any point during 2019. Given that financial indicators precede the observed outcome, the design enabled the analysis of financial characteristics as determinants of insolvency. Focusing on a one-year prediction horizon allows for a clear temporal link between financial conditions and subsequent insolvency, reducing endogeneity concerns and ensuring that predictor variables are strictly prior to the outcome. However, this approach also introduces temporal limitations, as it captures short-term dynamics rather than long-term patterns of financial deterioration. Future research could extend this framework by applying multi-year horizons or panel-based approaches to examine the persistence of growth and financial structure effects on insolvency risk over time.

Sales growth is defined as the year-over-year percentage increase in sales revenue, comparing sales figures from 2018 to those from 2019:

$$sg = \frac{sales_t - sales_{t-1}}{sales_{t-1}}$$

Sales growth is grouped into 4 categories: (i) sales growth ≤ -1 (high decline); (ii) sales growth>-1 and <=0 (moderate decline); (iii) sales growth>0 and ≤1 (moderate growth); (iv) sales growth>1 (high growth).

During the data preparation stage, several financial ratios were excluded from the modelling process to ensure statistical stability since they contained outliers (total debt over EBITDA, cash over debt, operating cash flow over equity). Finally, 31 financial ratios used in this research are divided into eight groups: (1) Profitability ratios: ROA, ROE, PM, EBIT margin, EBITDA margin, retained earnings over total assets; (2) Liquidity ratios: current ratio, quick ratio, cash ratio, cash over sales; (3) Leverage ratios: total debt ratio, debt-equity ratio, equity to assets, current liabilities over assets, current liabilities over equity, equity over fixed assets, (equity + long-term debt)/fixed assets; (4) Turnover ratios: total asset turnover, fixed asset turnover, inventory turnover, days' sales in inventory, receivables turnover, days' sales in receivables; (5) Sales growth; (6) R&D indicators: nontangible assets/total assets, R&D expenditures over total assets, goodwill over total assets; (7) Investment indicators: investment over total assets, investment over total revenue; (8) Export indicators: export over sales, export over import.

Although a broader set of 31 financial ratios was initially considered, the final model retained only sales growth, leverage and liquidity. This parsimonious specification reflects the aim to analyze the interaction between growth dynamics and financial structure, rather than to optimize predictive performance. When sampling SMEs from the total base of all Croatian SMEs, random sampling was used, which ensured representativeness across different sectors and regions, which mitigates the potential bias raising due to not including indicators for the regional and sectoral affiliation of SMEs. Nevertheless, incorporating industry and regional controls could further enhance predictive accuracy and capture structural heterogeneity in future research.

4.3. Logistic regression with interaction effects

To address the research objectives outlined in the introduction, we employ logistic regression as the primary analytical method. This approach enables us to examine the relationship between financial indicators and insolvency while also exploring the interaction effects among financial indicators. By incorporating interactions, the model provides deeper insights into how these factors jointly influence insolvency risk.

If the vector of predictor values for an enterprise is denoted by $x = (x_1, x_2, ..., x_k)$ and the regression parameter vector by $\beta = (\beta_1, ..., \beta_k)$, the model that describes conditional probability of insolvency $p(x)$ can be shown by the equation:

$$log\frac{p(x)}{1-p(x)} = x'\beta. \quad (1)$$

This means that the predictor values x and probability of insolvency are linked through the nonlinear equation:

$$p(x) = \frac{e^{x'\ \beta}}{1+e^{x'\ \beta}}. \quad (2)$$

The classical maximum likelihood theory was applied for estimation (see, for example Dobson and Barnett 2018). When choosing a model, several classical criteria and procedures were combined. For example, minimization of information criteria (Akaike and Bayesian), models' comparison based on deviance and the principle of parsimony. As the response variable is binary, a ROC (random operating characteristic) analysis was also performed. It means that several classification measures (AUC, sensitivity, specificity, Kolmogorov-Smirnov statistic) were calculated to compare models.

In logistic regression, it is common practice to interpret the contribution of predictors to the response variable on the log-odds scale. Specifically, each parameter reflects the impact of the corresponding predictor on the log-odds of the outcome, which can be interpreted through the odds ratio. It is crucial to understand that odds ratios are frequently misinterpreted as relative risks. Unlike odds ratios, relative risk refers to the ratio of probabilities, not the ratio of odds.

As the relationship between probability of insolvency and predictors is nonlinear, the interpretation of the contribution of each variable to the response (probability of insolvency) should be discussed conditionally on the other variables involved in the predictor $\boldsymbol{x'\beta}$. This is even more important if there are interactions in models.

Accordingly, the modeling process places significant emphasis on marginal effects, which measure the relationship between changes in predictors and corresponding changes in the outcome (Williams 2012; Cameron and Trivedi 2010).

To be more specific, let us suppose that the predictor x_1 is continuous. The marginal effect of x_1 on the response $p = (x_1,...,x_k)$ is the partial derivative of the function p with respect to x_1. For the logistic regression model, it is:

$$\frac{\partial p}{\partial x_1} = \beta_1 \frac{e^{x'\boldsymbol{\beta}}}{\left(1+e^{x'\ \boldsymbol{\beta}}\right)^2} \quad (3)$$

As the derivative of a function is a measure of the rate at which the value p changes with respect to the change of the variable x_1, it is evident that this change is highly dependent on the values of all predictors. Also, it is important to notice that a marginal effect is no longer for a unit change but for a small change in the continuous predictor.

For categorical predictor, the marginal effect corresponds to the difference in p for the two different categories. For example, let us assume that the second predictor x_2 is a dummy variable related to the predictor with two values.

Then, the marginal effect

$$p(x_1, 1, \dots, x_k) - p(x_1, 0, \dots, x_k) =$$

$$\frac{e^{(x_1,1,\dots,x_k)'\ \boldsymbol{\beta}}}{1+e^{(x_1,1,\dots,x_k)'\ \boldsymbol{\beta}}} - \frac{e^{(x_1,0,\dots,x_k)'\ \boldsymbol{\beta}}}{1+e^{(x_1,0,\dots,x_k)'\ \boldsymbol{\beta}}} \quad (4)$$

also depends on other predictor values.

Incorporating marginal effects into the model-building process is not straightforward, as they are primarily intended for interpretation. However, average marginal effects (AMEs), calculated as the average of observation-specific marginal effects, provide additional insights and can be used to compare models when selecting one for interpretation. Accordingly, we computed and compared AMEs across several selected models to aid in this decision-making process.

For all computations we used R language and environment for statistical computing and graphics and packages ROCR (Sing et al. 2005), margins (Leeper 2021) and marginal effects (Arel-Bundock 2022).

Applying the described methodology to the dataset, we developed a model presented in Table 5.

Before interpreting the model, a detailed analysis of the predictors is presented.

Table 1 shows the relative frequencies of sales growth categories for the full sample and by solvency status. Among solvent SMEs, 42.15% experienced a sales decline, compared to 73.59% of insolvent ones.

Leverage is measured as the ratio of current liabilities to equity. Since equity can be negative in the Croatian accounting system when liabilities exceed assets, the ratio was categorized. Table 2 shows that most solvent SMEs are moderately leveraged, while most insolvent SMEs have liabilities exceeding their assets.

Table 1. Relative frequencies of sales growth

Sales growth	Sales growth description	% in whole sample	% among solvent SMEs	% among insolvent SMEs
≤ -1	High decline	10.11	3.53	17.42
>-1 and <=0	Moderate decline	46.94	38.62	56.17
>0 and ≤1	Moderate growth	32.09	44.65	18.17
>1	High growth	10.85	13.2	8.25
Total		100	100	100

Source: Authors' own work

Table 2. Relative frequencies of leverage ratio

Current liabilities/ equity	Current liabilities/ equity description	% in whole sample	% among solvent SMEs	% among insolvent SMEs
<0	negative	41.42	25.68	58.88
≥0 and ≤5	moderate leverage	47.38	62.01	31.14
>5	high leverage	11.21	12.32	9.98
Total		100	100	100

Source: Authors' own work

Because quick ratio and leverage were found to be associated with sales growth, Tables 3 and 4 present their distributions by sales growth category.

The Kruskal–Wallis test confirms significant differences in liquidity across sales growth levels ($p < 10^{-15}$). SMEs with moderate sales growth show the highest liquidity, whereas those with large sales declines show the lowest. Similarly, Pearson's Chi-squared test confirms a strong dependence between leverage and sales growth ($p < 10^{-15}$). SMEs with substantial sales declines most often have negative leverage. Interestingly, among high-growth SMEs, both negative and high leverage are more frequent compared to the moderately growing group.

Table 3. Descriptive statistics of quick ratio according to sales growth

Measure	High sales decline	Moderate sales decline	Moderate sales growth	High sales growth
Mean	0.7	1.05	1.28	1.05
Standard deviation	1.06	1.28	1.29	1.18
Median	0.25	0.58	0.84	0.72
Lower quartile	0.02	0.14	0.3	0.18
Upper quartile	0.99	1.4	1.78	1.38
Min	0	0	0	0
Max	5.53	6	5.96	5.97
N	370	1717	1174	397

Source: Authors' own work

Table 4. Relative frequencies of leverage according to sales growth

Leverage	High sales decline (%)	Moderate sales decline (%)	Moderate sales growth (%)	High sales growth (%)
negative	68.11	45.54	28.19	37.78
moderate leverage	24.05	44.09	60.31	45.09
high leverage	7.84	10.37	11.5	17.13
Total	100	100	100	100

Source: Authors' own work

5. Result

All 31 variables were included in the modeling process. Different modeling procedures and diagnostic tests, different selection procedures, multicollinearity testing were used to extract the variables that best contribute to the interpretation of insolvency. The most dominant indicators in different models were 3 ratios - sales growth, leverage and liquidity. These variables jointly capture the dynamic (growth), structural (leverage) and short-term stability (liquidity) aspects of SME performance thus aligning well with both theoretical reasoning and empirical robustness. The resulting model achieved an AUC of 0.76, indicating satisfactory discriminative ability despite its parsimonious specification. Table 5 presents the results of the logistic regression model ($\chi^2(15) = 184.76$, $p < .001$; AUC = 0.76).

As shown by the results, insolvency is impacted by the sales growth and leverage combined - with their main and interacting effect being statistically significant. Quick ratio has no significant main effect or interaction effect, but its average marginal effects show statistical significance. Main effects show that SMEs that have a strong drop in sales have a higher probability of insolvency compared to SMEs that have a moderate decline as well as any level of sales growth. SMEs with moderate growth have the lowest level of insolvency, followed by those with high growth, which confirms that balanced growth is much more sustainable than rapid growth or rapid decline in sales. From a financial structure perspective, SMEs with moderate leverage tend to face less insolvency risk than those operating with negative equity. However, once leverage becomes excessive, its risk profile converges with that of negative equity, implying that the advantages of growth may be neutralized by the burden of high debt. The interaction effects offer a more nuanced understanding of the relationship between growth and financial structure. Firms that achieve strong sales growth by maintaining moderate leverage exhibit the greatest resilience to insolvency, whereas those that experience high growth and high leverage also have reduced lower insolvency risk - but the effect is notably weaker. The abovementioned trend underscores that growth contributes to solvency only when it is supported by a well-balanced financial structure - one that aligns with the firm's stage of development and adheres to life-cycle and growth theory principles. (Penrose, 1959; Greiner, 1972).

Table 5. Logistic regression model of insolvency

Effect	Estimate	SE	t value	p value
Intercept	0.863	0.029	29.383	<.001
Main effects*				
Quick ratio	-0.005	0.027	-0.168	0.866
Moderate sales decline	-0.150	0.034	-4.458	<.001
Moderate sales growth	-0.364	0.039	-9.45	<.001
High sales growth	-0.260	0.047	-5.473	<.001
Moderate leverage	-0.158	0.069	-2.299	0.021
High leverage	-0.065	0.089	-.735	0.462
Interaction effects				
Quick ratio x Moderate sales decline	-0.009	0.029	-0.324	0.745
Quick ratio x Moderate sales growth	-0.026	0.030	-0.875	0.382
Quick ratio x High sales growth	-0.004	0.036	-0.105	0.916
Moderate sales decline x Moderate leverage	-0.106	0.073	-1.442	0.149
Moderate sales growth x Moderate leverage	-0.118	0.077	-1.544	0.122
High sales growth x Moderate leverage	-0.207	0.091	-2.265	0.023
Moderate sales decline x High leverage	-0.070	0.010	-0.728	0.466
Moderate sales growth x High leverage	-0.147	0.100	-1.466	0.142
High sales growth x High leverage	-0.340	0.111	-3.073	0.002

* base category for sales growth is high sales decline; base category for leverage is negative leverage

Source: Authors' own work

Table 6. Average marginal effects (AME) of variables on predicted values of insolvency

Factor	AME	SE	Z	p	Confidence interval (95%)	
					lower	upper
Moderate leverage	-0.268	0.019	-13.876	<.001	-0.306	-0.230
High leverage	-0.182	0.026	-7.136	<.001	-0.232	-0.132
Quick ratio	-0.018	0.007	-2.510	0.012	-0.032	-0.004
Moderate sales decline	-0.219	0.029	-7.525	<.001	-0.275	-0.162
Moderate sales growth	-0.465	0.030	-15.406	<.001	-0.524	-0.406
High sales growth	-0.400	0.035	-11.346	<.001	-0.469	-0.331

Source: Authors' own work

Table 6 reports the average marginal effects (AME) which quantify the average change in the probability of insolvency associated with a one-unit change in each predictor.

The results confirm that sales growth has the strongest effect, followed by leverage. Compared to firms experiencing a sharp sales decline, SMEs with moderate growth show the largest reduction in insolvency probability, around 45% on average. Even high growth lowers insolvency risk by roughly 40%. The moderate sales decline also shows a significant reduction but of smaller magnitude.

Concerning financial structure, it can be noticed that moderate and high leverage both significantly reduce insolvency probability relative to negative equity, confirming that a positive capital base and sustainable debt levels strengthen resilience. Although liquid assets contribute to solvency, their influence is secondary to sales performance and capital structure. Collectively, the AME results affirm the core model findings; insolvency risk within SMEs is dependable mostly upon growth dynamics accompanied by the overall strength of the firm's balance sheet with the short-term liquidity playing a minor role.

Building on the average marginal effects reported in Table 6, it is useful to explore how different combinations of leverage and sales growth jointly shape insolvency probabilities. Table 7 presents the predicted probabilities for these combinations, holding liquidity constant at its mean value (1.09).

Table 7 shows that the risk of insolvency depends on the interaction between leverage and sales growth. The lowest probability of insolvency (below 0.3) is present in SMEs that have a combination of moderate or high growth with moderate or high leverage. The minimum predicted probability (≈0.19) appears in two groups: moderately leveraged firms with moderate growth and highly leveraged firms with high growth.

Table 7. Probability of insolvency according to leverage and sales growth with liquidity held at mean value

Sales growth	Leverage	Predicted probability of insolvency	Confidence interval (95%)	
			lower	upper
High growth	Negative	0.5936	0.5141	0.6731
Moderate growth	Negative	0.4648	0.4140	0.5156
Moderate decline	Negative	0.6972	0.6629	0.7315
High decline	Negative	0.8575	0.7879	0.9270
High growth	Moderate	0.2294	0.1564	0.3025
Moderate growth	Moderate	0.1889	0.1520	0.2258
Moderate decline	Moderate	0.4333	0.3982	0.4684
High decline	Moderate	0.6999	0.5997	0.8001
High growth	High	0.1879	0.0802	0.2956
Moderate growth	High	0.2527	0.1766	0.3289
Moderate decline	High	0.5616	0.4954	0.6278
High decline	High	0.7921	0.6289	0.9552

Source: Authors' own work

From this, it could be concluded that the most resilient are those SMEs where sales growth is supported by an adequate level of capital. SMEs with high sales decline have the highest probability of insolvency (0.7-0.9). In addition to them, the high-risk group includes those SMEs that have a moderate sales decline and negative leverage.

Interestingly, the effect of leverage reverses depending on growth intensity:

- For moderate growth, moderate leverage is safer than high leverage.
- For high growth, the opposite holds – high leverage becomes beneficial, likely because external financing supports the expansion.

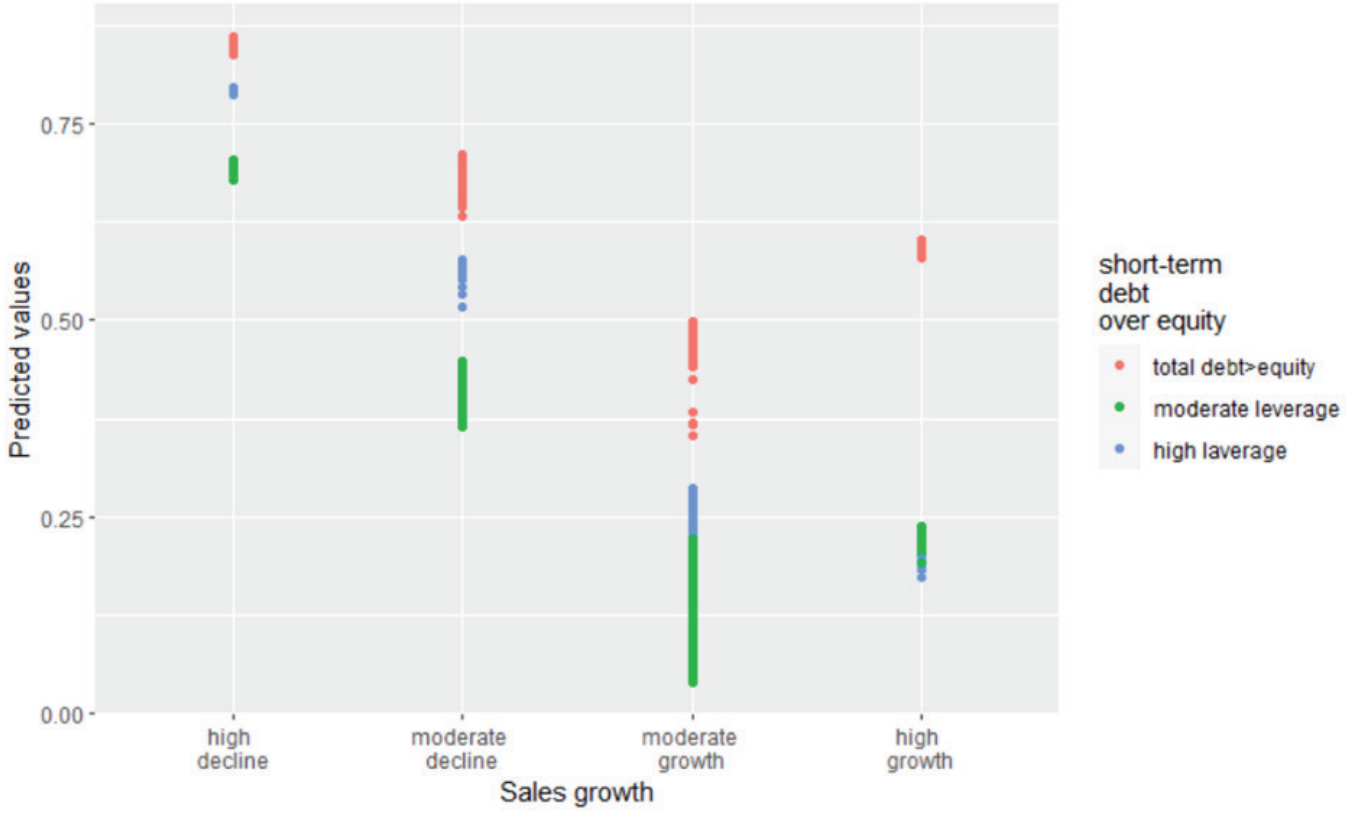
These patterns highlight the nonlinear relationship between financial structure and growth in determining insolvency risk. In other words, leverage can either mitigate or amplify insolvency risk depending on the firm's growth dynamics.

Building on the predicted probabilities from Table 7, Figure 1 illustrates how insolvency risk varies across combinations of sales growth and leverage.

The highest insolvency probabilities are consistently found among SMEs experiencing high or moderate sales declines particularly in the case where total debt exceeds total equity. This risk gradually decreases with moderate and high leverage levels. However, the pattern changes in the case of high sales growth – while firms with negative leverage still face elevated risk, those with high leverage outperform their moderately leveraged counterparts, suggesting that leverage can become advantageous when rapid growth is supported by sufficient financing capacity.

These findings confirm the two central hypotheses of this study. First, sales growth significantly influences the probability of insolvency among SMEs, and second, this influence is conditioned by the firm's financial structure, particularly leverage and liquidity. The results underscore that moderate growth, supported by moderate leverage, represents the most resilient configuration, minimizing insolvency risk while maintaining financial stability.

Figure 1. Predictions of probability of insolvency according to the levels of sales growth and leverage



Source: Authors' own work

6. Discussion and conclusion

There are numerous studies dealing with the growth and insolvency of small and medium-sized enterprises. Most often, they are studied as two separate phenomena. Still, there are studies that try to reveal their connection. They give mixed results - some find positive, some negative, while others find no connection between insolvency and growth. This research aims to make a contribution in that field by giving another approach in studying their relationship. Specifically, the interconnectedness between growth and insolvency was analyzed both directly and through interactions with other financial indicators. Unlike traditional models that do not consider the mutual interaction of financial ratios, this approach with interaction effects enables a deeper understanding of how sales growth, leverage and liquidity together shape the probability of insolvency. Through interactions, it is possible to discover sophisticated patterns that would otherwise remain hidden in models that take into account only main effects.

This research has generated five key conclusions. First, although sales growth has been confirmed as an important phenomenon from a theoretical perspective, it has been understudied in insolvency research. Previous research has taken various measures of liquidity, leverage, turnover and profitability, but rarely captures the paradox of growth - as both an opportunity and a potential source of financial distress. Our results are consistent with the theories of Penrose and Greiner, which emphasize growth dynamics and distress. Secondly, in predicting insolvency, three variables stand out, which together, in interaction, affect the risk of insolvency - sales growth, leverage ratio (current assets/equity) and quick ratio (current assets-inventories/current liabilities). Thirdly, sales growth affects the reduction of insolvency risk, but this effect depends on the financial structure. In particular, SMEs where liabilities are greater than assets have a higher probability of default even when sales are growing, which shows that a very high level of indebtedness cancels out the positive effect of sales growth. The pattern of highly indebted SMEs with high sales growth is very interesting - they have a lower insolvency risk than equally indebted SMEs with moderate growth. It can be concluded that when SMEs are highly indebted, growth must be strong enough to maintain solvency. Fourth, the most exposed to insolvency are those SMEs that have a strong decline in sales, regardless of liquidity and leverage. Even those SMEs that have high liquidity are not protected from a high risk of insolvency if they have a strong decline in sales. Fifth, the research showed that it is important to include the interaction between financial indicators. Quick ratio alone, as a direct effect, did not show significance. However, in interaction with sales growth, it was shown to have a statistically significant effect. From this, it can be concluded that liquidity has become important when viewed in the context of growth intensity – SMEs that achieve strong growth can better absorb financial stress if they maintain a sufficient level of liquidity. Accordingly, SMEs that achieve a decline in sales and at the same time have a low level of liquidity have an even greater risk of insolvency.

The research also holds practical implications within the Croatian institutional and financial context, where SMEs represent over 99% of active enterprises and account for the majority of employment. For policymakers, given that growing firms are extremely important for every economy, and this research has shown that sustainable growth reduces the risk of insolvency, the state should provide access to finance through its programs for those firms that have the potential for growth. In addition, the simplification of the financing approval procedure and the creation of programs that encourage and reward responsible leverage management would contribute to growth. As far as bankers and investors are concerned, sales growth should be considered as a key indicator in assessing defaults. As the results show, the least risky SMEs clients are those who achieve growth with sustainable leverage. On the other hand, a drop in sales can be considered an early warning sign, even among those firms that have good liquidity. By strategically financing growth-oriented SMEs, financial institutions can simultaneously support economic development and mitigate portfolio risk exposure.

This research has several limitations related to data, variables and methodology. First, the research is based on observational financial data and as such it identifies statistical associations rather than causal mechanisms. Future work could employ longitudinal or quasi-experimental designs to explore the causal dynamics linking growth, liquidity and leverage with insolvency outcomes. Second, the analysis relied on financial statements of SMEs for two consecutive years, which constrains temporal generalization. Future research could extend this framework using panel data to assess how the persistence of growth and financial structure affects insolvency over time. Third, some financial ratios (total debt over EBITDA, operating cash flow over equity, cash over debt) were excluded due to outliers. Although this approach ensured model stability, it may have omitted potentially informative indicators. Future studies could apply robust statistical techniques (e.g., winsorization) to address this

limitation. Fourth, listwise deletion was applied to handle missing data. This approach may have introduced bias if SMEs with incomplete reporting differ systematically from those with complete statements. Future research could use multiple imputation or alternative techniques to test the robustness of the results.

In addition, future research could expand in four directions: (1) incorporating industry-specific factors to test whether the growth and insolvency relationship differs across sectors; (2) including variables reflecting the SMEs' life-cycle stage, given its influence on capital structure and growth strategies; (3) integrating qualitative dimensions such as entrepreneur characteristics, human capital, R&D intensity and innovation; and (4) applying advanced analytical techniques, including neural networks or support vector machines in order to capture nonlinear patterns that traditional regression models might overlook.

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MODELLING OF STRUCTURAL EQUATIONS BASED ON THE RELATIONSHIP BETWEEN FINANCIAL OVERDEBT, JOB RISK, DECREASED QUALITY OF LIFE, AND PROACTIVE BEHAVIOR IN THE MEANING OF FINDING AN ADDITIONAL JOB

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Abstract

Modern lifestyles often put at risk careless and reckless financial management, which can lead to over-indebtedness, default and bankruptcy. The inability of individuals to manage their finances is accompanied by numerous negative business, social and family implications that manifest themselves through financial stress, limited spending opportunities, which are directly related to the quality of life, and increasing inequality. In the paper, the authors investigate the phenomenon of excessive borrowing in Croatia to improve the quality of life and artificially raise the standard of living, which limits the plans of the inhabitants of Croatia. Quality of life, within the framework of this research, encompasses the dimensions of financial stability, health, social inclusion and general satisfaction with life, analysing how an individual's economic circumstances shape their personal and social well-being. Furthermore, the paper analyses (i) the characteristics of individuals in financial difficulties, their attitudes towards debt reduction planning and financial recovery strategies, and (ii) differences in proactive behaviour among individuals, particularly in the context of willingness to take on additional work and the benefits of living standards in response to the current deterioration of their financial situation. The research results indicate that the key to achieving an economy of well-being is finding a balance between the benefits of credit and a sustainable level of indebtedness adjusted to the individual's financial capabilities. In this context, the research was conducted on a purposive sample of 782 respondents who experienced a loss of economic autonomy and sovereignty in making financial decisions, which influenced their proactive behaviour. The research results confirm that the key to achieving economic well-being is establishing a balance between the benefits of credit and a sustainable level of indebtedness that does not threaten the financial stability of the individual. The research was conducted on a purposive sample of 782 respondents who experienced a loss of economic autonomy, which had a direct impact on the quality of life. The research results suggest that economic factors, such as low income and increased indebtedness, have a more pronounced negative effect on quality of life, while job riskiness may be a reason for finding additional work.

Keywords: *welfare economy, credit indebtedness, quality of life, financial literacy, debts*

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1. Introduction

Over-indebtedness of Croatian citizens has been one of the biggest problems since the founding of the Republic of Croatia, and as such, it is unsustainable. Poverty, caused by long-term blocking of accounts, job insecurity and unemployment, creates a hopeless situation for many families with the consequences of complete economic and social exclusion. Poverty can be defined as economic deprivation that exists in Croatia, recognised in long-term unemployment, job insecurity, lack of involvement in social networks and unavailability of legal protection. The biggest causes of poverty in Croatia, apart from the already mentioned elements, are account blocking and the personal attitude of maintaining the standard of living by "*ironing the cards*", and then the impossibility of settling them. Long-term unemployment has negative social consequences and isolation, reducing the chance of re-employment even more. As a chain, everything intertwines in the form of social isolation that impairs the quality of life and leads to a decline in the standard of living. The desire for higher winnings forces individuals to try their hand at betting shops, games of chance and trading on financial markets, and often replaces the gain with big losses that are just a step to slavery.

No matter that more developed countries like Sweden, Norway, Denmark and Finland have adopted the new concept development of the welfare state, which strives to enable welfare through its economic policy, in Croatia, the concept of well-being is exclusively self-interested. In countries that could be characterised as a welfare state, the tax system and economic regulation must be transparent, predictable, and the change framework must be predefined and clear. The most successful countries, considering their growth, income per inhabitant and level of employment, are those whose limited government spending is followed by taxes, the application of which, together with regulation, is clear, predictable and not excessive. This paper aims to provide a detailed overview of the impact of a low level of economic opportunity on personal well-being and quality of life. The insights gained from this research can be useful for shaping policies and programs that seek to reduce economic inequalities and improve living conditions for vulnerable populations.

Considering the results of the research, this paper contributes to the larger body of research on financial behaviour and its implications for economic well-being. By analysing the interrelationship between credit use, financial stability and quality of life, the study provides valuable insights into the challenges individuals face in managing their economic circumstances. The results highlight the need for policies that promote responsible borrowing and financial literacy, as well as structural measures aimed at mitigating the negative effects of over-indebtedness. Ultimately, achieving a sustainable balance between credit facilities and financial stability is critical to fostering long-term economic prosperity.

2. Indebtedness and Impact on Quality of Life

The desire to own things, new cars, and status in society has led many to be unreasonable spenders beyond their means and thus become slaves to money. Just buying on instalment payments, current consumers are enabled to buy whatever they want at that moment. All of your opportunities have also allowed consumers to create an unstoppable desire for marketable goods and lust for something new constantly. Passion for brands and the availability of all goods and services separated the individual from himself and introduced him to the world of expressing status and supremacy over other individuals.

At the same time, increasing debts arise, and often, the inability to repay the cost of living standards. Consumer society can be identified with consumerism, which has become a disease of today's capitalism, trade, market and economy. People have become slaves to modern times, slaves to spending and everything different, everything that is not spent and everything that is not bought, becomes completely unacceptable. His spine has taken the number one position in all buying principles, in every consumer behaviour and in everything which represents today's consumption of goods and services (Grubišić 2016). Consumption is not only for satisfying certain needs, but it also shows a certain social and cultural context (new car, cottage, skiing, sailing, new cell phone, etc.). Advertising industries played a big role in the emotional upheaval of the individual and the desire to own ever larger and more expensive consumer goods. This emotional upheaval in the consciousness of each individual is also the threat of debt slavery, more precisely, large consumption and living in debt. It is a practice that today goes beyond common sense, but fits perfectly with consumption as a dominant social value. The desire for a high standard of living is stronger than a reasonable judgment of one's possibilities and creates space for unrealistic and frivolous behaviours that lead to borrowing from various banks, by borrowing on credit cards and by taking out loans in various savings banks... Job insecurity, minimum

wages and a low level of economic opportunities significantly reduced the quality of life of the individual, and they joined the phenomenon called credit mania. Credit creation (Cooper 2009) is the foundation of the creation of wealth, and it is also the cause of financial instability. An additional problem is the extreme ease of obtaining loans on the market because it usually precedes the financial and economic crisis, so in such conditions, one should be particularly cautious in borrowing (Buterin, Lukežić and Buterin 2018). In times of strong financial crises, even the largest financial institutions are not spared from failure, while individuals are not because of their low financial strength (Olgić, Draženović et al. 2018). Furthermore, borrowing in foreign currency is especially risky due to the possibility of exchange rate changes (Buterin, Plenča, Buterin, 2015). Creditomania is a risk, especially when old loans are repaid with new loans, whose spiral leads to economic and general social disorder. Despite the low rate of inflation and the introduction of the currency clause, the indebtedness of citizens increased into the sky. Today, the entire economy is based on the fact that people are in debt. Higher standards are imposed on all Croatian citizens, which is best evidenced by the use of mobile phones and the desire to own expensive things, such as cars, etc. Peračković's claims (Peračković 2013) lead to one of the new characteristics of the middle class as a strong consumer segment of society that has a standard of living redefined into a lifestyle.

2.1. Quality of Life

The quality of life is realised in the conditions of general human well-being, which, in addition to material well-being, also includes intangible components. It is a complex concept, which many scientists analyse from different angles. The quality of life is associated with well-being, and it is considered that well-being is achieved through satisfaction or utility resulting from the consumption of goods and services, so it follows that well-being is greater the greater the consumption of goods and services, while individuals are the best judges of their well-being (Hausman and McPherson 1996). When it comes to the quality of life, a large number of authors analyse it from a psychological approach, from which it can be concluded that the quality of life of today's man is closely related to the concept of subjective well-being, satisfaction with life and the concept of happiness. Defining quality of life in a broader sense and under the definition of the World Bank, quality of life is defined as general human well-being, which, in addition to material well-being, also includes intangible components such as environmental quality, national security, personal protection, and political and economic freedoms (The World Bank Group, "*Glossary*") In their works, most authors state that mere material wealth is not enough to achieve quality of life today, but also a whole series of other conditions and well-being that are part of the complexity of living today. Thus, the conditions of growing up, education, the value system of society, culture and tradition are important elements that define the quality of life of a modern man. Achieving the standard of living imposed by the consumer society in its scientific approach is based on general principles, but it cannot be an exclusion or reason for imposing the standard of living at any cost. Quality of life is an extremely complex concept that is almost impossible to define unambiguously. One of the definitions is that quality of life is a complex process of evaluating life satisfaction within the environment in which an individual lives (Petz 2005). Browne (1994) defines quality of life as a constant interaction of the influence of external conditions on an individual's life and the subjective perception of these conditions. (Krizmanić and Kolesarić, 1989) define quality of life as a psychological category that does not result from satisfying basic needs, but from the overall psychological structure of an individual in interaction with the physical and social environment in which he lives and is based on subjective assessment. The sources of satisfaction and dissatisfaction of each individual are numerous and different, and the objective circumstances in which he lives can significantly increase or decrease them (Petz 2005). The concept of quality of life consists of an objective and a subjective aspect. Subjective indicators of the quality of life depend on the individual's personality traits, while objective indicators consist of material conditions, housing conditions, organisation of health care, social care, mortality rate and the like (Žganec, Rusac, and Laklija, 2007).

Citizens' over-indebtedness significantly affects many quality-of-life variables and can also be defined by a reduced sense of happiness. Happiness is a subjective emotion. It depends on life circumstances, but also our personality, personality structure, and how we look at things in our own lives. The fact is that material factors play a significant role in the standard of living and the prosperity of the country, but it is also necessary to include subjective feelings of satisfaction and happiness because they are related to the quality of life (Ralašić and Bogdan, 2018). Many forms of well-being are difficult to measure with monetary indicators. However, some variables

essential to happiness are very measurable. Happiness is increased by togetherness and a sense of belonging. Connection with people, money, health, freedom, and the trust we feel towards people and institutions also affect happiness. Happiest countries are characterised by connectedness, togetherness and support among residents (Scandinavian countries: Finland and Denmark). In such welfare states, the population has numerous benefits related to children's education, and treatment that is available and free for everyone, resulting in satisfaction that increases the level of happiness as an emotion. In addition to the above, happiness is also affected by the lack of/employment of the population, the level of salary, i.e. income, security, freedom, stability and peace in the country, health, activities of individuals, social networks, attitude towards the environment and numerous other factors (Štojs 2019). Terms such as insecurity, precariousness and vulnerability entered the employment-related lexicon and came to assume relevance in the scientific debate among sociologists (Anderson and Pontusson 2007; Juliá, Vanroelen, Bosmans, Van Aerden, and Benach 2017), psychologists (Dooley, Rook and Catalano 1987; Vander Elst et al. 2014) and economists (Böckerman 2004; Origo and Pagani 2009; Böckerman et al. 2011). Few studies have examined causal mechanisms (mediators) that may explain the relationship between perceived job insecurity and quality of life or group differences (moderators) in that relationship (Caroli and Godard 2014). Elaborating the stress pathways through which perceived job insecurity impairs quality of life and identifying factors that modify the relationship between perceived job insecurity and quality of life may improve our understanding of how work-related stressors contribute to health disparities.

In sociology, well-being is associated with the concept of standard of living and quality of life. Increasing overall well-being has its objective and subjective dimensions. Objective well-being includes the concept of economic development (it has two dimensions: economic and non-economic) and living conditions, while the subjective dimension refers to residents' perception of well-being. As a measure of happiness and well-being, GDP is often used in the literature, but it is not always a reliable measure of the above, because sometimes the quality of life in society can decrease regardless of GDP growth, i.e. having more money does not necessarily mean greater happiness for people, As a result of the above, it began to be studied what leads to satisfaction and happiness in people and how well-being can be measured. In this way, a new research area was created, which was called welfare economics.

3. Economics of Well-being

The economy of well-being has an increasing number of supporters who suggest the implementation of activities that will raise happiness not only at the individual level, but also at the level of satisfaction of the entire social community (Ralašić and Bogdan 2018). Economics represents all industries, but until recently, it was unthinkable that happiness would be evaluated in medicine and psychology through indicators of indices represented in the economy of well-being (Hanson 2013). The welfare economy does not aim to satisfy the interests of capital, but to simplify life in the local community and make every member of it happy (Štojs 2019).

The economy of well-being can be defined as "*an economy that supports the quality of life in the entire community; that creates abundant opportunities and possibilities for meeting the needs of citizens without endangering others; that uses and shares resources fairly; that accepts responsibility and fosters solidarity; that respects the sustainability of ecosystems, understanding that well-being is a consumable resource that must be managed fairly and transparently*." Therefore, the economy of well-being is an economy that, in addition to the financial aspect of living, wants to live with aspects that come from the concept of socially responsible business.

The national happiness index expresses in numerical results indicators of the quality of living in a certain living environment, but also the effectiveness of society. The effectiveness of society implies a measure of the needs and expectations of the country's inhabitants. In the welfare economy, there are a number of components that measure the quality of the economy through the openness of the economy, through various macroeconomic indicators, as the basis of economic growth and the efficiency of the financial sector. The business environment is an important indicator of well-being because it refers to the ranking of the business environment by the infrastructure, as well as the possibilities of investing in the state, and the flexibility of the labour market. Education, health, national and personal security are additional indicators for measuring well-being in a country, and are necessary for measuring the general satisfaction of residents.

This further points to the fact that when monitoring well-being, it is necessary to connect objective factors with subjective factors, while taking into account that these are personal understandings of the concept of happiness. The subjective factor of happiness is much more complex than the objective factor, but by joint measurement and the obtained results,

the overall picture of society can be seen (Nikolova and Sanfey 2015). According to the Happiness Index, Croatia is at the very bottom, and many studies have already proven that countries with higher incomes are happier, but that they do not become happier as they become richer (Akerlof and Kranton 2010). The easiest way to explain this paradox is that in a certain country, the richer one becomes happier, and that is why most people want to be rich. At the same time, when entire societies become rich, no one becomes happier.

According to research by the Happiness Index (NIS), Croats can be characterised as pessimists or mild optimists (Štojs, according to Hendal Market Research, NIS, 2019). They are not satisfied with the degree of satisfaction of basic life needs, so this leads them to excessive debt.

Citizens' over-indebtedness significantly affects many quality-of-life variables and can also be defined by a reduced sense of happiness. Happiness is a subjective emotion. It depends on life circumstances, but also on our personality, personality structure, and on how we look at things in our own lives. The fact is that material factors play a significant role in the standard of living and the prosperity of the country, but it is also necessary to include subjective feelings of satisfaction and happiness because they are related to the quality of life (Ralašić and Bogdan 2018). Many forms of well-being are difficult to measure with monetary indicators. However, some variables essential to happiness are very measurable. Happiness is increased by togetherness and a sense of belonging, connection with people, money, health, freedom, and the trust we feel towards people and institutions, which also affect happiness. Socio-economic development imposed the need for a more complex approach and deeper analysis of living conditions (Grilec Kaurić and Ujević 2013) to have more, to become happier. Apart from the objective indicators of job insecurity, this is precisely the main reason why Croats have become indebted instead of happy. When a country's progress is measured, its GDP is usually cited, which says nothing about the well-being of its citizens. More and more EU countries need to create new indices that would show the well-being of the inhabitants and their economic power. In addition to the happiness index, there is a need for other indicators that will measure the objective prerequisites of life, and they will further show the subjective satisfaction of each resident. The authors think that the research on the indebtedness of Croatian citizens and their distance from well-being will have a positive impact on the inhabitants because they will begin to develop awareness and create within themselves the feeling that the quality of life in relation to indebtedness is incomparably better.

3.1. Lending versus responsible lending

In the modern economic system, credit indebtedness plays a key role in the financial stability of a society and its citizens. However, the political and regulatory aspects of this phenomenon are often insufficiently explored, which leaves room for potential economic crises and financial abuses. The role of banks, credit policy and consumer protection represents a triangle through which the impact of regulation (or lack thereof) on overall economic stability can be analysed. Banks are key actors in the process of granting loans, but their operations are not only market-oriented but also deeply connected to political and regulatory frameworks. State policies determine monetary policy guidelines, while regulators, such as central banks and financial regulatory authorities, set limits and rules that should prevent irresponsible lending. However, throughout history, we have seen how banks have often exploited regulatory loopholes, encouraging excessive indebtedness of consumers and businesses, which ultimately led to financial bubbles and economic collapses, such as the global financial crisis of 2008. Responsible lending refers primarily to bilateral relationships between lenders and borrowers. On the lender's side, this refers to their assessment of the borrower's creditworthiness, and it is important to keep in mind that creditworthiness is not a permanent and static category, but that it can change. On the borrower's side, responsible lending should refer to an objective assessment of whether the loan obligations can be properly fulfilled. Even though the consumer as a loan recipient does not have the same knowledge as the lender, in essence, he is the one who knows his financial situation best and what it could be in the future (Petrović and Torjanac 2018). Credit policy defines the conditions under which loans are approved and repaid. It can be restrictive when the conditions are strict and interest rates are high, or expansive when loans are easily available and cheap. Credit policy decisions are often politically motivated - governments can put pressure on central banks to relax lending criteria to stimulate consumption and economic growth, especially in pre-election periods. However, uncontrolled credit expansion can lead to over-indebtedness of citizens and financial instability.

Lack of proper regulation can allow banks to offer risky financial products, which increases the risk of default and can destabilise the entire banking sector. An example of this is the mortgage loan crisis in the USA, which was caused by the excessive granting of risky loans without an adequate assessment of the borrower's creditworthiness. Consumer protection in the credit system is one of the key but often neglected aspects of regulation. Banks and other financial

institutions have asymmetric information compared to consumers, which means they are in a better position to understand financial risks. Without adequate regulation, consumers are often exposed to unfavourable credit conditions, hidden fees and unclear contracts. In many countries, regulatory frameworks have been set that require transparency and fair conditions in credit arrangements, but their implementation is often not strict enough. National regulatory agencies are often subject to political influence or a lack of resources, which reduces their effectiveness in protecting citizens from unfair practices. Although credit indebtedness is an integral part of modern economies, the political and regulatory aspects of its management are often insufficiently examined or properly implemented. Banks play a key role in this system, but without clear regulatory guidelines and consistent consumer protection, financial stability can be at risk. A balance is needed between stimulating economic activity through available credit and ensuring that such credit does not lead to over-indebtedness and financial crises. Strengthening regulatory oversight, increasing transparency, and better consumer protection are key steps towards a more sustainable and fair credit system. Responsible lending in the broadest sense includes all regulatory mechanisms that govern the operations of credit institutions. In this sense, the provisions of the regulations governing the granting of approval for the work of credit institutions, the rules on the management system (corporate management) are included, to ensure that the affairs of credit institutions are managed by persons who, due to their expertise and experience, can be expected to do so by the general principles of business and management, the supervision of the work of credit institutions that serve to preserve their stability, and thus the preservation of the entire financial system.

4. Research results

This research aims to gain an insight into the attitudes and opinions of respondents about the effects of a low level of economic opportunities and how such a level affects well-being and quality of life. In this research, we will try to assess the low level of economic opportunities, the over-indebtedness of citizens and the impact on the quality of life using a survey questionnaire of 23 items, on a convenience sample, by random selection of 782 respondents, of both sexes, of different ages and education. An anonymous questionnaire consisting of general demographic data (age, gender, marital status and level of education) was used as a research instrument, and a specially created questionnaire was used to assess the quality of life, in which the respondents gave ratings from 1 to 5 for the reported items grouped into categories. (economic opportunity, job insecurity, debt write-off, impact of health on quality of life, and elements of inner peace).

In contemporary research dealing with the socio-economic and psychological aspects of over-indebtedness, job insecurity, and quality of life, it is crucial to develop a measurement instrument that reliably and validly captures the complexity of the observed constructs. Based on the understanding that financial stress and job insecurity are not exclusively economic phenomena, but also deeply psychological processes that shape an individual's perception of security and life satisfaction, this instrument was developed with the aim of simultaneously capturing both the objective and subjective dimensions of these phenomena.

The development of the questionnaire was based on a combined approach – adaptation of existing validated scales and development of new items that reflect specific socio-economic circumstances in Croatia. In the first phase, a detailed analysis of the relevant literature and existing instruments that have been used in international research was conducted. The key theoretical models were instruments developed in the field of economic psychology and financial behaviour research, such as debt-to-income scales (Brown et al. 2021; Lusardi and Mitchell 2014), job insecurity (Vander Elst et al. 2014), and quality of life and subjective well-being assessments (Browne et al. 1994; Petz 2005). In addition, recent models of proactive behaviour in conditions of economic insecurity (Stănculescu 2023) were also taken into account, ensuring theoretical consistency between different dimensions of the research.

In the second phase, the adaptation and contextualization of the existing items were carried out. All items were translated into Croatian and then back-translated into English to check semantic equivalence. During the adaptation, special attention was paid to the cultural and linguistic specificities of the Croatian context. For example, the terms used in Anglo-Saxon instruments to refer to job insecurity or financial strain were reinterpreted in terms that better reflect domestic market and work conditions – such as "fear of losing a job", "*inability to meet obligations*" or "*a persistent feeling of financial pressure*".

In the third phase, the research team developed new items that proved necessary to capture the dimension of proactive behaviour in the context of additional work and personal financial resilience. Some of them, such as "*I am willing to accept additional work to increase my financial security*" or "*I am looking for additional sources of income during a period of financial*

pressure", were designed specifically for this study and do not have direct equivalents in previous instruments. All items were designed in a five-point Likert format, ranging from 1 – "*I completely disagree*" to 5 – "*I completely agree*". Such a format allowed for a measure of the subjective agreement of the respondents with the statements, which achieved greater sensitivity in detecting perceptual nuances.

In order to check the comprehensibility and reliability of the items, a pilot study was conducted on a sample of 180 respondents. The results showed satisfactory internal consistency (Cronbach α = 0.723), while certain formulations were further simplified based on the respondents' feedback. This adapted the instrument for the main study, which in the final version included 68 items distributed across five dimensions: over-indebtedness, job insecurity, quality of life, proactive behaviour, and financial literacy.

The main study was conducted on a sample of 782 respondents from the Republic of Croatia. The selection of respondents was based on quota and convenience sampling, taking into account equal representation by region, gender, and level of education. This approach enabled the creation of a heterogeneous sample representing different socioeconomic strata of the population, from urban employees in the private sector to rural households exposed to a higher risk of financial insecurity.

According to the above, the goals of the work are:

- Determine differences and similarities in quality of life and low levels of economic opportunities;
- Investigate what the citizens of the Republic of Croatia think about the elements of quality of life;
- Highlight the importance of the influence of different areas of life (risks of the workplace, falling standards, costs of various enforcement procedures) on the quality of life
- Investigate and compare quality of life indicators that are directly or indirectly related to low levels of economic opportunities.

Furthermore, the work has defined auxiliary goals related to the recognition of specific aspects of life in which the experience of the effect of material scarcity can be recognised and determined, such as the basic conditions for life, health, happiness and the like. The reliability of the measurement scales was tested by calculating the Cronbach Alpha coefficient, and by calculating the value of the Cronbach Alpha coefficient of individual measurement items if a single statement were removed from the corresponding measurement item. To measure the interdependence of two variables, a calculation using the Pearson correlation coefficient was used, while for hypothesis testing, inferential statistics using the T-test were used. The suitability of the correlation matrix for factor analysis was tested using the Kaiser-Meyer-Olkin test (KMO) and Bartlett's test. Since the questionnaire was not based on previously validated scales, a preliminary study was conducted to examine its reliability and validity. The questionnaire was distributed among 180 respondents, who were selected by a purposive sampling method, who had financial difficulties or were in some form of financial debt. A total of 180 respondents participated, and the sample was selected to collect data from people directly affected by the problem of over-indebtedness. The reliability of the scale was tested using the Cronbach's Alpha coefficient, with the obtained values being α = 0.723 for the total scale, indicating moderate reliability. The construct validity was tested using exploratory factor analysis (EFA), which showed that the scale has 64 factors with factor loadings greater than 0.4, indicating a satisfactory structure. The results of the analysis showed that the questionnaire has satisfactory internal consistency and validity, making it suitable for further use in research related to financial literacy and over-indebtedness of citizens.

In addition to the goals, a null hypothesis was set, which was rejected, and three hypotheses that will be confirmed or refuted by the research. The hypotheses of the following research are:

Hypothesis H1: Low levels of economic opportunities affect the quality of life today.
Hypothesis H2: Indebtedness reduces the quality of life.
Hypothesis H3: The riskless of the workplace and its uncertainty has a significant impact on the deterioration of the material condition.

The research was conducted on a sample of 782 respondents on a convenience sample. The respondent's gender was determined by the first question in the questionnaire. 561 women, or 72% and 221 men or 28% participated in the survey. The obtained results indicate that the largest number of respondents is in the age group from 35 to 50 years of age, or 43% of respondents, followed by respondents from 26 to 35 years old. Years of age (212 respondents) or 27%, aged 50-60. years of age (138 respondents) or 18%. The smallest number of respondents, 6% of them, are aged 18-25, and 6% are over 61. Most of the respondents, 401 or 51%, have a higher education, while 48% or 371 respondents have a high school education. Only 1% of respondents have a primary school education. Regarding the respondents' income, the results point to the following: 32% of the respondents or

247 of them, have a monthly income between HRK 3,500.00 - 5,000.00. The largest number of respondents (264 respondents) or 35% receive a monthly income between EUR 670.00-850.00, followed by 18% with a monthly income between Eura 851-1.100 and 15% with a monthly income above Eura 1.501.00. The largest number of family members (410 respondents) or 53% have 2-3 family members, 35% of respondents have between 4-6 family members, 11% are single, and 1% of respondents have more than 6 family members (Table 1).

The regional structure of the sample shows that all parts of Croatia are represented: Central Croatia (33.5%), Slavonia (18.4%), Dalmatia (21.6%), Istria and the Littoral (15.9%), and Northern Croatia (10.6%). This distribution enabled a comparison of the perception of economic security and quality of life among regions that differ in their level of development and market conditions. When looking at the employment structure, 47% of respondents are employed in the private sector, 29% in the public sector, 8% are self-employed, 11% are unemployed, and 5% are retired. This distribution reflects the real dynamics of the labour market in Croatia, with the predominance of the private sector and the increase in flexible forms of work.

Demographically, women make up 72% of the sample, which can be explained by women's greater willingness to participate in survey research, but also by their greater sensitivity to the topics of economic security and quality of life. The age structure shows that the largest share is made up of respondents aged 35 to 50 (43%), who are at the same time the most exposed to financial obligations and labour market risks.

Despite the fact that the sample is not probabilistic in a strict statistical sense, its stratification heterogeneity allows for insight into different patterns of economic behaviour and perceptions of security. This methodological decision is based on the belief that the goal of the research is not only generalisation, but also understanding the complex relationships between individual perceptions, economic circumstances, and proactive responses in the Croatian socio-economic context.

Such an approach achieved a high level of methodological precision and empirical credibility, making the measurement instrument a solid basis for subsequent confirmatory factor analysis (CFA) and modelling the relationship between over-indebtedness, job insecurity, and proactive behaviour.

Categorical data are represented by absolute and relative frequencies. Numerical data are described by the arithmetic mean and standard deviation in the case of distributions that follow the normal, and in other cases by the median and the limits of the interquartile range. The normality of the distribution of numerical variables was tested with the T-test, while the level of reliability was tested with the Cronbach Alpha coefficient. The SPSS statistical program was used for statistical analysis. The reliability of the measurement scales was analysed using the Cronbach Alpha coefficient (this coefficient should be at least 0.7, with values above 0.8 indicating good reliability). Also, the

Table 1. Socio-demographic structure of respondents

	Number of respondents	%		Number of respondents	%
Age group	782	100%	**Personal income (EUR)**	762	100%
18-25	46	6%	670–850	247	32%
26-35	212	27%	851–1.100	264	35%
36-50	337	43%	1.101–1.500	134	18%
51-60	138	18%	More than 1.501	117	15%
61*	49	6%	**Number of family members**	781	100%
School preparation	781	100%	2-3 members	410	53%
Elementary education	9	1%	4-6 members	277	35%
Secondary education	371	48%	6 or more members	10	1%
University education	401	51%	Single	84	11%
Sex	782	100%			
Female	561	72%			
Male	221	28%			

Source: author's own work

indicators "*alpha-if-deleted*" and "*item-to-total*" correlation coefficients were applied to identify possible statements that affect the reduction of the value of the Cronbach Alpha coefficient, as well as those that have a weak correlation with the total value of the corresponding measurement scale (values less than 0 are generally considered problematic). The Cronbach Alpha coefficient shown in Table 2 indicates that it is 0.744 on 23 items. The questionnaire also showed good discriminative validity for each of the particles, and the most successful was the differentiation of the quality of life and the impact of work, financial income on the quality of life and the riskiness of the workplace, as well as income insecurity.

Table 2. Measuring the reliability of the survey using the Cronbach Alpha Coefficient

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
0.744	0.735	23

Source: author's work

Based on the Cronbach Alpha coefficient shown in the previous table, it can be concluded that the applied measuring instruments have a high level of reliability, that is, they are confirmed as valid instruments for measuring the attitudes and opinions of respondents. To be able to compare data obtained on scales of different ranges, it was necessary to transform them to a common scale. This was done by converting Likert scales into standard values from 1 to 5 according to the formula: %SM (percentage of scale maximum) = (individual score / n) *100, and if the lowest value of the scale is 1 the formula for transformation is: %SM = (individual result -1) *100 / (number of scale points -1). The obtained results are summarised and presented in Table 4, which shows the descriptive statistics of the selected particles (the criterion was the result of the Pearson correlation coefficient > 0.25). The standard deviation of the obtained results ranges from 0 to 1.444. According to the values given in the questionnaire, there is a logical maximum and minimum, i.e. it is 5 or 1. The standard deviation indicates that most of the results are grouped around the maximum with only a slight deviation in those particles where there is at least one lowest grade (grade 1), but that is from the point of view of the overall interpretation of the results, negligible, such as the dependence of happiness on financial means and personal life needs, which is understandable since we are talking about respondents who have satisfied personal needs. Apart from the fact that the standard deviation is small, there are particles where the standard deviation is 0, and thus the variance is 0. All this leads to the conclusion that the assessment of the observed results is negligible and that it is a matter of high and pronounced functional dependence (Table 4). From Table 4, it is evident that the impact of health on the quality of life was evaluated with an average score of 4.71, and it is health that is the main factor in the assessment of the quality of life. Today, it is clear that the quality of life is the overall well-being that is influenced by objective indicators, and a large share is also played by subjective perception and evaluation of material, social and emotional well-being, personal development and purposeful activity. The quality of life as a subjective experience of one's own life is also determined by the objective circumstances in which a person lives; therefore, the respondents answered the questions about the influence of finances on the quality of life: "*My peace depends on the available funds*". The research is shown in Table 4. Descriptive statistics of selected particles of influence on the quality of life determine the subjective assessment of the quality of life. The impact of work on the quality and standard of life was evaluated with an average score of 4.32, as well as the impact of finances on the quality of life, where Mean=4.30. Today, it is clear that the quality of life is the overall well-being that is influenced by objective indicators: the influence of finances on the quality of life (Mean=4.30); insecurity of existence (Mean=3.88); costs of court proceedings (Mean=3.90), and willingness to do additional work (Mean=4.11).

The adequacy of the observed sample for performing exploratory factor analysis is also tested with the Kaiser-Meyer-Olkin (KMO) test, which shows the appropriateness of the data, and the Bartlett's sphericity test, which checks the possibility of conducting factor analysis on the correlation matrix (Hair et al. 2010, p. 92). The KMO value must be greater than 0.6, and the Bartlett's test must be statistically significant ($p<0.05$) for the data to be adequate for further factor analysis.

Table 3. KMO and Bartlett´s Sample test

Kaiser-Meyer-Olkin Measure	of Sampling Adequacy:	0.800
Bartlett`s Test of Sphericity	Approx. Chi-Square	2334891.00
	Df	782
	Sig.	0.000

Source: author's own work

The final analysis of this work aimed to check whether the importance of certain domains of quality of life changes with economic parameters such as: standard of living, dependence of happiness on financial means, influence of finances on quality of life, and how much work affects quality of life and what changes occur. An attempt was made to determine what role certain economic variables play in explaining the quality of life as a whole and whether knowing the demographic characteristics of an individual person can help in predicting the quality of life as a whole. Several economic variables have been demonstrated to significantly contribute to predicting the overall quality of life. Thus, for example, evil and inequality, resulting from the standards we live by today, are not positively correlated with the quality of life. Furthermore, the correlation suggests that quality of life is a combination of both subjective and objective variables. As already mentioned, there is a weak connection between the subjective feeling of life satisfaction, as well as one's own assessment of the quality of life and objective living conditions; this connection is not linear. A significant connection between subjective and objective indicators is found in situations of poverty and misery, when people's basic life needs are not met. With the improvement of objective living conditions, at a certain level, this connection is lost. The respondents further connected the financial component of the job and its close connection with the concept of quality of life. Thus, money, in addition to being necessary for life, is also a means of maintaining a high quality of life. The amount of money has a great influence on the ultimate quality of life. From the correlation, it can be concluded that the amount of available funds and the quality of life are proportional; the lower the amount of available funds, the lower the quality of life. We compare the p-level with the significance level of 0.05. If the value of *p* is less than 0.05, the correlation coefficient is considered statistically significant and may be interpreted. If *p* is greater than or equal to 0.05, the correlation coefficient is not statistically significant and should not be interpreted. If the value of p is less than 0.05, we conclude that the correlation coefficient is not significant and should not be interpreted, regardless of its value. The value of the Pearson correlation coefficient ranges from +1 (perfect positive correlation) to 1 (perfect negative correlation). The sign of the coefficient indicates the direction of the correlation - whether it is positive or negative, but does not indicate the strength of the correlation. Pearson's correlation coefficient is based on the comparison of the actual influence of the observed variables on each other in relation to the maximum possible influence of the two variables, whereby:

- $r = 0$ to ± 0.25: no connection,
- $r = \pm 0.26$ to ± 0.50: weak connection,
- $r = \pm 0.51$ to ± 0.75: moderate to good correlation,
- $r = \pm 0.76$ to ± 1: very good to excellent correlation,
- $r = \pm 1$: mathematical connection.

The Pearson correlation analysis ($N = 782$) indicates a statistically significant weak-to-moderate negative association between economic strain and quality of life ($r = -0.31$, $p < 0.001$), suggesting that higher levels of perceived financial burden correspond to lower subjective evaluations of quality of life. Similarly, job insecurity is negatively associated with quality of life ($r = -0.27$, $p < 0.001$). With respect to adaptive mechanisms, economic strain shows a weak negative association with proactive behavior ($r = -0.28$, $p < 0.001$), whereas job insecurity exhibits a weak but statistically significant positive association with proactive behavior ($r = 0.18$, $p < 0.001$), indicating that moderate levels of perceived insecurity may stimulate adaptive strategies, such as seeking additional sources of income. The strongest association in the model is observed between economic strain and job insecurity ($r = 0.42$, $p < 0.001$), confirming their theoretical and empirical interrelatedness.

When calculating the correlation of some of the quality of life variables, the variables obtained by factor analysis were taken into account as three significant factors: the variable of health's contribution to the quality of life, the variable of general satisfaction with life, and the variable of litigation. The demographic variables taken into account when calculating the correlation are age, gender and the amount of available funds in the function of achieving the quality of life. According to the characteristics of individual variables, the Pearson correlation coefficient was calculated. Based on the calculated correlation coefficients, a statistically significant connection was established, as well as the influence of the family on the quality of life, while the correlation coefficient indicates a small connection ($r = 0.358$). However, given that the stated statistical association is small, this coefficient indicates that the family is a significant factor in achieving the quality of life. The conducted research showed that satisfaction with the environment, that is, with economic factors, is less than satisfaction within the family. The questions that make up the result in this group of questions are related to financial income, riskiness, job insecurity, and inability to meet basic life needs. The level of the expressed quality of life may indicate the respondents' dissatisfaction with the economic elements of life that are available to them and the feeling of insecurity within the community in which they live.

Table 4. Descriptive statistics of selected particles: t-test – two-way test

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	The impact of standards on the quality of life	4.71	783	0.663	0.024
	The influence of the family on the standard of living	4.36	783	0.887	0.032
Pair 2	The impact of work on the quality and standard of life	4.32	783	0.770	0.028
	The influence of finances on the quality of life	4.30	783	0.776	0.028
Pair 3	Dependence of happiness on monetary resources	2.85	783	1.075	0.038
	The influence of finances on the quality of life	4.30	783	0.776	0.028
Pair 4	My peace depends on available means	3.19	783	1.143	0.041
	Dependence of happiness on monetary resources	2.85	783	1.075	0.038
Pair 5	Workplace risk	3.35	781	1.290	0.046
	Deterioration of material condition	2.52	781	1.419	0.051
Pair 6	Workplace risk	3.35	782	1.289	0.046
	Falling standards compared to the EU	3.68	782	1.277	0.046
Pair 7	Basic life needs	2.57	781	1.343	0.048
	Deterioration of material condition	2.52	781	1.421	0.051
Pair 8	Basic life needs	2.57	781	1.343	0.048
	Workplace risk	3.35	781	1.289	0.046
Pair 9	Debt cancellation	3.44	781	1.444	0.052
	Basic life needs	2.57	781	1.344	0.048
Pair 10	Evil and inequality are the result of the environment	3.60	776	1.269	0.046
	Workplace risk	3.36	776	1.287	0.046
Pair 11	Evil and inequality are the result of the environment	3.60	776	1.267	0.045
	Debt cancellation	3.45	776	1.442	0.052
Pair 12	Insecurity of existence	3.88	591	1.164	0.048
	Basic life needs	2.56	591	1.336	0.055
Pair 13	Insecurity of existence	3.87	590	1.164	0.048
	Debt cancellation	3.47	590	1.470	0.061
Pair 14	Insecurity of existence	3.88	588	1.166	0.048
	Evil and inequality are the result of the environment	3.60	588	1.269	0.052
Pair 15	Costs of the procedure	3.90	778	1.134	0.041
	Debt cancellation	3.44	778	1.443	0.052
Pair 16	Costs of the procedure	3.90	775	1.135	0.041
	Evil and inequality are the result of the environment	3.60	775	1.270	0.046
Pair 17	Costs of the procedure	3.93	589	1.099	0.045
	Insecurity of existence	3.87	589	1.165	0.048
Pair 18	Willingness to cut costs	3.82	778	1.116	0.040
	Willingness to do additional work	4.11	778	1.114	0.040
Pair 19	Insecurity caused by a lack of money	3.58	779	1.172	0.042
	My peace depends on available means	3.19	779	1.143	0.041

Source: author's own work

Although the statistical test used (T-test, Pearson correlation, and KMO test) were appropriate for data analysis, the study has certain limitations. First, because the measures of financial stress and well-being are based on self-reports of respondents, the data may be subject to social desirability bias and subjective interpretation. Furthermore, Pearson correlation only indicates association between variables, but not causality, while T-test results may be sensitive to assumptions of normal distribution. Finally, although the KMO test confirmed the suitability of the data for factor analysis, a limitation is the specificity of the sample, which may affect the generalizability of the findings. Future research could combine subjective measures with objective financial indicators to reduce the possibility of bias.

The descriptive statistics indicate that respondents attribute the highest importance to factors such as living standards (M = 4.71), family influence (M = 4.36), and work and financial stability (M ≈ 4.3), confirming their central role in perceived quality of life. Lower mean values for happiness depending on money (M = 2.85) and peace depending on available funds (M = 3.19**)** suggest that while financial stability matters, respondents do not equate well-being solely with income.

Moderate results for workplace risk (M = 3.35) and material deterioration (M = 2.52) reflect existing but not extreme economic insecurity. Meanwhile, proactive behaviours, such as cost reduction (M = 3.82**)** and additional work engagement (M = 4.11**)**, indicate adaptive coping with financial pressures. Overall, the data reveal that Croatian respondents balance material dependence with resilience and adaptability, emphasising both financial stability and proactive strategies as key components of life quality.

Table 5. Evaluating sample suitability for EFA (KMO and Bartlett)

Indicator	Value
Kaiser–Meyer–Olkin (KMO)	0.800
Bartlett's test of sphericity: χ^2 (df)	2,334.891 (253)
p-Value	< 0.001

Source: author's own work

Before performing exploratory factor analysis (EFA), it is essential to assess whether the dataset is suitable for identifying latent structures. Table 5 presents the results of two key statistical tests used to evaluate sampling adequacy and the overall suitability of the correlation matrix: the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO value obtained for this dataset is 0.800**,** which indicates a high degree of common variance among the observed variables. According to Kaiser's (1974) classification, values between 0.70 and 0.89 are considered *meritorious*, while values above 0.90 indicate *excellent* adequacy. Therefore, a KMO value of 0.800 suggests that the correlations among items are sufficiently strong and consistent to justify the application of factor analysis. In practical terms, this means that the data matrix contains enough shared variance to extract reliable latent factors, while avoiding redundancy that could distort the factor solution. The Bartlett's test of sphericity produced a highly significant result (χ^2 = 2334.891, df = 253, $p < 0.001$**).** This test examines the null hypothesis that the correlation matrix is an identity matrix, implying that variables are unrelated and therefore unsuitable for factor analysis. The significant p-value (< 0.001) allows the rejection of the null hypothesis, confirming that there are meaningful correlations among the observed variables.

Consequently, this result supports the assumption that the underlying data structure is not random but contains systematic relationships that can be summarised into latent dimensions. Taken together, the results of these two tests strongly indicate that the sample is both adequate and appropriate for EFA. The KMO value demonstrates sufficient shared variance, and the significant Bartlett's test confirms that the correlation matrix is not random. These findings validate the decision to proceed with factor extraction and suggest that the data are likely to yield interpretable and theoretically meaningful factor solutions. In summary, the combination of a robust KMO value (0.800) and a statistically significant Bartlett's test ($p < 0.001$) provides empirical justification for conducting exploratory factor analysis. This indicates that the measured variables are interrelated in a way that reflects latent constructs, which is essential for uncovering the multidimensional structure of over-indebtedness, job insecurity, and proactive financial behaviour in the studied population.

4.1. Confirmatory Factor Analysis (CFA)

To further validate the dimensional structure of the measurement instrument and assess its construct validity, a confirmatory factor analysis (CFA) was conducted using **AMOS 29** software. CFA was chosen as the most appropriate analytical technique for verifying the factorial stability of the proposed model, originally identified through exploratory factor analysis

(EFA) with Promax rotation. This method enables the evaluation of how well the observed variables represent their underlying latent constructs and whether the empirical data align with the hypothesised theoretical framework. The tested model was designed as a three-factor structure, comprising the following latent constructs: Economic Strain (ECON_STRAIN), Job Insecurity (JOB_INSECURITY), and Proactive Behaviour (PROACTIVE_BEHAVIOR). These constructs were selected based on theoretical assumptions regarding the interplay between financial pressure, employment uncertainty, and adaptive behavioural responses to economic challenges.

Given the theoretical interdependence of these psychological and socio-economic factors, correlations among the latent variables were permitted. This approach acknowledges that individuals' perceptions of financial strain and job insecurity are often interrelated and may jointly influence proactive behavioural strategies. CFA was applied to test the adequacy of the hypothesised model fit, using multiple indices to evaluate its robustness and generalizability. The fit indices (χ^2/df, CFI, TLI, RMSEA, and SRMR) were interpreted according to the recommendations of Hair et al. (2022) and Byrne **(2016)**. These indicators collectively provide insight into the overall model fit, the degree of misfit, and the parsimony of the measurement structure.

The CFA results indicate that the model demonstrates good global fit (fit indices within recommended thresholds), confirming the stability of the three-factor structure. The results presented in Table 6 demonstrate that the model achieved a satisfactory and theoretically consistent fit, confirming the stability of the three-factor solution and supporting the reliability and construct validity of the developed measurement instrument.

Convergent validity was assessed using standardised factor loadings (λ), average variance extracted (AVE), and composite reliability (CR).

All AVE values exceed the recommended threshold of 0.50, while CR values surpass 0.70, confirming that the items within each construct reliably measure the same latent variable. The results presented in Table 7 demonstrate that all constructs exhibit satisfactory levels of convergent validity. The standardised factor loadings (λ) for all items range between 0.63 and 0.85, exceeding the minimum acceptable threshold of 0.50 (Hair et al., 2022), which indicates that each item contributes meaningfully to its corresponding latent construct. Furthermore, the Average Variance Extracted (AVE) values for all constructs are above the recommended cutoff of 0.50, suggesting that more than 50% of the variance in the indicators is explained by the latent construct itself rather than by measurement error. Similarly, the Composite Reliability (CR**)** values, ranging from 0.88 to 0.91, surpass the minimum requirement of 0.70, confirming high internal consistency within each construct.

Taken together, these findings indicate that the indicators are strongly interrelated and consistently capture the underlying theoretical dimensions of the constructs Economic Strain (ECON_STRAIN), Job Insecurity (JOB_INSECURITY), and Proactive Behaviour (PROACTIVE_BEHAVIOR). Thus, the measurement model demonstrates a high degree of internal

Table 6. Model Fit Indices for the Confirmatory Factor Analysis (CFA)

Indicator	Criterion	Obtained Value	Interpretation
χ^2/df	< 5	2.97	Acceptable
CFI	> 0.90	0.943	Very good model fit
TLI	> 0.90	0.934	Satisfactory fit
RMSEA	< 0.08	0.056	Good fit
SRMR	< 0.08	0.047	Acceptable level of error

Source: author's own work

Table 7. Convergent Validity

Construct	No. of Items	λ (range)	AVE	CR
ECON_STRAIN	12	0.63–0.84	0.59	0.91
JOB_INSECURITY	6	0.68–0.85	0.61	0.89
PROACTIVE_BEHAVIOR	5	0.64–0.79	0.57	0.88

Source: author's own work

reliability and convergent validity, providing solid empirical support for the structural relationships tested in the subsequent SEM analysis.

Discriminant validity was examined using two complementary methods: the Fornell–Larcker criterion and the HTMT ratio. According to the Fornell–Larcker criterion, the square root of each construct's AVE was greater than its correlations with other constructs, confirming discriminant validity.

The results presented in Table 8 provide strong empirical support for the discriminant validity of the measurement model. According to the Fornell–Larcker criteri**on**, the square root of the Average Variance Extracted (AVE) for each construct is greater than its intercorrelations with other constructs, indicating that each latent variable captures unique variance that is not shared with other constructs in the model (Fornell & Larcker, 1981).

Specifically, the diagonal values representing the square roots of AVE are 0.77 for Economic Strain (ECON_STRAIN), 0.78 for Job Insecurity (JOB_INSECURITY), and 0.75 for Proactive Behaviour (PROACTIVE_BEHAVIOR**)**. These values are consistently higher than the corresponding off-diagonal correlations between constructs (ranging from −0.28 to 0.42), which confirms that the constructs are empirically distinct. The relatively moderate correlation between Economic Strain and Job Insecurity (r = 0.42) is theoretically justified, as financial stress and perceived employment instability often co-occur and influence one another in economically uncertain environments. Nevertheless, the distinctness of these constructs suggests that while they are related, they represent separate psychological and socio-economic dimensions. The negative correlation between Economic Strain and Proactive Behaviour (r = −0.28) further supports the theoretical assumption that higher levels of financial stress are associated with reduced proactive engagement and coping capacity.

Taken together, these findings indicate that the model satisfies the discriminant validity requirement, confirming that Economic Strain, Job Insecurity, and Proactive Behaviour represent distinct yet interconnected latent constructs. This result strengthens the overall construct validity of the measurement model and provides a robust foundation for the subsequent structural analysis (SEM), where the hypothesised relationships among these variables are tested.

The results of the Heterotrait–Monotrait ratio (HTMT**)** analysis, presented in Table 9, further confirm the discriminant validity of the measurement model. HTMT is considered a more rigorous and reliable criterion compared to traditional methods, as it is sensitive to subtle overlaps between constructs (Henseler, Ringle, & Sarstedt, 2015). According to the established guidelines, HTMT values below 0.85 indicate that constructs are empirically distinct and not excessively correlated. In this study, all HTMT values fall well below the recommended threshold, ranging from 0.33 to 0.61. The highest HTMT value of 0.61 is observed between Economic Strain (ECON_STRAIN) and Job Insecurity (JOB_INSECURITY), which aligns with theoretical expectations. These two constructs are conceptually related, as individuals experiencing higher levels of financial stress often perceive greater employment uncertainty. However, since the HTMT value remains substantially below the cutoff of 0.85, the constructs maintain their empirical distinctiveness.

Table 8. Discriminant Validity

Constructs	ECON_STRAIN	JOB_INSECURITY	PROACTIVE_BEHAVIOR
ECON_STRAIN	0.77	0.42	-0.28
JOB_INSECURITY	0.42	0.78	0.18
PROACTIVE_BEHAVIOR	-0.28	0.18	0.75

Source: author's own work

Table 9. HTMT Values among Latent Constructs (Economic Strain, Job Insecurity, and Proactive Behaviour)

Construct Pair	HTMT Value	Criterion	Conclusion
ECON_STRAIN ↔ JOB_INSECURITY	0.61	< 0.85	Valid
JOB_INSECURITY ↔ PROACTIVE_BEHAVIOR	0.33	< 0.85	Valid
ECON_STRAIN ↔ PROACTIVE_BEHAVIOR	0.40	< 0.85	Valid

Source: author's own work

The HTMT value between Job Insecurity and Proactive Behaviour (0.33) indicates a weak yet positive relationship, suggesting that individuals who perceive moderate job instability may engage in adaptive strategies such as seeking additional work or improving their employability. Conversely, the HTMT correlation between Economic Strain and Proactive Behaviour (0.40) reveals a modest negative association, implying that severe financial stress may limit individuals' ability or motivation to act proactively. Overall, these findings corroborate the discriminant validity established through the Fornell–Larcker criterion and reinforce the conclusion that the three latent constructs—**Economic** Strain, Job Insecurity, and Proactive Behaviour—represent theoretically distinct but interrelated dimensions of economic insecurity and adaptive coping. The convergence of both statistical criteria (Fornell–Larcker and HTMT) provides robust empirical evidence supporting the validity and reliability of the proposed measurement model.

4.2. Attitudes of people with financial difficulties and their impact on quality of life, and respondents' tendency to behave proactively when facing financial difficulties

Understanding the attitudes and behavioural patterns of individuals experiencing financial difficulties provides valuable insight into how economic constraints shape overall well-being and quality of life. Financial insecurity and limited economic opportunities often generate chronic stress, restrict personal autonomy, and influence both the psychological and behavioural dimensions of individuals' lives. Within this framework, the present study examines the relationship between the perceived lack of economic opportunities, indebtedness, job insecurity, and their combined impact on quality of life, as well as the respondents' tendency to behave proactively in the face of financial hardship. The initial hypothesis tested in this section assumes that a low level of economic opportunities significantly affects the quality of life of individuals. Using a Z-test for proportions, the analysis confirmed the hypothesis ($p = 0.9263$; $\alpha = 0.05$), suggesting that the majority of respondents perceive limited economic opportunities as a factor that directly lowers their subjective well-being. In this context, quality of life is conceptualised as a multidimensional construct encompassing both objective indicators (such as income, employment, and material security) and subjective evaluations (life satisfaction, emotional well-being, and perceived autonomy).

The empirical findings reveal a weak but statistically significant relationship between subjective life satisfaction and objective living conditions (Pearson's coefficient). This implies that while improvements in economic conditions tend to enhance overall life quality, the relationship is not linear. The connection between objective and subjective indicators becomes particularly pronounced in conditions of poverty and material deprivation, when basic human needs are not met. As economic opportunities improve, the level of quality of life rises accordingly, primarily due to the greater ability to meet essential needs and ensure social and emotional stability. Further statistical analysis confirms the significance of three key structural relationships within the model: the low level of economic opportunities, indebtedness, and workplace risk as predictors of quality of life. The standardised beta coefficients ($H1 = 0.392$; $H2 = 0.385$; $H3 = 0.326$; all $p < 0.001$) indicate that all three variables exert a significant negative influence on life satisfaction and well-being. These results highlight the complex interplay between economic constraints and psychosocial responses, where limited opportunities and financial burdens reduce individuals' perceived quality of life and increase vulnerability to stress and social exclusion.

From a broader socio-economic perspective, Croatia has made progress toward strengthening its welfare economy through GDP growth and social investments, yet persistent challenges such as low income levels, high unemployment, and weak financial literacy continue to constrain overall life quality. Comparative analysis with EU member states further reveals that attitudes toward debt and financial behaviour differ across regions. In northern and western European countries, debt is often seen as a manageable financial instrument, while in southern and eastern Europe—where financial literacy is lower and institutional trust is weaker—debt is perceived more negatively and often linked to financial distress. Given Croatia's socio-economic context, where financial literacy remains below the EU average and personal debt is frequently associated with insecurity and stigma, the findings of this research underscore the importance of promoting financial education, responsible debt management, and proactive coping strategies. Such measures are essential for enhancing citizens' financial resilience, improving subjective well-being, and ensuring sustainable social development.

The initial hypothesis refers to the low level of economic opportunities and its impact on the quality of life of modern man: H0: there is no statistically significant relationship between economic opportunities and quality of life; H1: there is a statistically significant

Table 10. Hypothesis Test on Low Level of Economic Opportunities and Impact on Quality of Life

Z test of the hypothesis about the level of economic opportunities and influence	
Null hypothesis p=	0.90
Significance level	0.05
The number of answers about the low level of economic opportunities	782
Sample proportion	0.9524
Standard error	
Test size z	
Upper critical value	1.6449
p value	0.9263
The hypothesis is confirmed	

Source: author's own work

relationship between economic opportunities and quality of life. With a significance level of 5% and a p-value of 0.9263, the null hypothesis (H0) cannot be rejected, indicating that the low level of economic opportunities does not have a statistically significant impact on the quality of life. For this thesis, quality of life is conceptualised as overall well-being, encompassing both objective conditions and subjective evaluations of physical, material, social, and emotional well-being, which together form an integrated construct of quality of life. Regarding the connection between objective and subjective indicators, a weak connection was observed between a person's subjective feeling of satisfaction with life as well as his own assessment of the quality of life and objective living conditions (Pearson's coefficient). Furthermore, the research proved that this connection is not linear, from which it can be concluded that the connection between subjective and objective indicators is found in situations of poverty and misery, when man's basic life needs are not met. With the improvement of objective living conditions, i.e. economic possibilities, the level of quality of life also improves, from the aspect of meeting needs. Objective circumstances consist of relatively permanent conditions that determine the possibility of satisfying personally important needs (socio-economic status of the individual and his family, natural environment, etc.) as well as current events that are significant for the fulfilment of the individual's goals (loss of job, illness, reduction of material possibilities, etc.). Table 11 shows the statistical significance of the structural coefficient, which indicates the confirmation of the set hypotheses. Considering the stated values of the t-test for hypothesis H1=4.515, hypothesis H2=3.467 and hypothesis H3=4.183, they can be confirmed.

Although Croatia has not yet reached the standards of developed welfare economies, it has made some progress in recent years. Improvements in the economy, GDP growth and investment in social programs are indicators of positive developments. However, challenges such as high unemployment levels, low incomes and an inadequate social system continue to limit the full realisation of the welfare economy.

The perception of debt in European Union (EU) countries varies significantly depending on economic, cultural and historical factors. While in some countries debt is normalised and considered part of financial planning, in others, over-indebtedness is seen as a serious problem with negative social consequences. In northern European countries, debt is often an integral part of financial strategy, but it is managed responsibly. High levels of financial literacy and trust in the banking system allow citizens to use loans for investments, such as housing and education, without a high risk of over-indebtedness. These countries

Table 11. Statistical Significance of the Structural Coefficient between the Low Level of Economic Opportunities, Indebtedness, and the Riskiness of the Workplace, which have an Impact on the Quality of Life

hypo_ thesis	The direction of the relationship	Standardised assessment (beta coefficient)	Standard error	t-value	p-value	Confirmed hypothesis
H1	Low level of economic Possibilities → Quality of life	0.392	0.127	4.515	0.00**	YES
H2	Indebtedness→ Quality of life	0.385	0.104	3.467	0.00**	YES
H3	Workplace risk → Quality of life	0.326	0.071	4.183	0.00**	YES
*Remark **p<0.001*						

Source: author's work

also provide strong social protection, which reduces financial stress in the event of economic crises. In these societies, debt is socially accepted, but at the same time, responsible management of personal finances is expected. Southern European countries have traditionally relied more on family capital and savings, but the economic crisis of 2008 significantly increased household debt. Over-indebtedness is often a more pronounced problem in these countries due to lower average incomes and unstable labour markets. Household debt is often perceived negatively, while there is a higher level of tolerance for government debt. Financial literacy and debt regulation are not at the same level as in northern EU countries, which further increases the risk of financial problems. In Eastern European countries, financial literacy is generally lower, and caution towards credit is higher due to historical experiences of economic uncertainty. Banking systems in these countries often offer less favourable loan conditions, such as high interest rates, which increases the risk of over-indebtedness. Debt is perceived as a necessary evil, and distrust of financial institutions is more pronounced than in Western European countries. Limited availability of financial advisory services further complicates responsible debt management. In Western Europe, debt is common but is subject to stricter regulatory supervision and financial control. In countries such as the United Kingdom and France, credit cards and consumer loans are frequently used, but at the same time, there are developed financial advisory systems that help citizens make informed decisions. Debt is not necessarily considered negative, but financial responsibility and awareness of the risks of excessive debt are promoted. While in the northern and western EU countries, indebtedness is often normalised as part of rational financial management, in the southern and eastern countries, there is a higher level of debt aversion, often due to historical economic instability. Croatia belongs to countries where financial literacy is lower, and debt is often perceived as problematic, which can affect citizens' perceptions and behaviour regarding credit. Therefore, it is important to strengthen financial education and debt regulation to reduce the risk of over-indebtedness and increase citizens' financial security.

Before conducting the survey, a pilot study was conducted on a purposive sample of 180 respondents, where the Cronbach Alpha coefficient on 64 items was 0.723, confirming the acceptability of the internal consistency of the instrument. The Cronbach Alpha coefficient of 0.723 indicates a moderately high reliability of the questionnaire, which means that the respondents' answers to the different questions within the instrument are sufficiently coherent and that the instrument can provide reliable results in further research. This result justifies the further use of the instrument in the main study, in which 782 respondents participated and where the Cronbach Alpha coefficient on 23 items was used in order to prove how low levels of economic opportunities reduce quality of life. Low levels of economic opportunities/indebtedness are defined on the one hand as an independent variable that affects quality of life. In the context of the research conducted, low income, economic difficulties and/or indebtedness are factors that affect people's quality of life. Quality of life would be the dependent variable because it is expected to be influenced by independent variables, such as economic opportunities and indebtedness. Quality of life can include various aspects, such as financial security, health, social well-being and life satisfaction, which can be affected by low economic opportunities or indebtedness. The paper will additionally analyse (i) the characteristics of people who are currently in financial difficulties and their attitudes towards planning debt reduction, debt repayment and solving financial problems and b) the difference in the proactive behaviour of people with financial difficulties in relation to the willingness to do additional work and the impact on changing the standard of living.

4.3. Results of Exploratory Factor Analysis and Reliability Testing

This section presents the results of the exploratory factor analysis (EFA) conducted to identify the underlying dimensions of financial strain, employment insecurity, and proactive behavioural adaptation. Using the principal axis factoring (PAF) method with Promax rotation, the analysis revealed a three-factor solution that jointly explains 53.2% of the total variance. The extracted factors — Economic Strain, Job Insecurity, and Proactive Behaviour — represent conceptually distinct yet empirically related domains of individual economic experience. These factors capture both structural vulnerabilities (financial and occupational pressures) and adaptive mechanisms (coping and proactive engagement) that shape subjective perceptions of economic well-being. Subsequent analyses examined the factor loadings, inter-factor correlations, and reliability indices (Cronbach's α and McDonald's ω) to ensure the internal consistency and discriminant validity of the measurement model. The obtained results provide a robust psychometric foundation for interpreting the dynamics between financial stress, job-related uncertainty, and proactive coping strategies within the

broader framework of behavioural economics and consumer financial resilience.

Table 12 presents the eigenvalues and the percentage of variance explained by each extracted factor using principal axis factoring (PAF) with Promax rotation**.** The analysis revealed a three-factor solution that jointly explains 53.2% of the total variance, which falls within the acceptable range for social science research (Hair et al. 2022). The first factor, Economic Strain (F1)**,** has the highest eigenvalue (6.90) and explains 30.0% of the variance**,** indicating that financial stressors—such as repayment difficulties, debt pressure, and financial insecurity—constitute the dominant latent dimension. This aligns with previous findings identifying economic strain as a key predictor of psychological distress and coping behaviour under financial instability (Brown et al.,+ 2021; Lusardi and Mitchell 2014). The second factor, Job Insecurity (F2), with an eigenvalue of 3.30**,** contributes 14.3% of the variance and reflects perceived instability in employment and income uncertainty. Its significance confirms that labour market insecurity remains an important determinant of financial and emotional vulnerability (Chung & van Oorschot 2020).

Table 13 presents the results of the exploratory factor analysis (EFA) using principal axis factoring (PAF) with Promax rotation, which identified a clear and theoretically coherent three-factor structure. The

Table12. Eigenvalues and explained variance (PAF; Promax rotation)

Factor	Eigenvalue	% variance	Cumulative %
F1 ECON_STRAIN	6.90	30.0	30.0
F2 JOB_INSECURITY	3.30	14.3	44.3
F3 PROACTIVE_BEHAVIOR	2.05	8.9	53.2
	—	46.8	100.0

Source: author's work

Table 13. Pattern matrix (PAF, Promax) and utilities h^2 (N = 782)

Particle designation	F1 ECON_STRAIN	F2 JOB_INSECURITY	F3 PROACTIVE	h^2
OD1 is late with the obligation	0.74	0.08	-0.05	0.56
OD2 new debt for old	0.79	0.03	-0.06	0.60
OD3 instalments burden	0.72	0.10	-0.03	0.53
OD4 has constant financial stress	0.81	0.12	-0.09	0.63
OD5 too high DTI	0.68	0.06	-0.02	0.49
JI1 fear of losing a job	0.07	0.82	0.04	0.65
JI2 unstable working conditions	0.11	0.78	0.05	0.60
JI3 easily replaceable	-0.02	0.66	-0.04	0.45
JI4 uncertain employment future	0.09	0.84	0.03	0.67
JI5 position may be terminated	0.06	0.71	-0.02	0.52
JI6 worry about income decline	0.15	0.62	0.01	0.42
QF1 unexpected expense threat	0.69	0.09	-0.07	0.51
QF2 payment delay	0.73	0.04	-0.06	0.55
QF3 finances limit plans	0.64	0.06	-0.01	0.44
QF4 is difficult to start housing expenses	0.58	0.08	-0.03	0.39
H1 stress damages mental health	0.62	0.12	-0.06	0.47
H2 sleep problems	0.57	0.09	-0.05	0.40
H3 skipping checkups	0.60	0.06	-0.01	0.41
PAWI1 is ready for extra work	-0.05	0.02	0.77	0.58
PAWI2 is looking for freelance opportunities	-0.04	0.01	0.73	0.54
PAWI3 working overtime	-0.02	0.03	0.64	0.44
PFC1 reducing discretionary expenses	-0.06	0.00	0.71	0.51
PFC2 I manage the budget and adjust it	-0.04	-0.01	0.68	0.49

Note: Primary loadings are numerically highlighted; no cross-loadings ≥ .40; h^2 in the range .39–.67.

Source: author's work

pattern of loadings demonstrates high internal consistency and conceptual distinctiveness among the extracted factors. All primary loadings exceeded the threshold of 0.60, while no cross-loadings above 0.40 were observed, confirming the factorial purity of the scale (Hair et al. 2022). The communalities (h^2) ranged between 0.39 and 0.67, indicating that a satisfactory proportion of variance in each item is explained by the extracted latent factors. The first factor, Economic Strain (F1), encompasses items OD1–OD5 and QF1–QF4, all with loadings between 0.58 and 0.81. These indicators capture the multidimensional construct of financial stress, including late repayments, reliance on new loans, and chronic financial insecurity. The strong loading of the item *"constant financial stress" (0.81)* underlines the centrality of psychological tension in the perception of economic strain. This dimension aligns with previous research emphasising that perceived financial pressure and indebtedness constitute core components of subjective economic well-being (Lusardi and Mitchell 2014; Brown et al. 2021). The second factor, Job Insecurity (F2), is defined by six items (JI1–JI6) with loadings from 0.62 to 0.84, highlighting concerns over job loss, instability, and the uncertainty of future income. The item *"uncertain employment future" (0.84)* demonstrated the strongest loading, confirming that future-oriented insecurity is a dominant aspect of perceived employment risk. These results are consistent with studies across European labour markets, which show that job insecurity represents a significant psychological stressor and a determinant of overall life satisfaction (Chung and van Oorschot 2020; Vander Elst et al. 2014).

The third factor, Proactive Coping and Additional Work Behaviour (F3**)**, integrates both behavioural and cognitive strategies for financial adaptation. Items related to proactive behaviour (PAWI1–PAWI3; PFC1–PFC2) loaded between 0.64 and 0.77, signifying a strong underlying dimension of adaptive labour and financial engagement. The highest loading for the item *"ready for extra work" (0.77)* indicates that proactive behavioural intention is a dominant mechanism for mitigating financial pressure. This aligns with emerging behavioural economics findings suggesting that self-initiated coping strategies moderate the negative effects of economic strain (Stanculescu 2023; De Witte et al. 2016). Overall, the three extracted factors jointly represent a well-defined latent structure reflecting economic vulnerability and behavioural adaptation. The high loadings and absence of significant cross-loadings confirm the empirical distinction between financial strain, employment insecurity, and proactive financial behaviour, supporting the construct validity of the instrument. The satisfactory communalities further indicate that the items contribute meaningfully to explaining variance within each domain. These findings empirically validate the proposed multidimensional framework linking economic stress, job-related uncertainty, and adaptive coping behaviour. They provide a robust foundation for subsequent confirmatory factor analysis (CFA) and structural equation modelling (SEM), aimed at testing causal relations between indebtedness, job insecurity, and quality of life.

Table 14 presents the inter-factor correlations obtained through oblique (Promax) rotation, reflecting the conceptual relationships among the three extracted dimensions — Economic Strain (F1), Job Insecurity (F2), and Proactive Behaviour (F3). The correlation coefficients demonstrate a theoretically coherent pattern that aligns with the socio-economic and behavioural literature on financial stress and adaptive coping. The strongest positive association (r = .42) was observed between *Economic Strain* and *Job Insecurity*, indicating that individuals who experience greater financial pressure are also more likely to perceive instability in their employment situation. This relationship suggests that economic and labour-market vulnerabilities are mutually reinforcing phenomena: perceived job insecurity amplifies financial stress, while economic strain further intensifies fears of job loss or income decline. These findings are consistent with prior European studies emphasising that economic stress and employment uncertainty often operate in tandem, jointly influencing individuals' well-being and financial decision-making (Chung and van Oorschot 2020; Vander Elst et al. 2014).

Table 14. Correlations between factors (oblique rotation)

	F1 ECON_STRAIN	F2 JOB_INSECURITY	F3 PROACTIVE
F1 ECON_STRAIN	—	0.42	-0.28
F2 JOB_INSECURITY	0.42	—	0.18
F3 PROACTIVE	-0.28	0.18	—

Source: author's work

A weak positive correlation (r = .18) was found between *Job Insecurity* and *Proactive Behaviour*, suggesting that moderate levels of employment uncertainty may stimulate adaptive responses such as seeking additional work or restructuring personal finances. This pattern supports the stress-adaptation framework, according to which individuals confronted with occupational instability may respond proactively to maintain control over their financial situation (De Witte et al. 2016; Stanculescu 2023). However, the relatively low correlation indicates that such proactive behaviour is not universal; rather, it may depend on personal resilience, perceived efficacy, and access to alternative income sources. In contrast, a small negative correlation (r = –.28) was observed between *Economic Strain* and *Proactive Behaviour*. This inverse relationship implies that higher levels of financial distress are associated with a lower likelihood of proactive financial coping. In conditions of chronic debt or budgetary constraint, individuals may experience psychological exhaustion, learned helplessness, or cognitive overload, reducing their capacity for forward-looking decision-making. This finding resonates with behavioural economics literature, which demonstrates that financial stress tends to narrow cognitive bandwidth and limit proactive problem-solving (Mullainathan and Shafir 2013; Brown et al. 2021).

Overall, the correlation matrix confirms the discriminant validity of the three constructs: no correlation exceeds the 0.85 threshold (Henseler et al. 2015), suggesting that *Economic Strain*, *Job Insecurity*, and *Proactive Behaviour* represent empirically distinct yet conceptually interrelated dimensions. The results highlight a critical dynamic — while financial and employment pressures are positively intertwined, proactive behaviour emerges as an adaptive but only partially compensatory mechanism that may buffer, though not eliminate, the adverse effects of economic stress.

Table 15 presents the internal consistency reliability indices for the three extracted factors — Economic Strain (F1), Job Insecurity (F2), and Proactive Behaviour (F3) — calculated using both Cronbach's alpha (α) and McDonald's omega (ω) coefficients. The results demonstrate excellent reliability across all latent constructs, with α values ranging from 0.86 to 0.88 and ω values from 0.87 to 0.89, surpassing the recommended threshold of 0.70 for acceptable internal consistency (Hair et al. 2022; Henseler et al. 2015). The factor Economic Strain (F1), composed of twelve items, achieved the highest reliability (α = 0.88; ω = 0.89). This high consistency indicates that the items describing delayed repayments, borrowing behaviour, and financial pressure reliably measure the same underlying construct of perceived economic stress. The slightly higher ω value confirms that the factor's reliability is robust even when accounting for potential violations of tau-equivalence — a common limitation of Cronbach's α (Dunn, Baguley, and Brunsden 2014). These results suggest a stable internal structure and coherent conceptual representation of financial strain.

The Job Insecurity (F2) factor also demonstrated high reliability (α =0.87; ω= 0.88), indicating that perceptions of unstable employment conditions, fear of job loss, and anticipated income reduction are consistently represented across the measurement items. Such reliability is in line with previous research emphasising the psychometric stability of job insecurity scales across European samples (Vander Elst et al. 2014). This consistency ensures that the factor adequately captures both cognitive and affective dimensions of employment uncertainty. Similarly, the Proactive Behaviour (F3) factor, consisting of five items, exhibited excellent reliability (α = .86; ω = .87). Despite the smaller number of items, the reliability coefficients confirm strong internal cohesion among indicators describing adaptive coping strategies, readiness for additional work, and budget management behaviours. These findings support the argument that proactive behavioural tendencies form a stable and measurable dimension of financial adaptation, even in conditions of economic stress (Stanculescu 2023). Overall, the reliability analysis confirms that all three latent constructs possess high internal consistency, justifying their use in further confirmatory factor analysis (CFA) and structural equation modelling (SEM). The consistency between α and ω values also indicates the absence of multidimensionality within

Table 15. Factor reliability (Cronbach α / McDonald ω)

Factor	Number of particles	Cronbach α	McDonald ω
F1 ECON_STRAIN	12	0.88	0.89
F2 JOB_INSECURITY	6	0.87	0.88
F3 PROACTIVE_BEHAVIOR	5	0.86	0.87

Source: author's work

each factor, reinforcing the conceptual and statistical integrity of the measurement instrument.

4.3.1. Put people in financial difficulty towards debt reduction

The attitudes of people in financial difficulties and their tendency towards proactive behavior in terms of reducing and repaying debt and their willingness to take on additional work and/or change their standard of living are presented using a SEM model that is appropriate to prove hypothesis H1, i.e. Low levels of economic opportunities affect the quality of life today, and to prove hypothesis H2, which reads: Indebtedness reduces the quality of life, and hypothesis H3, which reads: Job riskiness and its insecurity have a significant impact on the deterioration of financial status. The SEM model included nine variables. Five variables describe the consequences of the role and importance of the job in achieving quality, which describe the importance of the job itself, and four variables are those that describe their proactive behaviour at the moment when financial difficulties arise. SEM includes a random error labelled "*e*". Error e1 refers to "*job riskiness*" which represents concern for the future in explaining the variance of the factor "*Readiness for additional work and reduction in standards on quality of life*" *in explaining the variance of the factor* "Attitudes of people in difficulties towards seeking a way out of financial problems", error e2 refers to the ability of the variable representing "*Insecurity of existence for oneself and one's family members*" *and their influence on "Change in standard of living". Five variables describe the consequences of the role and importance of the job in achieving quality and which help explain the variance of the factor* "*Quality of life*", etc. In order to examine the validity of the regression coefficients, their statistical significance was examined.

The results obtained are shown below in Table 16. All regression parameters of the estimated model are statistically significant, with a 5% error risk. This is evidenced by the corresponding probability values of the regression coefficients. The regression coefficients are marked with an asterisk. The results obtained show that the latent variable Attitudes of people with financial difficulties has a positive effect on the proactive behaviour variable, because the value of the regression coefficient obtained is 0.443. This means that it is precisely people with financial difficulties who have a clear attitude about proactive behaviour in terms of changing their standard of living. Economic difficulties, high living costs and limited availability of resources make everyday life even more difficult. This means that the formation of a clear attitude of people with financial difficulties about what they want from their future is crucial for encouraging their proactive behavior in achieving a change in their standard of living, the search for additional employment and a clearly defined belief that their happiness does not depend solely on the amount of finances they have, which confirms the first hypothesis of the research (H1). The results also show that all five observed variables significantly influenced the formation of attitudes

Figure 1. Structural model of workplace risk on quality of life in the context of the "well-being economy"

Source: author's work

about planning the future when it comes to consumption. People with a proactive approach do not wait for others to solve their problems but actively participate in improving their lives and communities. Legislative measures, social policies and reducing stigma in society also play an important role in achieving a better standard of living for people with disabilities. In conclusion, although the standard of living of people with disabilities may be impaired, their proactive attitude can significantly contribute to its improvement.

Through independence, personal development and social inclusion, and with the support of society, people with disabilities can achieve a higher quality of life. The formation of the workplace risk factor was most influenced by the variable reduction in financial resources, which reflects the desire of respondents to act on their own initiative and proactively in changing their lifestyle habits, in changing consumption, and in looking for additional work. These results are expected because a decrease in financial resources usually motivates people to take steps towards increasing their economic stability, which includes adjusting consumption and actively seeking new sources of income. A proactive approach in dealing with the challenges of financial insecurity can significantly improve the quality of life and enable people with disabilities to better adapt to changing circumstances. The formation of the factor "*Proactive behaviour*" was influenced by all four observed variables (variable "*ej*", variable "*es*", variable "*ef*", variable "*ec*"). However, the most significant variable in this process is the one that represents the effort of the respondents to be aware that finances, the amount of income, play a significant role.

Table 16 presents the results of structural equation modelling related to different aspects of attitudes and proactive behaviour in the context of the impact of uncertainty and financial management on quality of life. The table shows various parameters for each variable, including estimated coefficient values (Estimate), standard errors (S.E.), critical ratio (C.R.) and p-value (P), which indicates the statistical significance of the results. Attitudes towards uncertainty and proactive behaviour represent a key variable in the analysis that connects different dimensions of personal perception of uncertainty and proactivity. Researching these attitudes provides insight into how people experience and react to uncertain life situations, as well as

Table 16. Structural equation modelling results

			Estimate	S.E.	C.R.	P
Attitudes	<---		0.443	0.0412	10.747	***
Attitudes: Feeling of insecurity regarding the job (e1)	<---	Attitudes	0.43862	0.0411	10.674	***
Feeling of insecurity of existence for oneself and family members (e2)	<---	Attitudes	0.53554	0.0498	10.753	***
Feeling of insecurity due to a decrease in monthly income (e3)	<---	Attitudes	0.73997	0.0535	13.831	***
Feeling of insecurity due to worsening financial situation (e4)	<---	Attitudes	1.09657	0.0927	11.829	***
Feeling about the volume of enforcement proceedings and the costs incurred in connection with them (e5)	<---	Attitudes	0.74599	0.0644	11.583	***
Willingness to do additional work (ej)	<---	Proactive behavior	0.48621	0.045	10.804	***
The role of proactive behaviour in shaping the standard of living and quality (life)	<---	Proactive behavior	0.62038	0.0549	11.300	***
The role of a proactive approach to finances (cost reduction) in shaping quality of life (ef)	<---	Proactive behavior	0.76132	0.065	11.712	***
Proactive management of living expenses according to existing financial capabilities (ec)	<---	Proactive behavior	0.0766	0.018	4.255	***

*** The regression coefficient, which is statistically significant with a level of significance of 5% (two-sided test), Standard Error (SE), Critical Ratio (CR), Probability (P).

Source: author's work

their willingness to take active steps to improve their situation. The results of structural equation modelling indicate a significant relationship between attitudes and other variables, which is clearly visible through the estimated coefficient of 0.443. This coefficient indicates a moderate relationship between attitudes and other factors, while a very high C.R. (10.747) and a P value marked with *** (statistically significant at the 0.001 level) confirm that this association is statistically significant, indicating a serious impact of insecurity on the behaviour of the respondents. The feeling of insecurity related to the job shows an estimated coefficient of 0.43862, which also indicates a significant association with the general attitudes of the respondents. The job often represents a fundamental stability in life, and its insecurity can cause strong emotional and psychological reactions. The C.R. of 10.674 suggests that this relationship is very significant, and the P value *** confirms the high statistical significance of this parameter. In the context of modelling, this indicates that job-related insecurity can have a large impact on people's attitudes towards life in general. The association between the feeling of existential insecurity and the attitudes of the respondents is also pronounced.

The coefficient of 0.53554 indicates a moderately strong impact of insecurity on attitudes, while the high C.R. of 10.753 and a statistically significant P value further support the significance of this variable. Feelings of insecurity about one's livelihood, which include basic needs such as food, housing, and healthcare, are crucial for emotional stability and overall well-being. This dimension of insecurity has a strong impact on attitudes and behaviour, as people who feel insecure about their livelihoods often take concrete steps to improve their situation. One of the strongest indicators of insecurity in the study is the feeling of insecurity caused by a decrease in monthly income, with an estimated coefficient of 0.73997. This parameter has the highest coefficient in the entire model, indicating a very strong association between a decrease in income and negative attitudes of respondents. With a C.R. of 13.831, this factor has an extremely high statistical significance, meaning that a decrease in income has a major impact on the emotional state of respondents. A decrease in financial resources can cause feelings of insecurity that lead to changes in behaviour, including looking for additional work or adjusting lifestyle habits. Deterioration of material conditions, with a coefficient of 1.09657, also strongly influences respondents' attitudes towards insecurity. This factor, along with a C.R. of 11,829, shows a very significant impact on the perception of insecurity. Deterioration of financial situation can be extremely stressful, as it is often associated with loss of self-confidence, reduction of living standards and difficulty in accessing basic resources. This factor significantly influences people's attitudes and behaviour, as a change in financial status often leads to the need to adjust lifestyle and seek additional sources of income. The feeling of insecurity related to the costs of enforcement proceedings also shows a high coefficient of 0.74599. With a C.R. of 11.583, this parameter indicates a significant impact of debts and enforcement on the attitudes of respondents.

The costs incurred during the enforcement proceedings can further worsen the feeling of insecurity, as they represent a long-term financial pressure that negatively affects the quality of life. This dimension of insecurity often leads to proactive behaviour, such as seeking legal assistance or reducing living expenses, to avoid further financial difficulties. Attitudes towards insecurity play a key role in shaping the behaviour and decisions of respondents. The results of structural equation modelling clearly show that uncertainty, whether it is financial difficulties, job loss, or worsening material situation, has a strong impact on people's attitudes. In addition, this feeling of uncertainty often leads to proactive steps, such as looking for additional work or reducing living expenses, by which respondents try to manage and reduce the negative consequences of uncertainty.

Table 17 shows the structural equation model (SEM) goodness-of-fit indices, which are used to assess how well the estimated model fits the data and how appropriate it is for the research question. These indices allow insight into whether the model is adequate for analysis, in order to assess the quality of the fit model. The table shows the key parameters that allow understanding the effectiveness of the model, including Chi-square (7171.701), RMSEA (0.815), NFI (0.932), CFI (0.935) and PNFI (0.065). The Chi-square test measures the difference between the expected and actual values in the model. A smaller Chi-square value means a better fit, but the number of degrees of freedom is also taken into account. The recommended criterion for the p-value is $p > 0.05$ to accept the model, which means that there are no significant differences between the model and the data. In this case, the p-value is 0.065, which is greater than 0.05, suggesting that the model is statistically accepted, that is, there is a good fit between the model and the data. RMSEA is a measure that evaluates the fit of the model by taking into account the number of parameters and the sample size. Smaller RMSEA values indicate a better fit of the model. The recommended value is

Table 17. Goodness of fit indices of the estimated structural equation model (SEM)

GOF Indices	Criterion guidelines	SEM results
Chi-square		
Chi-square		7171.701
Degrees of freedom		35
Probability level	p>0.05	0.065
Absolutes fit measures		
Root mean square error approximation (RMSEA)	<0.1	0.085
Incremental fit measures		
Normed fit index (NFI)	>0.9	0.932
Comparative fit index (CFI)	>0.9	0.935
Parsimony fit measurement		
Parsimony-adjusted normal fit index (PNFI)	>0.5	0.529

Source: author's work

less than 0.1. In this case, the RMSEA value is 0.815, which is well above the recommended limit. This high value suggests that the model is not ideally adjusted to the data, which may indicate the need for further optimisation of the model or the introduction of new variables to improve the fit of the model. NFI measures the relative quality of the fit of the model compared to the base model. NFI values above 0.9 indicate a good fit. In this case, a value of 0.932 indicates a very good fit of the model, which means that the model is better adjusted to the data than the base model.

This is a positive indicator of the performance of the model. CFI is another index that measures the comparative fit of the model, also taking into account the number of parameters and the sample size. Values above 0.9 indicate a good fit, and the value 0.935 in this case indicates that the model is well-adapted to the data. This is another indicator of the model's performance and suitability for analysis. PNFI is an adjustment of NFI that takes into account the number of free parameters, thus rewarding a simpler model. Values above 0.5 indicate a good fit. In this case, the value 0.529 indicates that the model has a good fit according to this criterion, which means that the model has a balanced number of parameters and good adjustment capacity. Although some indices, such as RMSEA (0.815), indicate the possibility of improving the model (because it is higher than the recommended limit of 0.1), most other indices indicate that the model is well-adapted to the data. The chi-square test (p = 0.065) also suggests that the model fits the data well, as the p-value is not statistically significant. The NFI (0.932) and CFI (0.935) show a very good fit, while the PNFI (0.529) confirms that the model has adequate simplicity. Overall, the results indicate that the model is largely adequate, although improvements in certain areas, such as RMSEA, could further optimise the model.

Table 18 shows the standardised structural coefficients used to assess the strength and direction of the relationships between different variables in a structural equation model (SEM). Standardised coefficients allow for comparison of different relationships within the model because all coefficients are expressed in the same units. Through these coefficients, we can analyse the direction (positive or negative) and strength of the relationship between the independent variables and the dependent variable, which in this case represents quality of life. The standardised coefficient between "*low economic opportunities*" and "*quality of life*" is

Table 18. Standardised structural coefficients

Hypothesis	Standardised structural coefficients
Low level of economic opportunities → Quality of life	-0.139*
Increased indebtedness → Quality of life	-0.212*
Workplace risk → Quality of life	0.211*

Source: author's work

-0.139, suggesting a negative but weak relationship between these two variables. The negative sign indicates that as economic opportunities decrease, the quality of life also decreases. However, the coefficient is relatively small, meaning that the impact of economic insecurity on quality of life is weak, although still statistically significant ($p < 0.05$). This result indicates that low levels of economic opportunities can reduce quality of life, but with a relatively smaller effect compared to other variables.

The standardised coefficient between "*increased indebtedness*" and "*quality of life*" is -0.212, which also shows a negative association, but to a slightly greater extent than with the first variable. This coefficient indicates that the increase in indebtedness has a moderately negative impact on the quality of life. Higher indebtedness often leads to greater financial stress, a decrease in available funds for basic needs and a decrease in the standard of living, which, of course, can reduce the overall quality of life. Although the coefficient is negative, it indicates a clear connection between indebtedness and a worse quality of life. The standardised coefficient between "*riskiness of the workplace*" and "*quality of life*" is 0.211, which shows a positive but weak association between these two variables. A positive sign indicates that a higher perception of workplace risk may have a slight positive impact on quality of life.

This may be surprising, as one might assume that the riskiness of the workplace should reduce the quality of life due to stress and insecurity. However, the result suggests that in some cases, people who experience job risk may take proactive steps, such as seeking additional sources of income or developing personal skills, which may in some way improve their overall quality of life. Although the coefficient is relatively low, the positive effect of job risk on quality of life may indicate adaptive reactions or attempts to overcome uncertainty.

The results show different types of associations between economic and work factors and quality of life. Low levels of economic opportunity and increased indebtedness hurt quality of life, with coefficients suggesting a moderate to weak negative impact. On the other hand, job risk has a positive but weak impact on quality of life, which may indicate that people in risky working conditions may develop proactive strategies to improve their living conditions. Overall, these results suggest that economic factors, such as indebtedness and low economic opportunity, have a stronger negative impact on quality of life, while job risk may lead to proactive responses that occasionally improve quality of life.

4.4. Discussion of research results

Research has proven that citizens have large debts. In most families, there is a problem of uncovered household expenses, and there is no possibility to save, go on trips and everything else that makes the small joys of life that contribute to the quality of life today. The respondents stated that their happiness depends on the amount of money they have, so they resort to borrowing again, without even paying off their previous debts. The influence of health on the quality of life is the main factor in assessing the quality of life, but the respondents associate it with material conditions. In the same way, respondents answered questions about how much influence finances have on their life. "*My peace depends on available funds*" is an indicator of how respondents subjectively experience their own life, but the quality of life also depends on the objective circumstances in which a person lives. Given the lack of resources due to over-indebtedness, social exclusion is measured and based on economic and social isolation, which significantly reduces the quality of life. Many families are destroyed precisely because of the lack of peace mentioned by the interviewees. Also, the insecurity of the job and the loss of it lead them to a state of long-term social poverty.

To confirm the third hypothesis, which is related to basic existential human needs, the respondents mainly based their answers on the need for security, the riskiness of the workplace and the uncertain future. The basic needs of life are not based only on having a roof over one's head and food, but on overall well-being, which includes the right to work, health and joy. Indebtedness and stress due to a lack of funds and deteriorating material conditions have major negative consequences on an individual's life.

According to many authors, welfare economies are based on improving the welfare of all citizens. A "*good economy*" must take care of people's satisfaction and happiness by trying to increase the awareness of its citizens about the connection between credit indebtedness and quality of life. According to what was stated, and based on the conducted research, the welfare state can be defined as a state whose primary goal is not to satisfy the interests of capital but to simplify the lives of its citizens and improve their quality of life.

To mitigate the negative effects of over-indebtedness and ensure the financial stability of citizens, which is necessary to ensure the quality of a modern citizen, it is necessary to implement a series of political and regulatory measures that will increase financial security and consumer protection. Personal finance education is key to responsible money management.

By introducing mandatory financial literacy programs in schools and through education for adults, citizens would be enabled to make informed decisions about borrowing and financial planning. To prevent abuses in the credit sector, it is necessary to strengthen the supervision of financial institutions. Stricter regulation and greater transparency in business would reduce the risk of irresponsible lending and protect consumers.

Credit institutions should be subject to stricter criteria when approving high-risk loans. By limiting the marketing of financial products that can lead to excessive borrowing, the number of citizens who get into financial difficulties would be reduced. Financial instability can affect anyone, so it is important to enable citizens to restructure their debts in case of temporary difficulties. Flexible repayment and loan rescheduling models would reduce the number of non-performing loans and facilitate easier debt repayment. Setting a ceiling on interest rates and eliminating hidden fees would prevent excessive borrowing and ensure a fairer distribution of loan costs. Clear lending conditions would reduce the risk of financial difficulties for citizens. By establishing free financial counselling centres, citizens would receive the necessary help in planning personal finances and negotiating with creditors. Such institutions could play a key role in preventing long-term over-indebtedness.

Citizens are often unaware of all the conditions under which they take out a loan. Banks should be required to have simpler and clearer contracts so that consumers better understand their financial obligations and avoid unexpected costs. Encouraging credit unions, microfinance, and non-profit credit institutions would provide citizens with more affordable financing options. These models can offer safer and more socially responsible ways of borrowing than traditional commercial banks. Court proceedings between citizens and banks are often lengthy and complex. Speeding up legal processes would ensure faster and more efficient protection of debtors, allowing them fairer conditions in financial disputes. By implementing these measures, the problem of over-indebtedness can be significantly reduced, and the long-term financial stability of citizens and society as a whole can be ensured.

5. Conclusion

Through the synthesis of empirical research conducted on 782 respondents, it was concluded that the availability of financial resources significantly affects the objective and subjective perception of the quality of life. The approach is based on auto-regressive models with a time lag of about thirty years, when citizens did not go into debt and when the desire to buy was not as pronounced as it is today. The theoretical and empirical processing of the research confirmed the relevance of debt slavery to the quality of life. Also, the value of KMO and Bartlett's test using default variables is justified. Given the high value (0.800), it was not necessary to test the other hypotheses with the Z-test because they were grouped (visible from the results of the KMO test), that is, they were not dispersed, and it was clear that the hypotheses were fully justified. Based on the conducted research, it can be concluded that the availability of financial resources significantly affects the objective and subjective perceptions of the quality of life of the respondents. The low level of economic opportunities, especially in the context of debt slavery, creates numerous challenges that negatively affect the daily lives and well-being of individuals.

Objectively, the lack of financial resources limits access to basic needs such as adequate housing, quality health care, education, and safe nutrition. These deprivations can lead to deterioration in physical health, reduced educational attainment and an overall reduction in life opportunities. Subjectively, the feeling of economic insecurity and the constant struggle for financial survival contribute to high levels of stress, anxiety, and depression. People facing financial difficulties often experience feelings of shame, guilt, and social exclusion, which further impair their psychological well-being and self-confidence. Debt slavery, a specific form of extreme financial insecurity, has proven to be a key factor that further deteriorates the quality of life. Respondents in debt slavery often face a continuous cycle of debt that is difficult to get out of, which creates a feeling of helplessness and hopelessness.

Job insecurity was caused by the emigration of professional staff from Croatia to improve the quality of life and raise the standard of living to a higher level. The focus on the initial assumption of this research, that economic well-being is reduced by borrowing and significantly affects the quality of life, calls for greater education of citizens in terms of financial management and a greater focus on the fact that money and power cannot be a substitute for family, social inclusion, education and other values.

The creation of material assets should only be a supplement to a better life, and thus to human freedom, so their integration aims to improve and increase the quality of life to a level that will satisfy every citizen and which as such, will be useful for society. The limitation of the guidelines given in this paper is that they do not represent a solution to the

problem nor enable automatic application in practice, but they are the first step towards solving it and stopping further borrowing. Citizens, as well as the state, are tasked with implementing the guidelines on an operational level. It can also be concluded that these indicators move Croatia away from a life of well-being, so Croatia is counted as a country that is far from the well-being economy that all EU countries strive for. The results of this research emphasise the need for urgent interventions and policies that will provide financial support and counselling to people in economic difficulties. Improving access to education, employment and health services can significantly contribute to improving the quality of life for vulnerable populations. Additionally, education on managing personal finances and access to resources for debt relief are crucial for achieving long-term economic improvement and enhanced subjective well-being. This paper confirms the importance of understanding and addressing economic inequalities to achieve overall social well-being.

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Appendix 1.

Likert Scale Items Measuring Economic Strain, Job Insecurity, and Proactive Behaviour

	OVER INDEBTEDNESS (OD)				
In the past 12 months, I have been late in repaying at least one financial obligation.	1	2	3	4	5
I often borrow money or take out a new loan to repay an existing debt.	1	2	3	4	5
Monthly instalments and interest payments burden my household budget beyond my financial means.	1	2	3	4	5
Because of my debts, I experience constant financial stress.	1	2	3	4	5
My debt-to-income ratio is too high for my financial situation.	1	2	3	4	5
R) I can regularly meet all my financial obligations without taking on additional debt.	1	2	3	4	5
	JOB INSECURITY (JI)				
I am afraid that I might lose my job or sources of income in the near future.	1	2	3	4	5
My working conditions are unstable and subject to unexpected changes.	1	2	3	4	5
I am easily replaceable in the labour market.	1	2	3	4	5
I feel uncertain about the future of my employment.	1	2	3	4	5
I believe that my job position could be eliminated due to organisational changes.	1	2	3	4	5
I worry that my income will decrease in the future.	1	2	3	4	5
I feel anxious when I think about my long-term job stability.					
	QUALITY OF LIFE – FINANCIAL DIMENSION (QoL-FIN)				
I have enough resources to cover my basic living needs. (R)	1	2	3	4	5
An unexpected expense (e.g., a repair) would seriously threaten my budget.	1	2	3	4	5
I often postpone payments due to a lack of money.	1	2	3	4	5
I can save money for at least three months a year. (R)	1	2	3	4	5
My financial situation limits my long-term plans.	1	2	3	4	5
I am afraid that I might lose my sources of income in the near future.	1	2	3	4	5
I find it difficult to cover basic housing and utility expenses.	1	2	3	4	5
I often feel financially insecure and worried about the future.	1	2	3	4	5
My long-term sense of security depends on income that is not stable.	1	2	3	4	5
In case of income loss, I would not be able to cover expenses for more than one month.	1	2	3	4	5
	QUALITY OF LITE – HEALTH AND WELL-BEING (QoL-HEALTH)				
Financial stress negatively affects my mental health.	1	2	3	4	5
Because of financial worries, I have trouble sleeping.	1	2	3	4	5
I am satisfied with my general health condition. (R)	1	2	3	4	5
Due to my financial situation, I sometimes skip medical check-ups or treatments.	1	2	3	4	5
Financial problems often cause me feelings of anxiety or hopelessness.	1	2	3	4	5

My financial situation reduces my motivation or ability to take care of my health.	1	2	3	4	5
I often experience physical symptoms (e.g., headaches, fatigue) due to financial stress.	1	2	3	4	5
Financial strain negatively affects my relationships and social interactions.	1	2	3	4	5
	QUALITY OF LITE – SOCIAL INCLUSION (QoL-SPC)				
My financial situation prevents me from participating in cultural or recreational events.	1	2	3	4	5
I feel embarrassed when I cannot afford to join friends in social activities.	1	2	3	4	5
Financial problems make me feel isolated from others.	1	2	3	4	5
I often compare my lifestyle to others and feel socially inferior.	1	2	3	4	5
My financial condition limits my ability to maintain relationships.	1	2	3	4	5
I feel less respected or valued in society due to my financial situation.	1	2	3	4	5
Despite financial challenges, I try to stay socially active and connected. (R)					
	QUALITY OF LIFE- SUBJECTIVE WELL-BEING (SWL)				
I feel that my life is meaningful despite financial challenges. (R)	1	2	3	4	5
My financial situation often makes me feel anxious or discouraged.	1	2	3	4	5
I have clear goals for improving my quality of life. (R)	1	2	3	4	5
I believe I can influence my life circumstances through my own actions. (R)	1	2	3	4	5
I rarely feel in control of my life because of financial pressure.	1	2	3	4	5
I feel emotionally stable and able to cope with everyday challenges. (R)	1	2	3	4	5
I feel hopeful about achieving a better standard of living in the future. (R)	1	2	3	4	5
I often compare my life negatively to others because of financial differences.	1	2	3	4	5
Despite difficulties, I am grateful for what I have in life. (R)	1	2	3	4	5
	PROACTIVE ADDITIONAL WORK INTENT (PAWI)				
I am willing to take an additional job (side gig) to increase my income.	1	2	3	4	5
I actively look for freelance, temporary, or seasonal work opportunities.	1	2	3	4	5
I am willing to work overtime if it improves my financial stability.	1	2	3	4	5
I am ready to accept less desirable jobs temporarily to earn extra income.	1	2	3	4	5
I regularly browse ads or online platforms for additional income opportunities.	1	2	3	4	5
I am willing to learn new skills to qualify for additional work.	1	2	3	4	5
I believe that taking initiative is essential for maintaining financial security.	1	2	3	4	5
	PROACTIVE FINANCIAL COPING (PFC)				
I systematically reduce discretionary spending (e.g., entertainment, shopping).	1	2	3	4	5
I keep track of my income and expenses and adjust my budget accordingly.	1	2	3	4	5
I look for better credit conditions (e.g., refinancing, lower interest rates).	1	2	3	4	5
I actively seek information about my legal rights in enforcement or other financial procedures.	1	2	3	4	5
I am willing to temporarily lower my standard of living to achieve long-term recovery.	1	2	3	4	5
I set clear financial goals and monitor my progress regularly.	1	2	3	4	5
I avoid unnecessary borrowing and try to live within my means.	1	2	3	4	5

	PERCEPTION OF COSTS AND PRESSURE OF FORECLOSERS				
The costs of enforcement proceedings significantly burden my household budget.	1	2	3	4	5
Because of enforcement procedures, I postpone other important life decisions.	1	2	3	4	5
I feel emotionally exhausted because of ongoing debt collection or enforcement cases.	1	2	3	4	5
Enforcement procedures make me feel powerless and without control over my finances.	1	2	3	4	5
I believe that enforcement-related costs are unfairly high compared to the original debt.	1	2	3	4	5
Debt enforcement procedures negatively affect my family and social relationships.	1	2	3	4	5
The enforcement process makes it difficult for me to recover financially and rebuild stability.	1	2	3	4	5
	FINANCIAL LITERACY - SELF-ASSESSMENT				
I understand the difference between nominal and effective interest rates. (R)	1	2	3	4	5
I know how to estimate what portion of my income I can safely dedicate to loan repayments. (R)	1	2	3	4	5
I know how to estimate what portion of my income I can safely dedicate to loan repayments. (R)	1	2	3	4	5
I understand how inflation affects the value of my savings and purchasing power. (R)	1	2	3	4	5
I regularly read or follow information about financial products and market trends. (R)	1	2	3	4	5
I understand how diversification reduces investment risk. (R)	1	2	3	4	5
I know how to set realistic financial goals and plan my budget accordingly. (R)	1	2	3	4	5

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ARE ALBANIAN HOUSEHOLDS FINANCIALLY FRAGILE?

Elona Dushku

Abstract

This study investigates financial fragility among Albanian households, measured by their ability to cover unexpected expenses, while analysing the impact of socio-economic factors and asset portfolios. Using data from Albania's first Household Wealth Survey, we find that 59 % of households lack sufficient liquidity to withstand financial shocks, classifying them as financially fragile. Our multinomial regression analysis reveals three key findings: first, households with more educated heads show significantly lower fragility; second, access to formal financial services enhances resilience; and third, family support networks serve as an important buffer against financial vulnerability. These results demonstrate that both formal financial inclusion and informal family ties play crucial roles in household financial stability. These findings suggest that promoting financial education, expanding access to financial services, and supporting remittance channels can help reduce household vulnerability in Albania.

Key words: *household financial fragility, personal finance*

Jel Classification: *D11, D14*

I. Introduction

The global financial crisis of 2007–2008, followed by the COVID-19 pandemic, brought renewed attention to the short-term financial vulnerabilities of households. These crises have shown how many households are unprepared to cope with sudden income losses or unexpected expenses, underscoring the broader implications of financial fragility. Financial fragility poses serious risks not only to individual well-being through increased stress, consumption smoothing problems, or limited access to credit but also to overall economic stability, particularly when widespread household vulnerabilities amplify macroeconomic shocks.

While the concept of financial fragility has gained prominence in recent years, its definition remains fluid. Traditionally associated with over-indebtedness or difficulty in repaying loans, the concept has evolved to encompass a wider set of financial constraints. Today, financial fragility is increasingly understood as a multidimensional phenomenon, reflecting (1) the risk arising from debt and insolvency, (2) constraints in income and liquidity, and (3) limited capacity to absorb unexpected shocks. This broader framing better captures the realities faced by households, especially in times of crisis.

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Despite its growing relevance, there is still no universally accepted definition of household financial fragility. Researchers have used varying criteria to capture its different dimensions. For example, Lusardi, Schneider, and Tufano (2011) define financially fragile households as those unable to cover an unexpected expense, emphasizing their lack of liquid assets rather than their level of debt. Similarly, Brunetti, Giarda, and Torricelli (2016) define financially fragile households as those whose income is sufficient to cover regular expenses but insufficient to absorb unforeseen financial shocks. These definitions shift the focus away from traditional debt-based indicators and toward households' resilience in the face of unexpected events.

As Lusardi, Schneider, and Tufano (2011) highlight, assessing financial fragility is complex because it encompasses both objective and subjective dimensions of household finance. On one hand, fragility may stem from limited financial assets or low income; on the other, it may arise from high levels of debt relative to repayment capacity. This complexity has led scholars to adopt different empirical strategies. Objective measures typically rely on quantifiable indicators, such as asset and liability levels, debt ratios, or liquidity indicators (e.g., Holló and Papp 2007; Brown and Taylor 2008; Jappelli, Pagano, and Di Maggio 2008). In contrast, subjective measures focus on households' self-assessed ability to manage unexpected expenses or meet daily financial obligations, thus capturing perceived vulnerability alongside actual financial conditions (e.g., Lusardi, Schneider, and Tufano 2011; Albacete and Fessler 2010; Ampudia, Vlokhoven, and Żochowski 2016).

Each approach has its advantages and limitations. Objective indicators are grounded in measurable financial variables but may overlook behavioral or psychological dimensions of financial stress. Subjective indicators, while offering a more holistic view, rely on individual perceptions that may be biased or inconsistent. Brunetti, Giarda, and Torricelli (2016) note that despite these limitations, both approaches contribute to a richer understanding of financial fragility and are often used complementarily in empirical studies.

A growing body of research highlights the role of socioeconomic characteristics in shaping household financial fragility. Being female, having a low level of education, low income, limited assets, or high levels of debt are all associated with greater vulnerability (Lusardi, Schneider, and Tufano 2011; Anderloni, Bacchiocchi, and Vandone 2012; Hasler and Lusardi 2019). Other studies also emphasize the importance of behavioral and institutional factors, such as financial literacy (Hasler, Lusardi, and Oggero 2018; Clark, Lusardi, and Mitchell 2020), reliance on credit for consumption (Jappelli, Pagano, and Di Maggio 2008; Ampudia, Vlokhoven, and Żochowski 2016), and weak consumer protection frameworks or enforcement mechanisms (Jappelli, Pagano, and Di Maggio 2008). Morduch and Schneider (2017) further argue that fragility is often linked to the volatility of household income and expenses, rather than persistent poverty.

The aim of this paper is to analyze the financial fragility of Albanian households, using the framework developed by Brunetti, Giarda, and Torricelli (2016) Drawing on granular data from the first wave of the Albanian Household Wealth Survey, we estimate that nearly 60% of households are financially fragile meaning they lack sufficient liquid assets to cover an unexpected expense equivalent to the median household income. Our findings indicate that households with lower income and education levels are significantly more vulnerable, while receiving remittances and owning financial assets reduce the likelihood of fragility. These results highlight the importance of household networks and financial inclusion in enhancing resilience.

There is a notable gap in the Albanian literature regarding this topic. Most existing studies have focused on individual credit risk and its implications for banking sector stability (e.g., Kalluci 2011; Shijaku and Ceca 2012; Shijaku and Kalluci 2014), largely due to limited access to micro-level household data. This paper provides the first empirical assessment of household financial fragility in Albania, using detailed survey data to examine the relationship between household characteristics and the ability to withstand financial shocks.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature. Section 3 presents methodology followed by data in section 4. Section 5 discusses the main empirical findings, and Section 6 concludes with a summary of results and policy implications.

2. Literature review

The concept of household financial fragility has gained growing importance in the economic literature, especially after major crises such as the 2007–2008 global financial crisis and the COVID-19 pandemic. These events exposed how vulnerable many households are to sudden income shocks and unplanned expenses, underlining the broader macroeconomic risks such fragility can pose. Financial fragility at the household level affects not only immediate well-being leading to reduced consumption, missed payments, and reliance on informal networks

but also has wider implications for financial stability and the effectiveness of economic policy. Despite its relevance, the literature does not offer a unified definition of household financial fragility. Instead, it is commonly viewed as a multidimensional phenomenon that encompasses (1) debt-related risks, such as the inability to meet financial obligations; (2) income constraints that prevent households from meeting basic needs; and (3) limited capacity to absorb unexpected shocks, such as medical emergencies or job losses. This broader interpretation moves beyond traditional measures of indebtedness and includes liquidity constraints, financial literacy, and access to informal support systems.

A range of studies have attempted to measure household financial fragility using either objective or subjective indicators. The first approach, based on objective indicators, includes measures such as the debt-to-income ratio (DTI), the debt service-to-income ratio (DSTI), and the volatility of income or assets. Research by Hollo and Papp (2007), Brown and Taylor (2008), Jappelli, Pagano, and Di Maggio (2008), and Ampudia, Vlokhoven, and Żochowski (2016), among others, has shown that these indicators are helpful in identifying financial stress, but they often mask heterogeneity between households. Albacete and Fessler (2010) and Leika and Marchettin (2017) point out that aggregate figures may overlook the different levels of risk faced by households with similar DTI ratios but varying asset liquidity or access to credit. The second approach focuses on subjective indicators obtained from household surveys. These indicators capture households' self-assessed ability to cope with financial difficulties, meet ends need, or handle an unexpected expense. For example, Lusardi, Schneider, and Tufano (2011) introduced a widely used survey measure that defines a household as financially fragile if it is unable to come up with $2,000 in 30 days. This survey-based methodology was later developed by Brunetti, Giarda, and Torricelli (2016), who emphasized the importance of liquidity over total income, showing that some households may appear financially stable but are vulnerable due to low levels of liquid assets.

The literature emphasizes that relying exclusively on either objective or subjective indicators risks providing an incomplete picture of financial vulnerability. Brunetti, Giarda, and Torricelli (2016) and Hasler and Lusardi (2019) argue that an accurate assessment must consider both sides of the household balance sheet, assets and liabilities along with perceptions, preferences, and access to informal support. Subjective indicators capture behavioral and psychological dimensions of financial fragility, while objective indicators may fail to account for informal strategies households use to cope with financial stress. Bialowolski and Weziak-Bialowolska (2014) stress the value of integrating both types of indicators to capture the differences between households that stem from socio-economic characteristics, risk attitudes, and expectations about the future.

Several studies provide empirical evidence supporting these theoretical perspectives. Jappelli, Pagano, and Di Maggio (2008) examined financial fragility across European countries, assessing its determinants and the role of institutional factors such as legal efficiency and bankruptcy regulation. They found that households with higher debt are more likely to fall into arrears when facing macroeconomic shocks, but strong institutions can help mitigate this risk. Lusardi, Schneider, and Tufano (2011) revealed that many American households are unable to withstand even modest financial shocks, especially those with low income, limited education, or weak financial literacy. These findings align with the theory of precautionary savings, where risk-averse individuals aim to build financial buffers to withstand future uncertainty (Deaton 1992; Carroll 1997). Anderloni, Bacchiocchi, and Vandone (2012) using a similar framework, constructed a financial vulnerability index for Italian households and found that unsecured debt and high debt service burdens increase fragility, while higher education reduces it. Brunetti, Giarda, and Torricelli (2016) deepened this approach by analyzing the impact of portfolio composition, showing that families with low liquidity even if their income covers expected expenses are more likely to be financially fragile. Their study also highlights that informal borrowing from family members is associated with higher fragility compared to formal credit sources. Clark, Lusardi, and Mitchell (2020) examining American households after the 2008 financial crisis, found that roughly half of them were unable to cover a $2,000 emergency, with fragility more common among young, female-headed, and low-income households. Their findings also documented coping strategies such as borrowing from friends, working more hours, or selling possessions. More recently, Chen, Zeng, and Tam (2023) investigated the role of social networks in reducing financial fragility in China, showing that family and informal connections can lower vulnerability by facilitating informal credit and improving financial literacy, especially among highly indebted households.

While the existing literature offers valuable insights into the determinants and measurement of household financial fragility across a range of economic contexts, relatively little is known about how

these dynamics manifest in countries with distinct structural and institutional characteristics, such as Albania. The Albanian case is particularly notable due to its high rate of homeownership, low financial diversification, limited access to formal credit markets, and substantial reliance on informal support systems, including remittances (Dushku and Frasheri 2021). These features suggest that conventional indicators may not fully capture the complexity of financial fragility in this context and highlight the need for a tailored, multidimensional approach.

This study contributes to the literature by providing the first empirical assessment of household financial fragility in Albania, using data from the 2019 Albanian Household Wealth Survey. Adopting the multidimensional framework proposed by Brunetti, Giarda, and Torricelli (2016), the analysis integrates both objective and subjective indicators to better account for the diverse channels through which vulnerability can emerge. Thus, the aim of this study is to examine the extent of financial fragility among Albanian households and to assess how socio-economic characteristics, asset structures, and informal financial support mechanisms particularly remittances influence their capacity to cope with unexpected economic shocks.

3. Methodology

As outlined above, the aim of this paper is to analyse how the socio-economic characteristics of households are associated with financial fragility, particularly in cases where households may not face immediate financial hardship but remain vulnerable to unexpected shocks or expenditures. These households, although seemingly stable, can become financially fragile due to a lack of liquidity or financial buffers.

To investigate which factors are correlated with different household financial conditions namely financially unconditional households, financially fragile households, over-consumer households, and financially conditional households we estimate a multinomial logit model as follows:

$$\ln \Omega_{m|b}\,(x) = \ln \frac{Pr(y=m|x)}{Pr(y=b|x)} = x\beta_{m|b} \quad \text{for } m = 1 \; to \; J \tag{1}$$

Here, b denotes the base category used to normalize the model[2], allowing us to estimate parameters for the remaining three categories. The model allows us to calculate the expected probability of a household falling into each financial status category, defined as:

$$P(Y_i = m|X_i) = \frac{\exp\left(\beta'_{(m|b)}\, X_i\right)}{\Sigma_{j=}^{J}\, exp\left(\beta'_{(m|b)}\, (X_i\right)} \tag{2}$$

In this specification, the dependent variable Y_i captures the financial status of household i, with four possible outcomes: m=1, financially unconditional households, m= 2, financially fragile households, m=3, over-consumer households, m=4, financially conditional households

The explanatory variables X_i represent both household-level socio-economic indicators and characteristics of the reference person (household head). These include demographic variables such as household size, gender, age, education level, and employment status, all included as qualitative indicators to explore how financial conditions vary across different socio-demographic groups.

To account for household financial behaviour and inclusion, we incorporate qualitative variables indicating whether the household has a mortgage, consumer loan, informal debt (i.e., debt to others), owns a bank account, or holds real estate beyond the main residence. These indicators are intended to capture the role of financial inclusion and portfolio diversification in a household's ability to absorb financial shocks. The ownership of secondary assets also serves as a proxy for risk preference and investment behaviour.

Following Campbell (2006), the structure of household assets, particularly homeownership can influence portfolio choices through two competing effects. The wealth effect suggests that owning a home may encourage investment in riskier assets, as the perceived wealth enables greater risk-taking. In contrast, the crowding-out effect posits that households heavily invested in illiquid assets (like their primary residence) may avoid additional risky or illiquid investments due to limited remaining wealth (Chetty and Szeidl 2010; Chetty, Sándor, and Szeidl 2017; Li, Brounen, Li, and Wei 2022).

Furthermore, we include variables capturing family ties, specifically income received from migrants, to explore the relationship between remittances and household financial fragility. Remittances are an important component of household income in Albania and are known to reduce poverty and provide financial resilience at both the micro and macro levels (Dushku and Frasheri 2021). Including this variable allows us to assess whether remittance-receiving households are better positioned to withstand unexpected financial shocks.

4. Data

As mentioned above, one of the main issues related to household financial fragility is the lack of a uniform and standard definition, which has led to the examination of its various aspects. The assessment of financial fragility among Albanian households is based on the approach proposed by Brunetti, Giarda, and Torricelli (2016), who define financially fragile households as those unable to afford an unexpected expense. This approach has several advantages compared to others: first, it analyses all households without focusing on specific groups such as those with debt or belonging to certain age groups; second, it relies on quantitative data, thus avoiding biases related to household self-perception of their financial situation; third, it distinguishes between expected and unexpected expenses, thereby capturing short-term financial problems; and fourth, it takes into account how household portfolio composition influences financial behaviour.

Following Brunetti, Giarda, and Torricelli (2016), in this paper we define financially fragile households as those that can afford expected expenses but do not have sufficient liquid assets to cover unexpected expenses. According to this approach, household classification is based on two criteria: (i) whether household income is sufficient to meet expected expenses, and (ii) whether liquid assets are sufficient to meet potential unexpected expenses.

Based on these criteria, households are categorized into four groups: unconditional households, financially fragile households, over-consuming households, and conditional households.

1. Unconditional households have income equal to or greater than expected expenses and liquid assets equal to or greater than unexpected expenses.
2. Financially fragile households have income equal to or greater than expected expenses but liquid assets less than unexpected expenses.
3. Over-consuming but liquid households earn less than they consume but have liquid assets equal to or greater than unexpected expenses.
4. Conditional households earn less than they consume and have liquid assets less than unexpected expenses.

Household income refers to the total annual net disposable income. Expected expenditures include planned expenses such as household spending on goods and services, rent, maintenance, and insurance. Liquid assets encompass the total value of readily available financial resources. Unexpected expenses refer to unplanned costs, including maintenance of the house or car, medical emergencies, temporary income loss, or wage reductions.

The main data source for this analysis is the detailed dataset from 2,106 households collected in the first round of the Albanian Household Wealth Survey, conducted by the Bank of Albania in 2019. This comprehensive survey captures various aspects of household wealth, including real and financial assets, consumption, savings, investments, debt levels, income, and expenses. Its detailed information allows for a thorough classification of households into the four financial conditions described above, and facilitates profiling based on socio-economic characteristics. Further details on the questionnaire, methodology, and results are provided by Dushku and Cami (2022). The data sample is randomly selected and representative at the national and population levels.

Expected household expenses include monthly spending on food (both inside and outside the home), electricity, water, internet, and other utilities, which are converted into annual figures. According to estimates by Dushku and Cami (2022), expected expenses average approximately 80% of total household income. Consistent with Lusardi, Schneider, and Tufano (2011) and Brunetti, Giarda, and Torricelli (2016), unexpected expenses are defined as those resulting from shocks such as health problems or job loss, and are proxied by the median monthly household income, which in our sample equals ALL 59,862. Liquid assets consist of funds held in current accounts and time deposits, excluding cash holdings, which were not reported in the survey. Given the low reported incidence of liquid asset ownership, we approximate liquid assets as the difference between household income and total expenses for goods and services.

Table 1 presents general characteristics of Albanian households, including debt exposure, portfolio composition, and education levels. The average household size is 3.7 members; with a reference person whose average age is 58.5 years; 78% of these reference persons are male. Over half have only primary education, 36% have completed high school, and 11% hold a university degree or higher. Regarding employment status, 44% are employed or self-employed, 37% retired, and 13% unemployed. Considerable heterogeneity exists among households in terms of income and wealth: annual household income averages around 1 million ALL, while total wealth (real and financial) averages about 6 million ALL. Nearly 90% of households own their primary residence, which represents the most important household asset.

Financial inclusion is relatively low: only 4% and

Table 1. Descriptive statistics on household and their reference person

Variables	Average	Std. Dev.	Min	Max
Gender: Male	77.1%	0.4	0	1
Age (years)	56.2	14.7	19	92
Marital status, married	81.1%	0.4	0	1
Years of education	10.1	3.5	0	21
Levels of educations				
Primary education	51.5%			
Secondary education	35.9%			
Tertiary education	12.5%			
Occupation status (as % of total reference persons)				
Employed/Self-employed	46.9%			
Unemployed	15.0 %			
Retired &others	38.2%			
Household size	3.7	1.7	1	17
Total household income (ALL million)	1.0	0.9	0.0	12.9
Household wealth (ALL million)	6.2	3.9	0.6	39.8
Having a mortgage loan	0.039	0.2	0	1
Having consumer loans	0.058	0.2	0	1
Having debts towards others	0.14	0.3	0	1
Owning the main dwelling	0.93	0.3	0	1
Owning other real estate properties (house, land, apartment etc.)	0.36	0.5	0	1
Household receiving-remittances	0.23	0.42	0	1

Source: Albanian Household Wealth Survey (AHWS), 2019, author's calculations

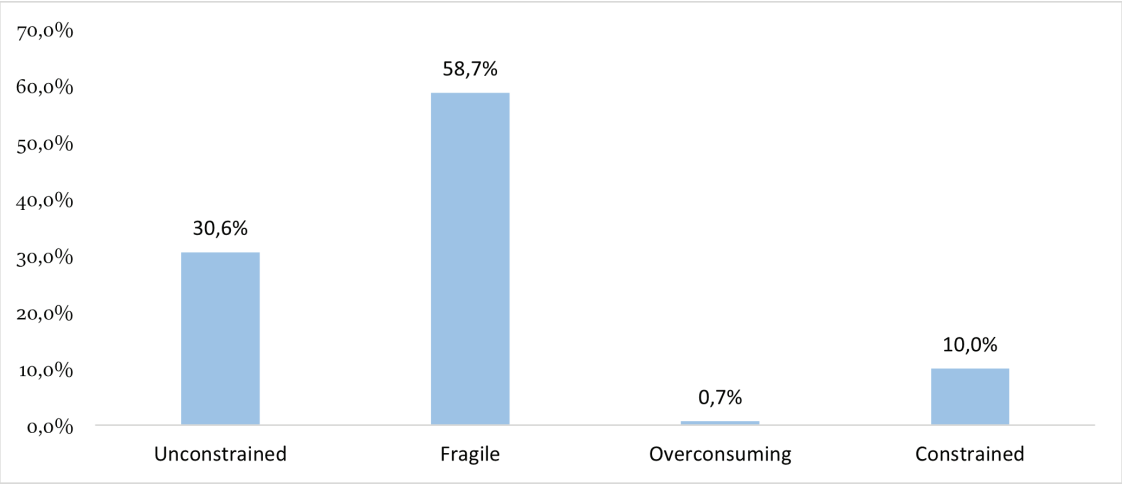
5% of households have mortgage and consumer loans, respectively, while 12.5% have borrowed from informal sources. These features make Albania an interesting case for studying financial fragility, characterized by low financial inclusion, limited debt exposure, lower education levels, and high rates of homeownership. Additionally, 23% of households receive income from immigrants, making remittances the second most important source of household income and highlighting their role in consumption and saving decisions (Dushku and Frasheri (2021)).

Based on household-level data and following the classification methodology proposed by Brunetti, Giarda, and Torricelli (2016), households in Albania are grouped into four categories (Graph 1). The data reveal that approximately 59% of households are financially fragile, 31% are unconditional, 10% are conditional, and less than 1% are over-consuming households. Financially fragile households are not inherently vulnerable, as they possess sufficient income to cover expected expenses; however, they lack adequate liquid assets to manage unexpected expenses. Consequently, any sudden shock such as job loss, unforeseen medical costs, temporary income reductions, or salary cuts can push these households into financial distress.

The second largest group consists of unconditional households, comprising 31% of the total sample. These households have sufficient income to cover both expected and unexpected expenses. Conditional households represent around 10% of the total and are characterized by insufficient income and liquidity to cover both expected and unexpected costs. Over-consuming households account for less than 1% of the population and are therefore excluded from the empirical analysis due to their minimal representation.

Table 2 presents key characteristics of the reference person and household composition for the three main groups: unconditional, financially fragile, and conditional households. Several similarities and differences emerge. Notably, financially fragile households exhibit higher exposure to all forms of borrowing.

Graph 1: Classification of household type



Source: Albanian Household Wealth Survey (AHWS), 2019, author's calculations

Their reference persons tend to be older on average and have lower levels of education compared to other groups. Additionally, financially fragile households show a greater propensity to own secondary real estate and receive income from immigrants, highlighting the significance of family ties and remittances in their financial strategies.

Table 2. Characteristics of the reference person and family by main groups

Household types	Unconstrained	Financially fragile	Constrained
Household size	3.36	3.24	3.23
Gender or reference persons (Male)	75.5%	78.1%	75.7%
Age of reference person	58.34	58.79	55.83
Level of education of reference person (years)	11.71	9.88	9.91
Percentage of reference persons by level of education			
Primary education	42%	56%	57%
Secondary education	39%	35%	36%
Tertiary education	20%	8%	7%
Labor status of reference person			
Unemployed	9%	13%	30%
Employed	46%	45%	38%
Retired	45%	43%	33%
Having debts towards others (as % all households that have a debt)	21%	65%	14%
Having a mortgage loan (as % of total households having a mortgage debt)	23%	54%	23%
Having a consumer loan (as % of total households having a consumer loan)	28%	61%	12%
Percentage of households having other real estate properties despite main residence	33%	57%	10%
Percentage of households receiving remittances	40%	52%	8%

Source: Albanian Household Wealth Survey (AHWS), 2019, author's calculations

5. Estimation results

Before estimating the model, we tested for multicollinearity among the explanatory variables. The correlation coefficients are generally low to moderate, and all VIF values are below the conventional threshold of 10, indicating that multicollinearity is not a concern and the explanatory variables can be reliably included in the multinomial logit model.

Table 3 presents the estimates obtained from the multinomial logistic regression, focusing specifically on the average marginal effects of each explanatory variable on the probability that a household is financially fragile. The results indicate that as the level of education increases, the likelihood of a household being financially fragile decreases. This finding aligns with previous studies (Lusardi, Schneider, and Tufano 2011; Halser and Lusardi 2019; Clark, Lusardi, and Mitchell 2020), which emphasize that individuals with higher education levels are generally better equipped to manage their finances and withstand unexpected financial shocks. Higher education is also associated with improved career prospects and higher income levels, contributing to greater financial stability against shocks (Lusardi and Mitchell 2008; Lusardi, Schneider, and Tufano 2011; Brunetti, Giarda, and Torricelli 2016; Halser and Lusardi 2019).

Regarding marital status, being married significantly reduces the probability of a household being financially fragile compared to other marital statuses. Interestingly, employment status shows that both employed and retired households have a higher probability of financial fragility, suggesting that in Albania, households are vulnerable to unexpected shocks regardless of whether the reference person is currently working or retired.

No significant relationship was found between having a mortgage loan, consumer loan, or outstanding debts to others and the likelihood of being financially fragile. Similarly, owning a second real estate property shows a negative correlation with financial fragility but lacks statistical significance.

In the second and third columns of Table 3, two dummy variables were included: one indicating whether the household receives income from immigrants (remittances), and another indicating whether the household has access to a bank or deposit account. The results show that households receiving remittances and those with financial access are less likely to be financially fragile. These findings underscore the importance of family ties and remittances in cushioning households from unexpected shocks, as well as the critical role of financial inclusion in enhancing household resilience. These conclusions are consistent with extensive literature on the subject (Chen, Zeng, and Tam 2023; Demirgüç-Kunt and Klapper 2013).

To verify the robustness of our results, we estimated a logistic regression model where the dependent variable equals one if the household is financially fragile and zero otherwise (Table 4). In the last three columns, we employed an alternative definition of household financial fragility proposed by Lusardi, Schneider, and Tufano (2011), which classifies households as financially fragile if they have less than three months' savings to cover their necessary expenses.

The results presented in the first three columns confirm the findings from the multinomial regression, emphasizing the significant role of the reference person's education level in reducing the probability of financial fragility. Additionally, the results reaffirm the positive impact of remittances in lowering the likelihood of households being financially fragile and improving their capacity to withstand unexpected financial shocks. This highlights the crucial role of family members and relatives living abroad, not only in poverty reduction (Dushku and Frasheri (2021)) but also in alleviating short-term financial vulnerabilities of Albanian households.

Table 3. Determinants of being financially fragile

	Average marginal effect	Average marginal effect	Average marginal effect
Household size	0.00776	0.00403	0.0113
p-value	(0.328)	(0.614)	(0.127)
Marital status: married	**-0.156****	**-0.155****	**-0.171*****
p-value	(0.016)	(0.019)	(0.008)
Cohabiting	-0.0564	-0.0785	-0.0785
p-value	(0.847)	(0.812)	(0.805)
Widow	**-0.139***	**-0.136***	**-0.153****
p-value	(0.056)	(0.064)	(0.033)
Divorced	-0.00538	-0.0245	-0.0975
p-value	(0.959)	(0.820)	(0.385)
Gender of reference person (Male)	0.0160	0.0155	0.0131
p-value	(0.625)	(0.636)	(0.677)
Age	-0.00204	-0.00192	-0.00110
p-value	(0.116)	(0.139)	(0.374)
Primary level of education (base: Secondary level of education)	**0.0738*****	**0.0756*****	**0.0375**
p-value	(0.002)	(0.002)	(0.101)
Tertiary level of education (base: secondary level of education)	**-0.178*****	**-0.182*****	**-0.116*****
p-value	(0.000)	(0.000)	(0.003)
Labor status: Employed	**0.0718****	**0.0649***	**0.0880****
p-value	(0.047)	(0.073)	(0.010)
Labor status: Retired& Others	**0.0933****	**0.0907****	**0.0808****
p-value	(0.024)	(0.029)	(0.040)
Having debts towards others	0.0409	0.0450	-0.000916
p-value	(0.236)	(0.195)	(0.978)
Having a consumer loan	0.0530	0.0493	0.0526
p-value	(0.330)	(0.370)	(0.371)
Having a mortgage loan	-0.0271	-0.0327	-0.00306
p-value	(0.667)	(0.601)	(0.962)
Having other real estate properties	-0.0381	-0.0328	-0.0306
p-value	(0.105)	(0.164)	(0.167)
Receiving remittances		**-0.0685*****	**-0.0680*****
p-value		(0.008)	(0.005)
Financial access			**-0.357*****
p-value			(0.000)
Pseudo R^2	0.0515	0.0602	0.1540
N	1971	1971	1971

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Albanian Household Wealth Survey (AHWS), 2019, author's calculations

Table 4. Robustness checks for households of being financially fragile

	Financially fragile households (Brunetti, Giarda, and Torricelli (2016),)			Financially fragile households (less than 3 months of saving		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Household size	0.00576	0.00179	0.00850	-0.00329	-0.00854	-0.00645
p-value	(0.461)	(0.820)	(0.241)	(0.653)	(0.244)	(0.373)
Marital status: Married	**-0.112***	-0.113	**-0.127****	**-0.170****	**-0.185*****	**-0.189*****
p-value	(0.099)	(0.101)	(0.052)	(0.050)	(0.031)	(0.027)
Cohabiting	-0.0378	-0.0132	-0.0647			
p-value	(0.900)	(0.963)	(0.800)			
Widow	-0.0811	-0.0806	-0.0992	-0.107	-0.118	-0.122
p-value	(0.281)	(0.287)	(0.165)	(0.252)	(0.203)	(0.186)
Divorced	0.0416	0.0233	-0.0515	0.00966	-0.0431	-0.0696
p-value	(0.693)	(0.828)	(0.631)	(0.940)	(0.734)	(0.575)
Gender of reference person (Male)	0.0270	0.0262	0.0226	0.0176	0.0179	0.0183
p-value	(0.412)	(0.427)	(0.468)	(0.590)	(0.579)	(0.571)
Age	-0.00186	-0.00174	-0.000867	**-0.00423*****	**-0.00406*****	**-0.00379*****
p-value	(0.146)	(0.173)	(0.471)	(0.000)	(0.001)	(0.001)
Primary level of education (base: secondary level of education)	**0.0747*****	**0.0750*****	**0.0371**	**0.0773*****	**0.0785*****	**0.0649*****
p-value	(0.002)	(0.002)	(0.102)	(0.001)	(0.001)	(0.006)
Tertiary level of education (base: Secondary level of education)	**-0.188*****	**-0.191*****	**-0.110*****	**-0.117*****	**-0.120*****	**-0.105*****
p-value	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.001)
Labor market status -Employed	0.0661*	0.0548	0.0776*	**-0.0968*****	**-0.114****	**-0.110*****
p-value	(0.066)	(0.128)	(0.022)	(0.009)	(0.002)	(0.003)
Labor market status -Retired& Others	**0.0860****	0.0804*	0.0701*	-0.0223	-0.0333	-0.0389
p-value	(0.039)	(0.053)	(0.075)	(0.607)	(0.448)	(0.371)
Having debts towards others	0.0351	0.0389	-0.00290	0.0206	0.0270	0.0130
p-value	(0.303)	(0.253)	(0.928)	(0.534)	(0.413)	(0.692)
Having a consumer loan	0.0503	0.0463	0.0450	0.0110	0.00735	0.00526
p-value	(0.350)	(0.391)	(0.407)	(0.826)	(0.883)	(0.916)
Having a mortgage loan	-0.0709	-0.0788	-0.0322	-0.0838	-0.0916	-0.0809
p-value	(0.224)	(0.176)	(0.580)	(0.187)	(0.147)	(0.198)
Having other real estate properties	-0.0443*	-0.0379	-0.0344	-0.00811	-0.000409	-0.0000309
p-value	(0.059)	(0.107)	(0.115)	(0.722)	(0.986)	(0.999)
Receiving remittances		**-0.0820*****	**-0.0851*****		**-0.109*****	**-0.110*****
p-value		(0.001)	(0.000)		(0.000)	(0.000)
Financial access			**-0.503*****			**-0.166*****
p-value			(0.000)			(0.000)
Pseudo R^2	0.0246	0.0284	0.1227	0.0358	0.0450	0.0570
N	1963	1963	1963	1715	1715	1715

Source: Albanian Household Wealth Survey (AHWS), 2019, author's calculations

6. Final remarks

Understanding household financial fragility is crucial not only for individual well-being but also for broader economic and social stability. Households that are unable to cope with unexpected expenses are more likely to experience long-term financial insecurity, reduced consumption, and downward mobility. This study, using data from the first wave of the Albanian Household Wealth Survey (2019) and following the framework proposed by Brunetti, Giarda, and Torricelli (2016), highlights that nearly 60% of Albanian households are financially fragile. The findings indicate that household vulnerability is strongly associated with lower levels of education, limited financial access, and the absence of income from remittances.

One of the most important implications of the analysis is the strong protective role played by education. Households led by individuals with higher levels of education are significantly less likely to be financially fragile. This suggests that financial fragility is not merely a function of income but also of how households understand and manage their financial resources. In this regard, enhancing financial literacy becomes a vital policy tool. Policymakers should consider embedding financial education within the national education system, starting from primary levels and extending to adult learning and community outreach programs. These efforts should focus on practical financial skills such as budgeting, managing debt, and building savings which are essential for navigating economic shocks. A financially literate population is more likely to engage with formal financial institutions, undertake long-term financial planning and avoid costly borrowing practices, thereby improving overall household resilience.

Another key finding of this study is the positive association between remittances and reduced financial fragility. Households that receive income from family members abroad are better positioned to withstand unexpected expenses, underscoring the vital role of migrant networks in supporting economic stability. Remittances serve not only as a buffer during crises but also to smooth consumption and invest in housing, education, or small businesses. To strengthen this channel, policymakers should aim to reduce the cost of remittance transfers and facilitate the formalization of these flows. Moreover, encouraging remittance-receiving households to use these funds for savings and investment possibly through targeted financial products or matched savings schemes can multiply their developmental impact and further enhance household resilience.

The results also show that access to formal financial services is associated with a lower likelihood of financial fragility. This reinforces the importance of financial inclusion as a policy priority. Promoting accessible banking, expanding digital financial infrastructure, and ensuring that low-income and rural households are not excluded from financial products can significantly improve the capacity of households to cope with unforeseen events.

In sum, this study provides evidence that education, remittances, and financial access are key pillars for building household financial resilience in Albania. With the forthcoming second wave of the Household Wealth Survey, future research will allow for a dynamic analysis of financial fragility over time and provide further insights into the stability of these relationships. Nonetheless, the current findings already offer clear guidance for policy interventions aimed at strengthening the financial security of Albanian households.

Endnotes

1. The multinomial logit model makes the so-called Independence of Irrelevant Alternatives (IIA) assumption, meaning that the odds do not depend on the other alternatives that are available. Performing both the Hausman and the Small-Hsiao tests, we found evidence against the IIA hypothesis. This hypothesis can be relaxed, but this generally leads to conceptually and computationally more complicated models so that, as a result, in applied work "the multinomial logit model is the most frequently used nominal regression model" (Long and Freese, 2006, p. 223). For additional details on the IIA and on the possible solutions in case of its rejection, see Long and Freese (2006), p. 243.
2. Since $\ln\Omega_{bb}\ (x) = \ln 1 = 0$, it must hold that $\beta b|b = 0$, therefore the log odds of an outcome or a condition compared to itself are 0, thus the effects of each variable random must also be 0.

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Annex

Table A1. Correlation summary

Household vulnerability	Household size	Marital status	Gender of reference person (Male)	Age	Education level	Labor status	Having debts towards others	Having a consumer loan	Having a mort-gage loan	Having other real estate properties	Receiving remitt-ances	Financial access
Household vulnerability	1											
Household size	0.0204	1										
Marital status	0.0112	-0.256***	1									
Gender of reference person (Male)	0.018	0.169***	-0.449***	1								
Age	-0.0840***	-0.310***	0.291***	0.0129	1							
Education level	-0.155***	-0.0229	-0.0970***	0.00529	-0.161***	1						
Labor status	-0.114***	-0.261***	0.207***	-0.0385	0.595***	-0.0880***	1					
Having debts towards others	0.0833***	0.140***	-0.0631**	0.0537*	-0.122***	-0.0550*	-0.0907***	1				
Having a consumer loan	0.00579	0.127***	-0.0391	0.00265	-0.0997***	0.0539*	-0.0829***	0.00757	1			
Having a mortgage loan	0.0558*	0.0526*	0.0066	0.00467	-0.0426	0.0440*	-0.0315	0.0203	-0.0056	1		
Having other real estate properties	-0.042	0.0868***	-0.0966***	0.121***	-0.0039	-0.157***	-0.0232	0.0514*	-0.0206	-0.0292	1	
Receiving remittances	-0.108***	-0.181***	0.0628**	-0.0599**	0.138***	-0.0624**	0.0753***	0.0163	-0.0417	-0.0629**	0.0689**	1
Financial access	-0.395***	0.0548*	-0.0520*	-0.0001	-0.0404	0.223***	-0.0391	-0.0685**	0.0266	0.0554*	-0.0056	-0.0435*

Table A2. Variance Inflation factor

Variable	VIF	1/VIF
Age	1.87	0.5339
Employment status	1.65	0.6054
Marital status	1.47	0.6814
Gender	1.34	0.7465
Household size	1.26	0.7939
Education level	1.11	0.9041
Access to bank account	1.06	0.9413
Receiving remittances	1.06	0.9421
Owns other real estate	1.05	0.9497
Has informal debt	1.04	0.9572
Has consumer loan	1.02	0.9767
Has mortgage loan	1.01	0.9903
Mean VIF	1.25	

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TOP TEAM MANAGEMENT HETEROGENEITY: DOES IT IMPROVE LARGE COMPANIES' FINANCIAL PERFORMANCE?

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Abstract

The most crucial question in strategic management is the role of the top management team (TMT) in a company's overall success. Empirical studies support the thesis that the TMT plays an important role in defining companies' outputs, thereby focusing on TMT structure. The research question of this paper is as follows: What is the impact of TMT heterogeneity on large companies' performance in Croatia? The authors employed a secondary quantitative approach. A panel analysis was conducted from 2015–2020. The research included 62 large companies that met the requirements. The results indicated a positive impact of gender and cultural heterogeneity on companies' performance, as measured by return on assets (ROA). In the return on sale (ROS) model, a positive impact of TMT heterogeneity is not indicated. This paper contributes by identifying the TMT structure from heterogeneous aspects in Croatia and analysing the impact of heterogeneity on companies' performance in line with the recommendations for defining the TMT structure.

Keywords: *top management team, TMT heterogeneity, companies' performance*

JEL Classification: *G34, M14*

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1. Introduction

By separating the ownership and management of the company and hiring company managers, owners face the challenge of establishing top management teams (TMTs) to advance their ownership interests. Waldman, Javidan, and Varella (2004) claim that strategic management in the last few decades has focused on researching TMTs and their impact on strategy development and company performance. Upper echelons theory (UET) was developed to explain the role and operations of the TMT in managing the company, and it serves as the fundamental theoretical framework in strategic management (Tipurić 2014). This theory emphasizes the impact of TMT demographic heterogeneity on the company's outputs, and this heterogeneity serves as a proxy for TMT cognitive

heterogeneity (Angriawan 2009).

Highlights of TMT' demographic characteristics beyond psychological characteristics were crucial during the development of UET (Hambrick and Mason 1984). The concept of organizational demography was developed by Pfeffer. The concept is based on the collection of individual data in the company, but it also describes company characteristics. According to UET, the cognitive heterogeneity of the TMT strengthens TMT competence in data processing and decision-making, thereby improving company performance (Hambrick and Mason 1984). Therefore, Kraiczy, Hack, and Kellermanns (2015) states that the individual interpretation of current situations by managers in which they are operating directly impacts their behaviours and strategic choices, whereas Chin, Hambrick, and Treviño (2013) claim that the basic postulate of UET is that the difference between companies' performance arises from manager heterogeneity.

Numerous researchers have identified the impact of TMT heterogeneity on company performance (Marimuthu and Kolandaisamy 2009; Wang, He, and Zhou 2016; Lo, Wang, and Zhan 2019; Cambrea et al. 2017; Triana, Miller, and Trzebiatowski 2014; Chen and Liu 2018); this impact is regarded as mostly positive (Pfeffer 1985; Naranjo-Gil, Hartmann, and Maas 2008) because of new market entry (Díaz-Fernández, González-Rodríguez, and Pawlak 2014), innovative strategic approaches (Talke, Salomo, and Rost 2010), and companies' diversification (Pitcher and Smith 2001). Today, managers operate in extremely dynamic environments, and they are confronted with a high level of heterogeneity. In accordance with this literature, the research aims were defined as follows: (1) identify TMT demographic heterogeneity level in large Croatian companies and (2) examine the impact of TMT heterogeneity on large Croatian companies' performance. The structure of the paper is as follows: Section 2 provides a literature review on UET and heterogeneity, Section 3 describes the empirical methodology applied, Section 4 discusses empirical results. Finally, Section 5 concludes the paper with notable implications and further research recommendations.

2. Literature review

Two basic questions in strategic management are why differences exist between companies' strategies and why some companies are more successful than others (Anwar Quttainah 2015). One crucial issue for companies is how to define TMT composition. A TMT is considered balanced when its members come from different fields, which increases its efficiency (Hassan and Marimuthu 2016). A TMT can be regarded as a decision-making entity involved in companies' activities related to competitiveness (Yoon, Kim, and Song 2016). Top managers are individuals with the power and authority to make strategic decisions within the company (Yoon, Kim, and Song 2016), define resource-allocation decisions, and select projects and goals (Ruiz-Jiménez, Fuentes-Fuentes, and Ruiz-Arroyo 2016). Therefore, managers can be considered the most significant resource for companies (Kamran 2012), and company development depends on the power of top management (Wang, He, and Zhou 2016). Hambrick (2007) states that understanding why companies behave as they do requires examining the most powerful actors: top managers. Management is responsible for external and internal company activities, with some limitations in power (Iqbal, Ahmad, and Li 2021).

UET, developed by Hambrick and Mason (1984), presents a model in which top managers play a crucial role in defining a company's outputs (Carpenter, Geletkancz, and Sanders 2004; Tipurić 2014; Kraiczy, Hack, and Kellermanns 2015). According to Dang and Vo (2014), the research has identified a significant relationship between TMT demographic characteristics and company operations. Accordingly, Shen and Zhuo (2022) claim that the cognitive processes of TMT members, influenced by demographic characteristics, shape company strategy. Neely et al. (2020) state that, over the past 35 years, UET has remained among the most significant perspectives in strategic management, and current papers in this field provide evidence of its relevance.

The three elements of UET are limited rationality, measured characteristics, and TMT responsibility (Lee, Choi, and Moon 2018). The major idea of UET is that "*strategic choices are more of the outcome of behavioural factors than that of mechanical calculation for economic optimization*" (Chuang, Nakatani, and Zhou 2009, p. 186). UET defines a company's outputs and performance level partially based upon managers' characteristics (Hambrick and Mason, 1984; Alazzani, Hassanein, and Aljanadi 2017). The theory assumes that people with a high degree of impact in companies, top managers, contribute to formulating and defining strategic decisions on the basis of their values and intellect (Thambugala and Rathwatta 2021), respectively, according to their individual preferences or preconceptions (Mehrabi, Coviello, and Ranaweera 2021). Chadwick and Dawson (2018) define cognitive frames as personal interpretations of the environment shaped by an individual's experiences, values, and personality. Therefore, top managers' decisions are not always driven by utility maximization because

of the managers' individual cognitive frames and values (Lee, Choi, and Moon 2018). Cognitive frames and values affect the filtering and perception of information; therefore, they influence an individual manager's perception of alternatives and business decisions (Plöckinger et al. 2016). In line with these statements, TMT composition directly impacts the potential performance of companies (Moreno-Gómez, Lafuente, and Vaillant 2018).

In their model, Hambrick and Mason (1984) highlight group characteristics, which are the results of the social experiences of every group member since they impact the development of values and perceptions. Furthermore, the authors state that the discourse on group heterogeneity has roots in the sociological research about cohorts and claim that the demographic concept can apply to subgroups such as TMTs. Heterogeneity is expected to have a positive impact on profitability in turbulent and unstable environments, which are the conditions under which most companies currently operate (Hambrick and Mason 1984; Roberts 2018). UET defines two basic ideas. The first is that TMT characteristics have a stronger impact than individual manager characteristics do because leadership is a common activity among team members, and collective abilities, interactions, and cognition across the entire TMT shape strategic behaviour. The second idea is related to using demographic characteristics as proxy variables for TMT cognitive frames because conventional psychological data about managers are difficult to collect (Hambrick 2007). Various authors identify the following demographic characteristics in research: age, organizational tenure, functional background, educational level, socioeconomic roots, financial position, and group heterogeneity (Hambrick and Mason 1984). Abatecola and Cristofaro (2018) claim that, over the years, scientists have expanded the range of characteristics associated with race, gender, and age.

This analysis considers tenure heterogeneity, functional background heterogeneity, educational background heterogeneity, gender heterogeneity, and cultural background heterogeneity comprehensively. Tenure heterogeneity is defined as the hiring of managers in TMT positions at different times (Chaganti et al. 2016). Magnanelli, Paolucci, and Pirolo (2021) state that this type of heterogeneity enables the exploitation of advantages and the avoidance of the disadvantages that new and existing TMT members bring. Therefore, this type of heterogeneity enables compensation for differences in managers' skills, experiences, risk attitudes, and business familiarity during strategic decision-making processes (Shakil and Abdul Wahab 2023). Functional background heterogeneity is a proxy variable for the information, skills, knowledge, and expertise that individuals bring to a group (Williams and O'Reilly III 1998). This variable indicates experience; a major related premise is that this type of heterogeneity is related to the diversity in knowledge and skills of top managers (Díaz-Fernández, González-Rodríguez, and Pawlak 2014). Functional background heterogeneity enhances the availability of expertise across different fields, enabling a TMT to operate more efficiently when faced with challenges.

Regarding educational background heterogeneity, Bai, Tsang, and Xia (2018) state that the research supports the idea that university-level educations occur during sensitive periods for individuals, and this experience has a strong impact and a permanent effect on future decision-making. Furthermore, managers' educational backgrounds enhance entrepreneurial skills, improve the information analysis process, and develop cognitive skills (Kotorri and Krasniqi, 2018). This type of heterogeneity can improve problem-solving in a dynamic environment (Díaz-Fernández, González-Rodríguez, and Pawlak 2014), has a positive impact on differentiation strategy and the expansion of the business field (Yang and Wang 2014), and leads to knowledge heterogeneity (Kock and Talke 2012). Regarding gender heterogeneity, Chadwick and Dawson (2018) state that compared with males, females remain underrepresented in managing positions. Not only should the relationship between company performance and manager gender be studied but so should the relationship between performance and TMT gender heterogeneity (Moreno-Gómez, Lafuente, and Vaillant 2018). The inclusion of females on TMTs provides new sets of experience, thinking, and perspectives about company strategies and initiatives (Kolev and McNamara 2020). Dezso and Gaddis Ross (2012) claim that gender heterogeneity on TMTs leads to better management activities and, consequently, better company performance and that gender heterogeneity can be considered an important aspect of a company (Alazzani, Hassanein, and Aljanadi 2017). With regard to cultural heterogeneity, changes in workforce demographics and the high level of business internationalization have resulted in significant shifts in cultural heterogeneity on TMTs (Ponomareva et al. 2022). Cultural values, beliefs, and norms are significant because they influence how people work in companies, and cultural heterogeneity enhances learning by combining different perspectives and interpretations to generate new solutions (Corritore, Goldberg, and Srivastava 2020). Furthermore, Taboroši et al. (2023) claim that national culture affects different types of job performance.

TMT heterogeneity involves differences between

TMT members linked to demographic characteristics and the importance of cognitive aspects, values, and experiences (Zhang 2007). The heterogeneity concept assumes that both individual and group characteristics, i.e., the TMT, are important (Prosvirkina and Wolfs 2021). In accordance with UET, TMT cognitive heterogeneity enhances their information-processing, decision-making, and problem-solving abilities (Zhang 2007), thereby improving company performance (Hambrick and Mason 1984). Yoon, Kim, and Song (2016) highlight that ensuring differences in knowledge and information is a basic postulate of TMT heterogeneity. Previous research has shown that heterogeneity enhances TMT efficiency (Moreno-Gómez, Lafuente, and Vaillant 2018) and influences entrepreneurial behaviour positively (Su, Yang, and Wang 2022). High levels of creativity, innovation, and quality in the decision-making process and high flexibility levels in everyday operations are expected outcomes of TMT heterogeneity (Angriawan 2009). In addition, homogeneity can lead to groupthink (Hambrick and Mason 1984).

Numerous theoretical and empirical papers support TMT heterogeneity as a positive approach. Many empirical studies have reported a significant, positive impact of TMT heterogeneity on company performance, as measured by financial and nonfinancial indicators. Furthermore, the studies show that demographic characteristics influence company strategy, international activities, acquisition activities (Carpenter, Geletkancz, and Sanders 2004), and strategic approaches to social responsibility (Thambugala and Rathwatta 2021). Kock and Talke (2012) conducted research across 317 companies operating in Europe and the USA and reported a positive impact of TMT heterogeneity on the strategic orientation towards innovation, which affects company performance positively. Meng, Yan, and Cao (2019) examined Chinese companies listed on stock exchanges and reported that functional background heterogeneity among TMTs affects direct foreign investment positively. Byron and Post (2016) conducted a meta-analysis including 26710 companies across 20 countries and identified a positive impact of gender heterogeneity on boards with respect to companies' social responsibilities. Companies with more women on their management boards achieve better social responsibility outcomes and greater prestige. Therefore, on the basis of the abovementioned statements by different authors, it can be concluded that TMT heterogeneity impacts the definition of company strategy.

Certo et al. (2006) and Magnanelli, Paolucci, and Pirolo (2021) observed a positive impact of TMT tenure heterogeneity on company performance. Empirical studies by Certo et al. (2006), Cannella, Park, and Lee (2008), and Auden, Shackman, and Onken (2006) revealed a positive impact of TMT functional background heterogeneity on companies' performance. Cambrea et al. (2017) and Akram et al. (2020) identified the positive impact of TMT educational background heterogeneity. The literature on TMT gender heterogeneity has shown a positive impact on companies' performance (Dezso and Gaddis Ross 2012; Cambrea et al. 2017; Chadwick and Dawson 2018). Similarly, Lo, Wang, and Zhan (2019), Marimuthu and Kolandaisamy (2009), Nielsen and Nielsen (2013), and Akram et al. (2020) reported a positive impact of TMT cultural heterogeneity on companies' performance. The formulated hypotheses are as follows:

H1. TMT heterogeneity has a positive impact on the performance of large Croatian companies.

- H1.a. TMT tenure heterogeneity has a positive impact on the performance of large Croatian companies.
- H1.b. TMT functional background heterogeneity has a positive impact on the performance of large Croatian companies.
- H1.c. TMT educational background heterogeneity has a positive impact on the performance of large Croatian companies.
- H1.d. TMT gender heterogeneity has a positive impact on the performance of large Croatian companies.
- H1.e. TMT cultural heterogeneity has a positive impact on the performance of large Croatian companies.

3. Methodology

The research sample included large Croatian companies. According to Financial Agency's online database, info.biz, on November 26, 2020, an initial research sample of large companies was defined. The sample included all economic activities. The initial sample included 364 companies. In accordance with the paper's research aim and the heterogeneity analysis, the final research sample consisted of large companies with TMTs of at least three members (Lo, Wang, and Zhan 2019). To obtain a balanced sample and ensure the possibility of a heterogeneity analysis in the study, companies in the sample had to meet the following criteria: (1) the company continuously operated from 2015–2020, (2) the company was a limited (Ltd.) or a joint-stock company, (3) the company had a dualistic governance model, (4) and the company continuously had three or more TMT members from

2015–2020. The TMT was defined as the management board. This board presents objective and unambiguous indicators of membership in top management (Thompson 1967; Mace 1971, according to Finkelstein and Hambrick 1990), in line with the dualistic governance model typical of Croatian companies. After secondary research was conducted and data on the five characteristics of heterogeneity among TMT members were collected, the final research sample comprised 62 companies. The authors defined two research models (equations (1) and (2)) for two dependent variables.

$$ROA_{i,t} = \alpha 0 + \beta 1\ HTENURE_{i,t} + \beta 2\ HFBACKGROUND_{i,t} + \beta 3\ HEBACKGROUND_{i,t} + \beta 4\ GENDER_{i,t} + \beta 5\ CULTURE_{i,t} + \beta 6\ FSIZE_{i,t} + \beta 7\ ATENURE_{i,t} + \beta 8\ TMT\ SIZE_{i,t} + \beta 9\ INDUSTRY_{i,t} + U_i + \varepsilon_{i,t} \quad (1)$$

$$ROS_{i,t} = \alpha 0 + \beta 1\ HTENURE_{i,t} + \beta 2\ HFBACKGROUND_{i,t} + \beta 3\ HEBACKGROUND_{i,t} + \beta 4\ GENDER_{i,t} + \beta 5\ CULTURE_{i,t} + \beta 6\ FSIZE_{i,t} + \beta 7\ ATENURE_{i,t} + \beta 8\ TMT\ SIZE_{i,t} + \beta 9\ INDUSTRY_{i,t} + U_i + \varepsilon_{i,t} \quad (2)$$

Company performance, a dependent variable in the research model, is measured by financial indicators. To measure company performance, two financial ratios are used: (1) return on assets (ROA), which is net profit divided by total assets (Díaz-Fernández, González-Rodríguez, and Pawlak 2014) and (2) return on sales (ROS), which is net profit divided by total sales (Díaz-Fernández, González-Rodríguez, and Pawlak 2014). These indicators are chosen in addition to capital profitability because the research on UET has identified greater volatility in capital profitability indicators than in ROA and ROS (Díaz-Fernández, González-Rodríguez, and Pawlak 2014). These variables were used in the research models of Lo, Wang, and Zhan (2019), Cambrea et al. (2017), Díaz-Fernández, González-Rodríguez, and Simonetti (2020), Harrison et al. (2019), Mohr and Batsakis (2019), and Martino, Rigolini, and D'Onza (2020).

The data on the independent variables were collected at the individual level (for each TMT member) and synthesized at the team level using heterogeneity measures to define heterogeneity across all of the TMTs. The TMTs' tenure heterogeneity was calculated by the coefficient of variation (Talke, Salomo, and Rost 2010; Ormiston, Wong, and Ha 2021). The functional background of all of the TMT members was classified into eight categories according to Kock and Talke (2012) and it was measured by the Blau index (Ormiston, Wong, and Ha 2021). The educational background of all of the TMT members were classified into six categories according to *Pravilnik o znanstvenim i umjetničkim područjima, poljima i granama*, br. 34/16, and it was measured by the Blau index (Ormiston, Wong, and Ha 2021). The TMTs' gender heterogeneity is the share of females on the TMTs divided by the total number of TMT members (Byron and Post 2016). The TMTs' cultural heterogeneity was measured by the proxy variable, team members' nationality (Lo, Wang, and Zhan 2019; Elron 1997; Cambrea et al. 2017; Marimuthu and Kolandaisamy 2009).

Therefore, the following control variables were included in the research model: company size (Fung et al. 2020; Magnanelli, Paolucci, and Pirolo 2021), average tenure (Hsieh et al. 2018; Mohr and Batsakis 2019), industry (Tanikawa and Jung 2016; Pemer, Börjeson, and Werr (2020), and TMT size (Jiang et al. 2020; Wrede and Dauth 2020). Company size is a control variable because it is expected to impact performance (Nielsen and Nielsen 2013) and the managerial discretion level (Finkelstein and Hambrick 1990). Average tenure is a control variable in situations in which TMT tenure heterogeneity is measured by the variation coefficient (Carpenter and Fredrickson 2001). Industry is a control variable because different managerial discretion levels are observed across industries (Finkelstein and Hambrick 1990). Tipurić (2020) observes lower managerial discretion levels in the telecommunications, hospitality, gas and oil distribution, and utility industries and higher managerial discretion levels in the fashion, food, and IT industries. Measuring TMT heterogeneity depends on TMT size (Wang, He, and Zhou 2016). TMT size is the total number of TMT members (Marimuthu and Kolandaisamy 2009). The variables are described in Table 1.

To test the paper's hypotheses, panel data (balanced panel) with time and range dimensions were used. The range dimensions pertained to the 62 companies, and the time dimension spanned from 2015–2020. A panel data analysis was employed for several reasons. It is applicable to the analysis of more variables across several time periods in cases of heterogeneity between companies (Gali et al. 2016). Therefore, this analysis has been used in empirical studies concerning UET (Kolev and McNamara 2020; Mohr and Batsakis 2019; Jiang et al. 2020; Kaur and Singh 2019). The paper's hypotheses were tested using two research models with the dependent variables ROA and ROS. Before Hausman's tests were conducted to determine whether the model is more appropriate with fixed or random effects (Jiang et al. 2020), the suitability of the models was assessed; i.e., the statistical assumptions underlying the above analysis were tested.

The following diagnostic tests were subsequently performed: normality, multicollinearity, linearity, autocorrelation, and heteroskedasticity. The tests revealed that the residuals were not normally distributed in

Table 1. Variable in the study

Variable	Measure	Source
Return on assets (ROA)	Net profit divided by total assets	Díaz-Fernández, González-Rodríguez, and Pawlak (2014)
Return on sales (ROS)	Net profit divided by total sales	Díaz-Fernández, González-Rodríguez, and Pawlak (2014)
TMT tenure heterogeneity (HTENURE)	The number of years that TMT member had spent in the team up to year t (coefficient of variation)	Talke, Salomo, and Rost (2010)
TMT functional background heterogeneity (HFBACKGROUND)	TMT members was classified into the following categories: financial, marketing, human resource management, production, research and development, information technology, law, and others (Blau index)	Kock and Talke (2012)
TMT educational background heterogeneity (HEBACKGROUND)	TMT members was classified into the following categories: natural science, technical science, biomedical science and health, human science, art, and others (Blau index)	Pravilnik o znanstvenim i umjetničkim područjima, poljima i granama, br. 34/16
TMT gender heterogeneity (GENDER)	The share of females on the TMTs divided by the total number of TMT members	Byron and Post (2016)
TMT cultural heterogeneity (CULTURE)	Number of TMT members of non-Croatian nationality divided by the total number of TMT members	Marimuthu and Kolandaisamy (2009)
Company size (FSIZE)	Total assets	Chen and Liu (2018)
Average tenure (ATENURE)	The average number of years that TMT members have spent on the team in year t.	Hsieh et al. (2018)
TMT size (TMT SIZE)	The total number of TMT members	Marimuthu and Kolandaisamy (2009)
Economic activity (INDUSTRY)	Industries with lower managerial discretion levels were labelled 0, those with higher levels were labelled 1, and the others were labelled 2	Tipurić (2020)

either model. However, Hair et al. (2006) and Tabchnick and Fidell (2007) claim that in situations with more than 200 observations, the present models have 372 observations. Therefore, both models exhibit autocorrelation and heteroskedasticity, and adjustments were made to address these results. Gujarati (2003), Hamid Mohsin (2021), Yaffee (2005), and Abdul Wahab and Hassan Shakil (2018) suggest the application of robust standard errors and covariance (White). Hausman's test indicated that the model with a random effect is more suitable for both of the dependent variables (ROA & ROS). Accordingly, Cannella, Park, and Lee (2008) argue that a random-effects model is more suitable when the sample has stable independent variables over time, as in the present model, because TMTs in some companies are constant, so TMT heterogeneity does not change over time.

The results of the ROA model are presented in Table 2. The ROA model revealed a positive and significant impact of the TMT's cultural heterogeneity on the company's performance, as measured by the ROA ($\beta = 0.0694$; $p<0.05$). On the basis of these results, H1.e is partially accepted. Furthermore, the results show a significant and positive impact of the TMT's gender heterogeneity on company performance, as measured by ROA ($\beta = 0.0694$; $p<0.05$), thereby partially supporting H1.d. The other variables that defined TMT heterogeneity on the basis of tenure, functional background, and educational background were insignificant in the research model. On the basis of these results, H1.a, H1.b, and H1c cannot be accepted.

The results of the ROS model are presented in Table 3. The ROS model revealed a significant and negative impact of the TMT's educational background heterogeneity on company performance measured by the ROS ($\beta = -0.0879$; $p<0.05$); thus, H1.c is not accepted. The other variables that defined TMT heterogeneity—tenure, functional background heterogeneity, and educational background—demonstrated no significant effect in the ROS research model. The results indicate a positive and significant impact of the TMT's gender and cultural heterogeneity on company performance measured by the ROA. Consequently, H1, TMT heterogeneity affects the performance of large Croatian companies positively, is partially accepted.

Table 2. Panel analysis results for the ROA model

ROA Model	coefficient
Independent variables	
c	0.0380 (0.2174)
TMT tenure heterogeneity	-0.0155 (0.2816)
TMT functional background heterogeneity	-0.0086 (0.8681)
TMT educational background heterogeneity	-0.0089 (0.7630)
TMT gender heterogeneity	0.0432** (0.0499)
TMT cultural heterogeneity	0.0694** (0.0110)
Company size	1.16E-12 (0.2979)
Average tenure	-0.0001 (0.9066)
Industry	-0.0073 (0.4642)
TMT size	0.0053 (0.2021)

*p<0.1; **p<0.05; ***p<0.01

Source: Author calculators

Table 3. Panel analysis results for the ROS model

ROS Model	coefficient
Independent variables	
c	0.0902 (0.1970)
TMT tenure heterogeneity	-0.0200 (0.2237)
TMT functional background heterogeneity	-0.0717 (0.3656)
TMT educational background heterogeneity	-0.0879** (0.0337)
TMT gender heterogeneity	0.0256 (0.2689)
TMT cultural heterogeneity	0.0163 (0.4765)
Company size	9.56E-13 (0.3551)
Average tenure	-0.0009 (0.7910)
Industry	-0.0219* (0.0564)
TMT size	0.0215 (0.1894)

*p<0.1; **p<0.05; ***p<0.01

Source: Author calculators

4. Results and discussion

The analysis identified the positive and significant impact of the TMT gender heterogeneity on company performance measured by the ROA. Similar results have been obtained in the literature: Dezso and Gaddis Ross (2012), Cambrea et al. (2017), and Chadwick and Dawson (2018). Ensuring gender heterogeneity can have a positive impact, because including women in TMTs leads to new experiences, thinking, and perspectives about company strategy and initiatives (Kolev and McNamara 2020), which increases creativity and innovation and improves the process of decision-making (Wellalage and Locke 2013). These results can be linked to requirements to include females in the higher management structure in companies at the European Union level, as in the rest of the world, but empirical studies show that females are still underrepresented in managing positions in companies (Chadwick and Dawson 2018).

It is important to highlight the positive impact of TMT gender heterogeneity, which leads to differences in the experience of and insights into certain business aspects. In addition, these results can be interpreted as females in companies facing the glass ceiling, who are striving harder in business environments, education, and specialization and are often gaining more business experience than men in the same positions are. For the past decade, gender heterogeneity in Europe has been a focus. Additionally, when the Women on Boards Directive was implemented in December 2022, the focus was on larger companies (iod.com 2023), so these results are crucial from an institutional perspective. Furthermore, the ROS model revealed an insignificant effect of the TMT gender heterogeneity on company performance, which is consistent with the results of Marimuthu and Kolandaisamy (2009).

The results indicate a positive and significant impact of the TMT' cultural heterogeneity on company performance measured by the ROA. Some studies have produced identical results: Lo, Wang, and Zhan (2019) and Akram et al. (2020). The positive impact of cultural heterogeneity stems from the fact that cultural values, attitudes, and norms significantly shape how people perform their tasks, accelerate learning, and combine diverse perspectives to generate new solutions (Corritore, Goldberg, and Srivastava 2020). In

addition, the positive impact of cultural heterogeneity can be observed in international experience, which provides top managers with a broader range of experience in international business activities and thereby improves business outcomes. The findings of Cambrea et al. (2017) indicated that TMT cultural heterogeneity had an insignificant impact on company performance, as indicated by the ROS model.

The analysis indicated a significant negative impact of TMT educational background heterogeneity company performance, as measured by the ROS. Chen and Liu (2018) and Li, Zhang, and Zhang (2015) reported similar findings. These results can be linked to the social identity perspective, as noted by Aboramadan (2020), because such heterogeneity can reduce communication and team cohesiveness and negatively impact company performance through intrateam conflicts. Social identity theory has a pessimistic view of heterogeneity (Mannix and Neale, 2005; Kagzi and Guha, 2018 according to Vetchagool (2025). Furthermore, Zhang, Wang, and Wang (2017) argue that the direction of this heterogeneity is influenced by the social context in which managers operate. Differences in educational backgrounds among TMT members can lead to different insights into business activities, bring different fields into focus, and eventually reduce team communication, thereby reducing TMT efficiency and company performance.

The other demographic dimensions—TMT tenure heterogeneity, functional background heterogeneity, and educational background heterogeneity—were not identified as having a positive or significant impact in either model (ROA and ROS), in line with the findings of Díaz-Fernández, González-Rodríguez, and Pawlak (2014) and Certo et al. (2006). Moreover, these dimensions have been shown to have both positive (Tanikawa and Jung 2016) and negative effects (Chen and Liu 2018). An explanation for these results could be that TMTs in Croatian companies exhibit lower to medium heterogeneity levels, which may affect the research results. A common problem in UET studies is inconsistent results (Nielsen 2010; Díaz-Fernández, González-Rodríguez, and Simonetti 2020; Díaz-Fernández, González-Rodríguez, and Simonetti 2015). Kokot, Tipurić, and Klačmer Čalopa (2021) claim that gaps in UET research result from the use of unsuitable methodologies, the omission of moderating variables, and the absence of psychological variables as a group dynamic.

Notably, otherwise comparable studies have been conducted in different geographical areas (Malaysia, Spain, the USA, Taiwan, and Italy), demonstrating that the research results can be identical despite differences in market characteristics. Agnihotri and Bhattacharya (2015) state that managers' demographic characteristics are more significant in a developing market because the human talent market is not fully developed; thus, managers must rely on internal talent when making strategic decisions. Therefore, demographic characteristics have a more significant effect in the Croatian market. In line with this concept, the results of the current study indicate that gender and cultural heterogeneities are significant. Less developed markets enable a greater impact of TMT heterogeneity in demographic characteristics on company performance. Additionally, the insignificant impact of some demographic characteristics suggests that managers' markets in Croatia are becoming increasingly developed and internationalized, possibly diminishing the significance of TMT heterogeneity for company performance.

During the interpretation of the results, awareness of research limitations is crucial. The first limitation concerns the sample size, 62 companies. The target research population comprises 364 companies. In line with the research aims and methodology, numerous companies had to be excluded. Furthermore, the lack of transparency about managers' information decreased the sample size. The level of managerial discretion was included in the research model through the industry variable, a proxy that also represents a research limitation. According to the literature, numerous factors can impact managerial discretion, and direct measurement can improve research results (Xie 2014). Moreover, the hypothesis testing excluded the internal and external environments in which the TMT members operate, such as group dynamics, innovation, and corporate entrepreneurship. A recommendation for future empirical studies is to include job demands in the research model. Therefore, a recommendation for future studies is to include more variables to describe the context in which TMTs operate and to explore group dynamics, employee loyalty, internationalization, and other factors that could moderate the association between TMT heterogeneity and company performance. Additionally, it is important to analyse nonfinancial performance because heterogeneity can affect employees' creativity, innovation, and corporate responsibility.

5. Conclusion

The TMT is a significant factor in defining and improving a company's efficiency, as demonstrated in the literature. UET provides the theoretical background for the numerous empirical studies analysed. Today, managers operate in a dynamic environment

while facing high heterogeneity within TMTs. Hence, companies must define a TMT structure that will lead to excellent performance. UET and the relevant research have identified gaps in the scientific knowledge and open questions, especially in Croatia. The scientific contribution of this paper lies in defining the TMT structure in terms of its demographic characteristics, according to the need for more information about TMT members. Additionally, the impact of TMT heterogeneity on the performance of a large Croatian company was analysed.

In line with the results of the secondary quantitative research, answers to the research questions are provided, and the scientific contribution could lead to an increase in studies, especially in Croatia, where heterogeneity dimensions are not well researched. The results indicated the positive impact of TMT cultural and gender heterogeneity on company performance, whereas a negative impact of the TMT educational background heterogeneity was identified. These results suggest that TMT heterogeneity is important and cannot be overlooked because some aspects of heterogeneity can impact company performance in both directions. The research results confirm the inconsistency in UET results. In Croatia and other countries, research gaps remain; thus, the authors offer recommendations for future research.

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THE RELATIONSHIP BETWEEN EXTERNAL DEBT AND ENVIRONMENTAL QUALITY IN TÜRKIYE: A FRACTIONAL FREQUENCY FOURIER ARDL BOUNDS TEST APPROACH

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Abstract

As efforts to achieve global sustainability goals intensify, it is increasingly important to understand the environmental consequences of countries' economic policies, particularly the impact of macroeconomic variables such as external debt. This study analyses the impact of Türkiye's external debt on environmental sustainability for 1970–2023 using the Fractional Frequency Fourier Autoregressive Distributed Lag (FFF-ARDL) method. Moreover, the variables of economic growth, renewable energy consumption (REN), and non-renewable energy (NREN) consumption were included in the model, and the Environmental Kuznets Curve (EKC) hypothesis was tested. Carbon dioxide (CO2) emissions were used as a proxy for environmental sustainability. The long-run coefficient findings indicate that increases in external debt reduce CO2 emissions, while economic growth initially increases emissions but then declines after a certain income threshold, confirming the EKC hypothesis. Moreover, REN energy consumption decreases CO2 emissions, whereas NREN energy consumption increases them. The Fourier Toda-Yamamoto test results indicate unidirectional causality running from CO2 emissions, REN, and external debt to NREN consumption. There is also unidirectional causality running from economic growth, REN, and NREN consumption to external debt. These findings suggest that Türkiye's external debt management and the transition toward REN sources are crucial for reducing CO2 emissions.

Keywords: *Environmental sustainability, economic growth, renewable energy consumption, external debt, fractional frequency fourier ARDL, Türkiye*

JEL codes: *Q53, Q56, F34, C22*

1. Introduction

As the devastating effects of climate change and environmental degradation become increasingly evident globally, sustainability has become a top priority on the international agenda. Considering the interaction between countries' economic growth models, financial structures, and environmental protection policies is vital. Developing and emerging market economies face the dilemma of preserving their natural assets and leaving an environmentally sound legacy for future generations while feeling compelled to achieve economic progress that enhances their populations' welfare (Baret and Menuet 2024).

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External borrowing has commonly financed these countries' economic development. However, recent scholarly studies (Akam et al. 2022; Bachegour and Qafas 2023; Carrera and de la Vega 2024; Saleem, Ahmed, and Samour 2024; Warsame, Dirie, and Nor 2024) have begun to question the potential negative environmental consequences of these financial strategies for environmental sustainability. These studies raise concerns that increasing external debt levels may lead to economic activities that intensify environmental pressure.

The link between the growing burden of external debt and environmental degradation is multifaceted and complex, requiring in-depth analysis. It can manifest through various transmission routes. One approach suggests that governments burdened by heavy external debt service obligations may be tempted to reduce public spending on environmental protection to redirect their limited fiscal space toward debt repayments or relax environmental standards to attract foreign investment and boost economic growth (Dong et al. 2018; Carrera and de la Vega 2024). Moreover, to generate the foreign currency inflows needed for external debt repayments, countries may resort to unsustainable and excessive exploitation of natural resources, including forests, minerals, and other natural assets, which can lead to serious ecological consequences, such as deforestation, soil erosion, water pollution, and irreversible biodiversity loss (Akam et al. 2022; Saleem, Ahmed, and Samour 2024). These mechanisms illustrate how economic pressures can lead to sacrificing long-term environmental health in search of short-term solutions. This perspective aligns with the debt overhang hypothesis, which posits that excessive debt burdens constrain fiscal capacity and distort investment priorities, often at the expense of environmental protection (Krugman 1988; Xu et al. 2022; Hu et al. 2024; Carrera and de la Vega 2024; Saleem, Ahmed, and Samour 2024).

Conversely, there is a different view that external financing flows can inherently support environmental sustainability; this perspective argues that environmental quality can be enhanced through the strategic use of external debt, particularly to accelerate the transition to renewable energy (REN) or to finance pollution-reducing infrastructure projects. However, whether this positive potential will be realised depends on the specific projects toward which debt resources are directed and how rigorously the environmental impacts of these investments are assessed. The fact that empirical studies generally depict that economic growth, at least in its initial stages, intensifies environmental pressures (Akam et al. 2022) further complicates the question of how external debt shapes environmental outcomes while simultaneously promoting economic growth. The Environmental Kuznets Curve (EKC) hypothesis provides a theoretical lens here, suggesting that environmental degradation follows an inverted U-shaped trajectory with respect to income levels: pollution rises during early growth phases but declines after a certain income threshold (Grossman and Krueger 1991, 1995). External debt can influence this trajectory by accelerating growth while potentially delaying the EKC turning point if debt-financed projects are environmentally harmful rather than green (Bachegour and Qafas 2023).

Furthermore, the Pollution Haven Hypothesis offers another important explanatory channel, arguing that countries with weaker environmental regulations may attract foreign direct investment (FDI) in polluting industries, a dynamic that can be indirectly reinforced by debt-driven liberalisation policies (Cole, Elliott, and Fredriksson 2006; Millimet and Roy 2016; Garsous and Kozluk 2017; Gill, Viswanathan, and Abdul Karim 2018; Dagar et al. 2022; Chiappini and Gerard 2025). Therefore, external borrowing may not only affect domestic fiscal choices but also shape the regulatory environment and investment patterns, thereby amplifying environmental risks in emerging economies.

Considering this global context and general trends, the case of Türkiye, which is both a dynamic emerging economy and is increasingly exposed to environmental pressures, deserves academic scrutiny. Türkiye has employed external borrowing as a strategic and widely used instrument to finance the rapid economic growth triggered by free-market-oriented reforms adopted in the 1980s. Factors such as global financial shocks, regional instability, and the country's domestic economic requirements have significantly increased Türkiye's external debt stock (EXTD) over time (Beşe and Friday 2022). This financing has generally facilitated investments in mega infrastructure projects, urbanisation, and the expansion of industrial capacity. However, this accelerated economic and physical transformation process also incurs environmental costs that cannot be overlooked. Türkiye faces serious environmental challenges, such as rapidly rising energy demand and a consequent increase in greenhouse gas emissions (Saleem Jabari, Aga, and Samour 2022), which may partly reflect the debt-financed growth model.

Empirical research in the Turkish context confirms the expected multifaceted and complex relationship between external debt accumulation and environmental sustainability. For instance, Beşe and Friday (2022) revealed that external debt can significantly impact environmental emissions and ecological footprints by influencing economic growth

dynamics. Similarly, Saleem Jabari, Aga, and Samour (2022) examined the relationship between Türkiye's external debt levels and the country's adoption and consumption of REN sources. These and similar studies strongly suggest that external debt is not only a general macroeconomic variable but also a critical factor influencing a country's production structure and energy dependencies, and thus its overall environmental performance through both indirect and direct channels. Türkiye's continued heavy reliance on fossil fuels, despite its substantial REN potential (Saleem Jabari, Aga, and Samour 2022), underscores the need for a detailed and critical analysis of the role of external debt in the country's transition to a cleaner energy system.

The central research question of this study can be articulated as follows: "Whether Türkiye's accumulated EXTD has had a statistically significant impact on the country's environmental sustainability performance (CO_2) over the broad period between 1970 and 2023, and if so, what is the nature (positive or negative) and severity of this impact" In addition to this main enquiry, the study also addresses the direct or indirect effects of variables that may mediate the environmental consequences of debt accumulation, such as the pace of economic growth (GDP per capita and GDP per capita squared), and the use of REN and non-renewable energy sources (NREN) sources. Furthermore, the methodological framework of this study includes the identification and assessment of potential structural changes or breaks in the Turkish economy or environmental policies that may have occurred from 1970 to 2023, which could affect the analysis.

Focusing on the Turkish economy, this study utilises annual time series data covering the period from 1970 to 2023, a choice made considering the limitations arising from the availability of datasets. The analytical framework is based on a model with carbon dioxide (CO_2) emissions as the environmental indicator and economic growth (GDP and GDP^2), REN, NREN consumption, and EXTD accumulation as the main explanatory variables. To effectively capture potential long-run stable relationships and short-run dynamics among the variables, the methodological approach employed is the Fractional Frequency Fourier ARDL (FFF-ARDL), which is more robust to potential structural breaks in the series.

The following sections of the paper are organised as: In the next section, we provide a comprehensive review of the existing empirical literature on the relationship between external debt and the environment both internationally and in Türkiye. Next, the characteristics of the dataset used in the study are detailed, and the econometric methodology applied is explained according to scientific principles. In the fourth section, the findings of the econometric analyses are rigorously presented and interpreted. The final section summarises the main conclusions of the study, providing concrete implications and recommendations for policymakers and guiding suggestions for potential areas of future research.

2. Literature Review

The complex and multi-faceted relationship between economic growth, development processes, and efforts to protect the environmental health of the planet has recently become one of the most hotly debated topics in both economic literature and environmental science. Within this broader framework, external borrowing, which developing nations have extensively used to finance their development efforts, has attracted increasing academic attention for its effects on macroeconomic performance and its environmental consequences. This emerging literature focuses on gaining a deeper understanding of the mechanisms through which the accumulation of external debt can affect environmental quality directly or indirectly. The following section provides a closer look at the literature by summarising the main findings of key seminal and influential studies in this area.

Katircioglu and Celebi (2018) analysed the relationship between CO_2 emissions and EXTD using the ARDL method, drawing on data from Türkiye from 1960 to 2013. Their empirical results indicate a positive correlation between EXTD and CO_2 emissions, which is attributed to the idea that increasing debt stimulates investments and raises energy demand, thereby worsening environmental pollution.

In a study on China, Beşe, Friday, and Özden (2021a) investigated the link between CO_2 emissions and EXTD for 1984–2018 using an ARDL model. Their analysis demonstrated that, in addition to EXTD, energy consumption and economic growth also significantly and positively affect CO_2 levels. In another study, Beşe, Friday, and Özden (2021b) examined the effects of EXTD on CO_2, methane, and emissions from various fossil fuel consumptions in India for 1971-2012, again applying the ARDL technique. This study confirms the positive and significant effect of EXTD on CO_2 and finds an inverted U-shaped relationship between economic development and methane and gas fuel emissions.

Akam, Owolabi, and Nathaniel (2021) analysed the growth-energy-emissions relationship of 33 heavily indebted poor countries (HIPCs) from 1990 to 2015 using DCCE-MG, AMG, and CCE-MG estimators. Their

empirical results revealed that economic growth negatively affects the environment by increasing CO_2 emissions, whereas REN promotes environmental sustainability by reducing CO_2 emissions. The study also found that EXTD contributes to higherCO_2 emissions. Akam et al. (2022) investigated the environmental impacts (CO_2 and ecological footprint [EF]) of EXTD in South Africa, Algeria, Nigeria, and Egypt (SANE) from 1970 to 2018 using the AMG method. Their findings demonstrate that economic growth and energy consumption increase environmental pressure, whereas EXTD increases the EF, particularly in South Africa and Algeria. This study also provides policy recommendations for reducing dependence on NREN.

Using the Bootstrap ARDL method for Türkiye, Xu et al. (2022) examined the dynamic effects of EXTD, energy use, and real income on the EF from 1985 to 2017. Their empirical analysis found that EXTD positively impacts environmental quality in both the short and long run, whereas energy consumption and real income have negative effects. This study recommends that Türkiye focus on debt consolidation programs to achieve long-term environmental sustainability goals. Beşe and Friday (2022) examined the relationships between CO_2, EF, GDP, and EXTD in Türkiye from 1970 to 2016 using the ARDL method. Their empirical findings show an inverted U-shaped relationship between CO_2 and EXTD, but not between EF and EXTD. They also concluded that GDP has a significant, long-run impact on the EF.

Samour and Adebayo (2022), evaluating the environmental quality of BRICS countries through the Load Capacity Factor (LCF), investigated the impact of EXTD and REN utilisation for 1990–2018 using MMQR, CCEMG, and AMG methods. Their analysis demonstrated that REN positively impacts LCF in the BRICS countries, whereas NREN, EXTD and GDP negatively affect LCF. Carrera and de la Vega (2024) examined the causal effect of EXTD on greenhouse gas emissions in 78 emerging and developing market economies from 1990 to 2015 using panel data analysis and found that EXTD increased emissions.

Sadiq et al. (2022) investigated the relationship between CO_2 emissions and EXTD for BRICS countries from 1990 to 2019 using CS-ARDL, CCEMG, and AMG methods and intriguingly found that EXTD supports environmental sustainability. This study suggests that the EXTD can positively promote ecological sustainability by financing green energy investments.

Farooq et al. (2023) examined the relationship between EXTD and ecological degradation (through indicators such as CO_2, NO_2, CH_4, EF, and WEF) in Organisation of Islamic Cooperation (OIC) countries for 1996–2018 using the panel GMM method. They concluded that increasing debt levels leads to greater ecological degradation. Alhassan and Kwakwa (2023) analysed the impact of EXTD on CO_2 emissions in Ghana from 1971 to 2018 using the FMOLS method and found that EXTD had a U-shaped effect on CO_2 emissions. Bachegour and Qafas (2023) analysed the relationship between EXTD and CO_2 emissions in Morocco from 1984 to 2018 using the ARDL model and found that EXTD has a significant negative effect on CO_2 emissions.

Warsame, Dirie, and Nor (2024) investigated the impact of EXTD and government expenditure on CO_2 emissions in Somalia from 1990 to 2019 using the ARDL, FMOLS, and DOLS methods. Their empirical findings report that increased EXTD and government expenditure lead to higher CO_2 emissions. The study suggests that debt and expenditures should be directed toward environmentally sustainable projects. Saleem, Ahmed, and Samour (2024) examined the impact of EXTD and REN on LCF in Brazil from 1970to 2021 using the A-ARDL method. They found that while REN positively affects ecological sustainability and growth by increasing LCF, an increase in EXTD negatively impacts ecological sustainability and growth by decreasing LCF.

Shamwil et al. (2024) examined the effects of EXTD, FDI, financial development, and REN on environmental sustainability in Nigeria from 1990 to 2022 using the ARDL method. Their empirical analysis concluded that EXTD, REN, and FDI improve environmental sustainability in both the short and long run, whereas financial development reduces environmental quality. This study recommends that Nigeria prudently manage EXTD and channel funds into REN investments. Finally, Yakubu and Aladejare (2025) investigated the impact of EXTD on ecological sustainability in 44 African countries from 1990 to 2020 using the CS-ARDL method and found that EXTD negatively affects ecological sustainability in the short and long run.

The varied empirical evidence in the literature suggests that the environmental consequences of external debt burdens can vary significantly depending on the country under study, the period of analysis, the econometric methods applied, and the set of specific variables included in the model. Although the general trend provides evidence that external debt exacerbates environmental degradation, some studies suggest that the strategic allocation of debt resources to "green" projects or under certain institutional and economic conditions can improve environmental quality. Previous research focusing on Türkiye also presents varied and sometimes contradictory results due to different periods and methodological approaches. This study investigates the complex interplay between

Table 1. Summary of Literature

Author(s) (Year)	Country/Region (Period)	Methodology	Result
Katırcıoğlu and Çelebi (2018)	Türkiye (1960–2013)	ARDL	EXTD increases CO2 emissions.
Beşe, Friday, and Özden (2021a)	China (1984–2018)	ARDL	EXTD, energy consumption, and GDP increase CO2 emissions.
Beşe, Friday, and Özden (2021b)	India (1971–2012)	ARDL	EXTD increases CO2 emissions; inverted U-shaped link for methane and gas fuel emissions.
Akam, Owolabi, and Nathaniel (2021)	33 HIPCs (1990–2015)	DCCE-MG, AMG, CCE-MG	GDP & EXTD increase CO2 emissions; REN reduces emissions.
Akam et al. (2022)	SANE (South Africa, Algeria, Nigeria, Egypt) (1970–2018)	AMG	GDP & energy use worsen environment; EXTD increases EF.
Xu et al. (2022)	Türkiye (1985–2017)	Bootstrap ARDL	EXTD improves environment; energy use & GDP worsen it.
Beşe and Friday (2022)	Türkiye (1970–2016)	ARDL	Inverted U-shape between CO2 emissions and EXTD; GDP affects EF.
Samour and Adebayo (2022)	BRICS (1990–2018)	MMQR, CCEMG, AMG	REN improves LCF; EXTD, GDP, NREN reduce LCF.
Sadiq et al. (2022)	BRICS (1990–2019)	CS-ARDL, CCEMG, AMG	EXTD supports environmental sustainability via green financing.
Farooq et al. (2023)	OIC (1996–2018)	Panel GMM	EXTD increases ecological degradation.
Alhassan and Kwakwa (2023)	Ghana (1971–2018)	FMOLS	EXTD has a U-shaped effect on CO2 emissions.
Bachegour and Qafas (2023)	Morocco (1984–2018)	ARDL	EXTD reduces CO2 emissions.
Carrera and de la Vega (2024)	78 Emerging & Developing Economies (1990–2015)	Panel Causality	EXTD increases greenhouse gas emissions.
Warsame, Dirie, and Nor (2024)	Somalia (1990–2019)	ARDL, FMOLS, DOLS	EXTD & government spending increase CO2 emissions.
Saleem, Ahmed, and Samour (2024)	Brazil (1970–2021)	A-ARDL	REN increases LCF; EXTD decreases LCF.
Shamwil et al. (2024)	Nigeria (1990–2022)	ARDL	EXTD, REN, FDI improve sustainability; financial development harms it.
Yakubu and Aladejare (2025)	44 African countries (1990–2020)	CS-ARDL	EXTD negatively affects ecological sustainability.

external debt accumulation, economic growth performance, energy consumption patterns, and environmental sustainability indicators in Türkiye from 1970 to 2023. To perform this analysis, we adopted the FFF-ARDL econometric approach, which offers more robust and reliable results owing to its ability to incorporate potential structural breaks and nonlinear trends into the model. This methodological choice constitutes a contribution to the literature, aiming to clarify the diverging findings in existing studies through a comprehensive analysis over this extended period in Türkiye.

3. Data and Methodology

This study aims to analyse the long-run relationship between external debt and environmental quality and the dynamics of this relationship between 1970 and 2023 in Türkiye. The FFF-ARDL Bound Test approach was used as the analytical method. CO_2 emissions, representing environmental quality, are designated as the dependent variable, while external debt is the main independent variable. Economic growth and REN consumption were included in the model as the control variables. The analyses were

carried out using economic software packages (EViews and WinRATS), with logarithmic transformations applied to the variables. Economic growth, REN consumption, and NREN consumption were included in the model as control variables.

$$CO2 = f\ (GDP, GDP^2, REN, NREN, EXTD) \quad (1)$$

The study model is presented in Equation (2) and is inspired by Beşe and Friday (2022) and Akam et al. (2022).

$$lnCO2_t = \beta_0 + \beta_1 lnGDP_t + \beta_2 lnGDP_t^2 + \beta_3 lnREN_t + \beta_4 lnNREN_t + \beta_5 lnEXTD_t + \varepsilon_t \quad (2)$$

Among the variables in the model, CO_2 represents carbon dioxide emissions (metric tons per capita), GDP represents economic growth (GDP per capita, constant 2015 US$), GDP^2 represents the square of economic growth (GDP per capita, constant 2015 US$), REN represents REN consumption (kWh per capita), NREN represents primary energy consumption per capita (kWh per capita), EXTD represents external debt (% of GDP), and ε_t represents the error term. Table 2 provides descriptions and data sources for these variables.

In time series analyses, structural breaks can undermine the reliability of traditional cointegration tests and even the standard ARDL bounds test (Pesaran, Shin, and Smith 2001). To overcome this potential problem and to examine the relationship between variables on a more robust basis, the FFF-ARDL bounds test method, which models structural breaks through Fourier functions (Becker, Enders, and Lee 2006; Enders and Lee 2012; Omay 2015) and operates within the ARDL framework (Yilanci, Bozoklu, and Gorus 2020), is preferred. This method offers the advantages of flexibly modelling structural breaks and working with series at different levels of stationarity (Enders and Lee 2012; Omay 2015; Yilanci, Bozoklu, and Gorus 2020; Syed, Apergis, and Goh 2023; Apergis, Degirmenci, and Aydin 2023).

The method is based on the ARDL bounds testing approach (Pesaran, Shin, and Smith 2001), which is characterised by its applicability regardless of whether the variables h are integrated of order I(0) or I(1). The main innovation of the FFF-ARDL bounds testing approach is the addition of low-frequency Fourier sine and cosine terms $\left[\gamma_1 sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 cos\left(\frac{2\pi kt}{T}\right)\right]$ to the deterministic components (constant term and/or trend) of the ARDL model (Enders and Lee 2012). These trigonometric terms can capture potential structural breaks in series with abrupt or smooth transitions without prior knowledge of the timing, number or form of the breaks. In this way, the approach aims to prevent forecast biases arising from ignoring structural changes and to increase the statistical power of the test (Yilanci, Bozoklu, and Gorus 2020; Georgescu and Kinnunen 2024).

Another distinguishing feature of the method is that fractional values are considered when determining the frequency parameter (k) used in the Fourier approach. Generally, the value of k (k*) that minimises the Akaike Information Criterion (AIC) (Akaike 1979) or the Sum of Residual Squares within the range k (0.1, 0.2, ..., 5) is chosen as the optimum frequency. A fractional value of k* indicates that the structural change in the series is permanent, whereas a whole number indicates that the change is temporary. This feature is important because it provides additional information about the nature of the structural break (Yilanci, Bozoklu, and Gorus 2020). Equation 3 presents the equation for this test.

Table 2. Variable Descriptions and Data Sources

Variable	Symbols	Description	Data Source
Carbon Emissions	CO_2	Metric tons per capita	World Bank
Economic Growth	GDP	GDP per capita (constant 2015 US$)	World Bank
Economic Growth Squared	GDP^2	Square of GDP per capita (constant 2015 US$)	Calculated by the author.
Renewable Energy	REN	Renewable energy consumption (kWh per capita)	International Energy Agency
Non-Renewable Energy	NREN	Primary energy consumption per capita (kWh per capita)	International Energy Agency
External Debt	EXTD	External Debt to GDP ratio (%)	World Bank

$$\Delta lnCO2_t = \alpha_0 + \gamma_1 sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 cos\left(\frac{2\pi kt}{T}\right) + \Sigma_{i=1}^{k}\beta_i \Delta lnCO2_{t-i} + \Sigma_{i=1}^{l}\gamma_i \Delta lnGDP_{t-i} + \Sigma_{i=1}^{m}\delta_i \Delta lnGDP_{t-i}^2 + \Sigma_{i=1}^{n}\varphi_i \Delta lnREN_{t-i} + \Sigma_{i=1}^{o}\phi_i \Delta lnNREN_{t-i} + \Sigma_{i=1}^{p}¥_i \Delta lnEXTD_{t-i} + \lambda_1 \Delta lnCO2_{t-1} + \lambda_2 \Delta lnGDP_{t-1} + \lambda_3 \Delta lnGDP_{t-1}^2 + \lambda_4 \Delta lnREN_{t-1} + \lambda_5 \Delta lnNREN_{t-1} + \lambda_6 \Delta lnEXTD_{t-1} + \varepsilon_t \quad (3)$$

Considering the terms of Equation (3), α_0 is the coefficient of the constant term. The coefficients λ_1, λ_2, λ_3, λ_4, λ_5, *and* λ_6 capture the effects of the one-period lagged levels of the variables used in the analysis. The coefficients β_i, γ_i, δ_i, φ_i, ϕ_i, and $¥_i$ correspond to the lagged differences of the $lnCO_2$, lnGDP, $lnGDP^2$, lnREN, lnNREN, and lnEXTD variables, respectively. In addition, for the Fourier component, π is a constant approximately equal to 3.14, "k" is the number of selected frequencies, "t" represents the time trend, and "T" is the total number of observations (Yilanci, Bozoklu, and Gorus 2020).

Similar to the standard ARDL test, the existence of a cointegration relationship is assessed through the significance of the coefficients of the lagged level variables in the model. However, because of the presence of Fourier terms in the FFF-ARDL bounds test model, the standard critical values presented by Pesaran, Shin, and Smith (2001) cannot be applied. Instead, special critical values derived from bootstrap simulations are employed to enhance the power and reliability of the test (McNown, Sam, and Goh 2018; Sam, McNown, and Goh 2019). Three main hypotheses were tested using this approach.

[i] H_0: Coefficients of the lagged level variables are jointly zero (F_A statistic),
[ii] H_0: The lagged level coefficient of the dependent variable is zero (t-statistic) and
[iii] H_0: The lagged level coefficients of the independent variables are jointly zero (F_B statistic)

To confirm the existence of a cointegration relationship among the variables, all three calculated F_A, t-statistic, and F_B test statistics should exceed the relevant critical values (considering their absolute values) obtained via the bootstrap method. This implies the rejection of the three main null hypotheses of the study. If this condition is met, the long-run and short-run coefficients of the model can be estimated, and the dynamic relationships between the variables can be interpreted in detail (McNown, Sam, and Goh 2018; Sam, McNown, and Goh 2019).

The Fourier Toda-Yamamoto causality test was proposed by Nazlıoğlu, Gormus, and Soytas (2016). This test offers a significant improvement over the traditional approach by incorporating structural changes into the Vector Autoregression (VAR) model (Sims 1980). It also extends the constant term assumption, allowing Fourier terms to be added to explanatory variables. This feature enables the integration of both gradual and smooth structural breaks into the model (Nazlıoğlu, Gormus, and Soytas 2016). The mathematical representation of the Fourier Toda-Yamamoto causality test is presented in Equation (4) below.

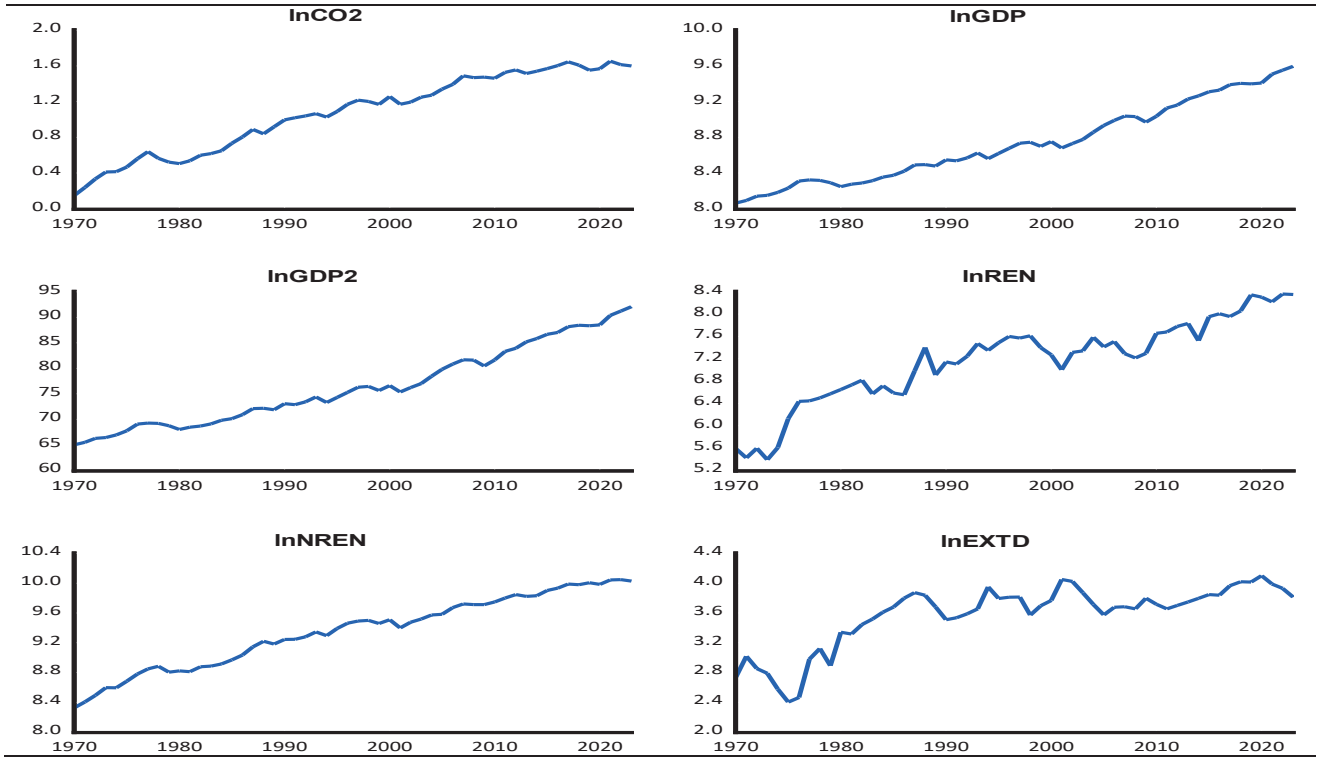
$$y_t = \alpha_0 + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) + \beta_1 y_{t-1} + \ldots + \beta_{p+d}\, y_{t-(p+d)} + \varepsilon_t \quad (4)$$

Table 3. Descriptive Statistics

	$lnCO_2$	lnGDP	$lnGDP^2$	lnREN	lnNREN	lnEXTD
Mean	1.069	8.734	76.47	7.164	9.348	3.570
Median	1.17	8.678	75.315	7.306	9.427	3.690
Maximum	1.653	9.597	92.093	8.36	10.048	4.101
Minimum	0.15	8.063	65.018	5.389	8.325	2.400
Std. Dev.	0.44	0.438	7.715	0.761	0.485	0.425
Skewness	–0.351	0.368	0.429	–0.626	–0.302	–1.281
Kurtosis	1.857	1.96	2.007	2.942	2.014	3.735
JB	4.048	3.651	3.874	3.533	3.006	3.422
Prob.	0.132	0.161	0.144	0.171	0.222	0.180
Observations	54	54	54	54	54	54

Source: Author calculations.

Chart 1. General Course of Variables in the 1970-2023 Period (Logarithmic)



In Equation (4), k represents the selected frequency, t is the deterministic trend, T is the total number of observations, p is the lag length obtained from the VAR model, d is the maximum order of integration of the variables and represents the residuals (Nazlıoğlu, Gormus, and Soytas 2016).

Before presenting the results of the FFF-ARDL bounds test, descriptive statistics summarising the distributional characteristics of the variables such as $lnCO_2$, lnGDP, $lnGDP^2$,lnREN, lnNREN, and lnEXTD were analysed and reported in Table 3. The mean values were 1.069 ($lnCO_2$), 8.734 (lnGDP), 7.164 (lnREN), 9.348 (lnNREN), and 3.570 (lnEXTD), and their proximity to the medians indicates that the distributions were generally symmetrical. $lnCO_2$ exhibits the highest volatility based on its standard deviation, whereas lnGDP and lnEXTD appear to be relatively more stable. The skewness values reveal that $lnCO_2$, lnREN, and lnNREN are left-skewed, lnGDP is slightly right-skewed, and lnEXTD is strongly left-skewed (– 1.281). The kurtosis values indicate that lnEXTD has the sharpest distribution (3.735), suggesting the potential presence of outliers. The Jarque-Bera (JB) test statistics and corresponding probability values confirm that none of the variables fail to reject the null hypothesis of normality at the 5% significance level, implying that the data are approximately normally distributed and suitable for econometric analysis with minimal outlier influence.

4. Empirical Results

The first step prior to presenting the FFF-ARDL bounds test findings is to determine the stationarity properties of the time series data used in the study. Structural breaks inherent in economic data may affect the results of the stationarity tests. Therefore, this analysis used methods that account for both structural breaks and standard unit root tests. The Augmented Dickey-Fuller (ADF) test, developed by Dickey and Fuller (1979, 1981), was applied for a traditional stationarity assessment. The Zivot-Andrews (ZA) unit root test proposed by Zivot and Andrews (1992) was used to test for the presence of single endogenously determined structural breaks. Moreover, the Fourier ADF test proposed by Christopoulos and León-Ledesma (2010) was included to capture potentially more complex or smoother structural changes. The unit root test results obtained from these different approaches provide comprehensive preliminary information on the degree of integration in the series. The results of the ADF test are presented in Table 4, while the results of the Fourier ADF and ZA tests, which account for structural breaks, are presented in detail in Tables 5 and 6. Each test provides a different perspective that enhances the reliability of the conclusions regarding the stationarity of the series.

Table 4. ADF Unit Root Test Results

	Level		1. Difference	
Variables	Constant	Constant & Trend	Constant	Constant & Trend
$lnCO_2$	–2.327 (0.167)	–2.162 (0.499)	–6.564 (0.000)***	–6.068 (0.000)***
lnGDP	0.884 (0.995)	–1.545 (0.801)	–6.908 (0.000)***	–7.035 (0.000)***
lnGDP2	1.179 (0.997)	–1.263 (0.886)	–6.807 (0.000)***	–7.027 (0.000)***
lnREN	–1.500 (0.526)	–2.870 (0.180)	–8.504 (0.000)***	–8.504 (0.000)***
lnNREN	–2.239 (0.195)	–3.210 (0.093)*	–7.461 (0.000)***	–7.784 (0.000)***
lnEXTD	–2.052 (0.264)	–2.123 (0.521)	–7.178 (0.000)***	–7.145 (0.000)***

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% significance levels, respectively.

Source: Author's calculations.

Table 5. Fourier ADF Unit Root Test Results

	Constant				Constant&Trend			
Variables	MinSSR	Frequency (k)	Test Statistics	F Test Statistics	MinSSR	Frequency (k)	Test Statistics	F Test Statistics
$lnCO_2$	3.679	1	–1.437	45.587***	0.192	1	–3.733	24.150***
lnGDP	4.197	1	–0.602	36.146***	0.098	1	–3.610	50.864***
$lnGDP^2$	1311.362	1	–0.542	35.841***	30.495	1	–3.992	67.078***
lnREN	19.755	1	–1.441	14.078***	1.931	1	–4.142	33.700***
lnNREN	5.31	1	–1.288	34.266***	0.17	1	–3.592	17.529***
lnEXTD	5.986	1	–1.621	15.316***	1.665	1	–4.314	31.550***

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% significance levels, respectively. The critical values for the FADF test were –4.43, –3.85, and –3.52 (constant) and –5.11, –4.46, and –4.15 (constant & trend) at the 1%, 5%, and 10% levels, respectively. For the F-test, the corresponding critical values were 6.730, 4.929, and 4.133 (constant) and 6.873, 4.972, and 6.873 (constant and trend).

Source: Author's calculations.

Table 6. ZA Unit Root Test Results

	Level		1. Difference	
	Model A	Model C	Model A	Model C
Variables	(Constant Breaking)	(Constant & Trend Breaking)	(Constant Breaking)	(Constant & Trend Breaking)
$lnCO_2$	–3.600 (B: 1985)	–3.750 (B: 2007)	–6.332*** (B: 1984)	–6.984*** (B: 1981)
lnGDP	–3.116 (B: 2011)	–4.074 (B: 1999)	–5.638*** (B: 2004)	–7.374*** (B: 1981)
$lnGDP^2$	–2.906 (B: 2011)	–4.108 (B: 1999)	–7.310*** (B: 2003)	–7.313*** (B: 1981)
lnREN	–4.388 (B: 1999)	–4.441 (B: 1999)	–8.917*** (B: 2009)	–8.817*** (B: 2009)
lnNREN	–4.409 (B: 1986)	–4.215 (B: 1987)	–8.651*** (B: 1982)	–8.248*** (B: 1979)
lnEXTD	–4.524 (B: 1980)	–4.467 (B: 1980)	–7.299*** (B: 1988)	–5.612*** (B: 1988)
Critical Values	Model A:		Model C:	
	1% [–5.34], **5%** [–4.93], **10%** [–4.58]		**1%** [–5.57], **5%** [–5.08], **10%** [–4.82]	

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% significance levels, respectively.

Source: Author's calculations.

Table 7. Lag Selection Criteria Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	238.6534	NA	3.66E-12	–9.30614	–9.07669	–9.21876
1	**522.0548**	**487.4505***	**1.86e-16***	**–19.20219***	**–17.59609***	**–18.59058***
2	540.7601	27.68382	3.96E-16	–18.5104	–15.5277	–17.3746
3	574.2892	41.57604	5.17E-16	–18.4116	–14.0522	–16.7515
4	611.7608	37.47162	6.93E-16	–18.4704	–12.7344	–16.2861

Source: Author's calculations.

The findings from the unit root tests applied in this analysis provide important information regarding the stationarity levels of the $lnCO_2$, lnGDP, $lnGDP^2$, lnREN, lnNREN, and EXTD time series for Türkiye. When the results of the standard ADF test (Table 4), the Fourier ADF test considering structural breaks and nonlinear components (Table 5), and the ZA test identifying single structural breakpoints (Table 6) are evaluated together, all series are non-stationary at levels. Therefore, the findings from these three different unit root tests reveal a common view that the variables are stationary at the first-difference level. Defining the variables as I(1) satisfies the fundamental assumptions of the FFF-ARDL bounds test model used in this study and enables the analysis of long-run cointegration relationships.

According to the lag selection criteria presented in Table 7, the optimal lag length for the model was determined to be one, based on all the criteria (LR, FPE, AIC, SC, and HQ).

There are various reasons why the FFF-ARDL bounds test approach is preferred to examine the long-run relationships among series. One of the main advantages of this method is that, unlike classical cointegration tests, it allows the variables used in the analysis to have different orders of integration, that is, both I(0) and I(1). Moreover, the "FFF-ARDL" component of the method enables the incorporation of smooth and/or multiple structural breaks into the analysis. It is critical not to ignore such breaks, which are common in economic and environmental time series and can be caused by significant policy changes, global shocks, or other structural transformations over time, to obtain more reliable and robust coefficient estimates that accurately reflect the true long-run dynamics between variables (Aliyev et al. 2024; Aliyev and Eylasov 2025). The FFF-ARDL approach provides a more robust analysis of the long-run link between external debt and environmental quality by considering the complex relationships and effects of possible structural changes over the study period.

The FFF-ARDL bounds test results presented in Table 8 strongly confirm the existence of a long-run cointegration relationship among the variables used in the model. The findings indicate a long-run equilibrium relationship between the variables at a high statistical significance level of 1%. This finding is supported by the calculated test statistics: F_A statistic (26.094), t- (–10.714), and F_B (29.839) statistics. Each value significantly exceeds the critical values obtained via the bootstrap method (including being more negative in absolute value for the t-statistic) at all conventional significance levels. For instance, the F_A statistic of 26.094 is far above the 1% critical upper bound (5.977), and the t-statistic of –10.714 is much lower than the 1% critical value (–5.13), confirming strong evidence against the null hypothesis of no cointegration. Similarly, the F_B statistic of 29.839 exceeds the 1% upper bound (5.67) by a large margin. This provides the conditions for rejecting the null hypothesis (no cointegration relationships). Thanks to the inclusion of the Fourier component in the model, which successfully controls for possible structural breaks and nonlinearities, this study identifies a statistically strong and significant long-run relationship between these variables. Hence, the FFF-ARDL bounds test findings confirm the existence of a persistent cointegration structure among the series.

The results of the various Diagnostic Tests conducted to assess the statistical power and reliability of the model are presented in Table 8 (Diagnostic Tests section). These findings support the validity and robustness of the estimated FFF-ARDL model. Specifically, the JB test confirms that the residual terms satisfy the assumption of a normal distribution (JB statistic = 0.645 and p = 0.724). The Breusch-Godfrey Lagrange Multiplier (BG-LM) test indicates that there is no serial correlation problem in the model (BG-LM statistic = 0.669, and p = 0.517). The Harvey test, which assesses heteroskedasticity, revealed a constant variance in the model's residuals (Harvey statistic = 1.392 and p = 0.213), indicating no issues with changing variance. Moreover, the Ramsey RESET (RR) test results confirm that the model has the correct functional form (RR

Table 8. FFF-ARDL Bounds Cointegration Test Results

Lag Length	Frequency (k)	F_A		t-Statistic		F_B	
1, 0, 1, 0, 0, 1	1.8	26.094***		–10.714***		29.839***	
	Critical Values	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	1%	4.608	5.977	–3.96	–5.13	3.42	5.67
	5%	3.442	4.69	–3.41	–4.52	2.4	4.19
	10%	2.927	4.068	–3.13	–4.21	1.98	3.51
Diagnostic Tests							
Tests		t-Statistic		Prob.			
JB		0.645		0.724			
BG-LM		0.669		0.517			
Harvey		1.392		0.213			
RR		0.71		0.482			
Cusum: Stability				**CusumSq:** Stability			

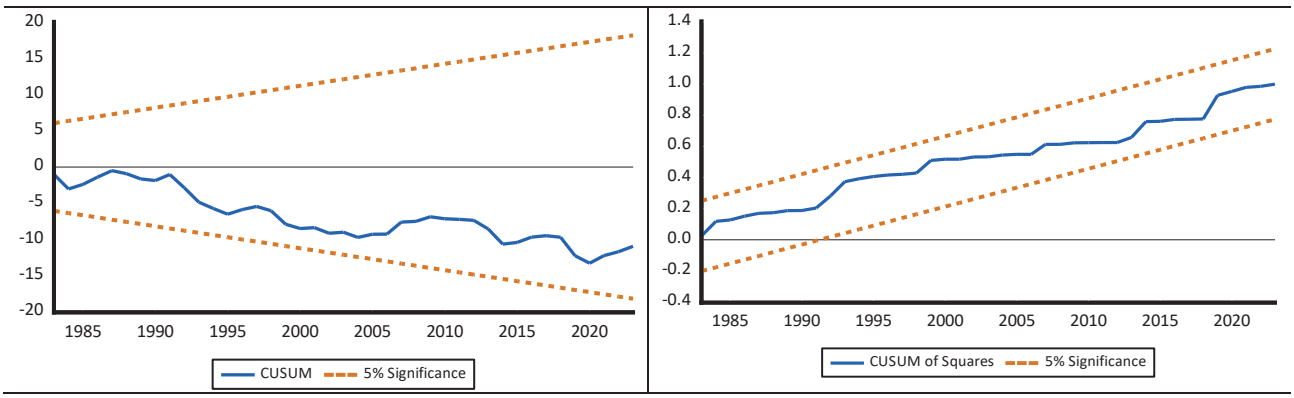
Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% significance levels, respectively.

Source: Author's calculations.

statistic = 0.710, p = 0.482). The graphs of the CUSUM and CUSUM of Squares (CusumSq) tests, which evaluate the stability of the coefficients over time and the presence of structural breaks, remain within the critical limits, indicating that the model coefficients are stable and that there are no significant structural breaks during the analysis period. The positive results of these comprehensive diagnostic tests demonstrate that the estimated model is statistically appropriate and suitable for making reliable inferences.

The long-run coefficient results of the FFF-ARDL bounds test in Table 9 confirm the validity of the EKC hypothesis in Türkiye. The positive and significant coefficient of lnGDP (5.976) and the negative and significant coefficient of $lnGDP^2$ (–0.336) at the 1% level indicate that CO_2 emissions initially increase with economic growth but decline after the income threshold is reached. Renewable energy use (lnREN) has a negative and highly significant effect (–0.134), reducing emissions, whereas non-renewable energy consumption (lnNREN) has a positive and significant impact (0.791), increasing environmental degradation. External debt (lnEXTD) also exhibits a negative and significant coefficient (–0.082), suggesting that higher debt may indirectly limit emissions. The error correction term (CointEq(–1)) is strongly significant (–0.994), implying that approximately 99.4% of short-run deviations are corrected in the next period, ensuring rapid convergence to the long-run equilibrium. Overall, these findings indicate that Türkiye's economic growth

Figure 1. Cusum and Cusumsq Graphs



Source: Author's calculations.

Table 9. FFF-ARDL Coefficient Results

Model: $lnCO_2$ = f(lnGDP, $lnGDP^2$, lnREN, lnNREN, lnEXTD)				
Long-Run Coefficient				
Variables	Coefficient	Std. Error	t-Statistic	Prob.
lnGDP	5.976	1.22	4.898	0.000***
$lnGDP^2$	–0.336	0.062	–5.350	0.000***
lnREN	–0.134	0.016	–8.194	0.000***
lnNREN	0.791	0.116	6.821	0.000***
lnEXTD	–0.082	0.022	–3.726	0.000***
Short-Run Coefficient				
Variables	Coefficient	Std. Error	t-Statistic	Prob.
D($lnGDP^2$)	–0.319	0.024	–13.203	0.000***
D(lnEXTD)	–0.007	0.017	–0.411	0.682
COS	0.001	0.003	0.111	0.911
SIN	–0.032	0.004	–7.734	0.000***
CointEq(-1)	–0.994	0.065	–15.195	0.000***

Note: ***, **, and * denote statistical significance at the 1, 5, and 10% significance levels, respectively.

Source: Author's calculations.

initially worsens environmental quality but eventually improves it as income rises, while promoting REN and managing external debt play crucial roles in reducing emissions. Conversely, dependence on NREN remains a major driver of environmental degradation, highlighting the need to transition to cleaner energy sources to achieve sustainable development.

According to the Fourier Toda-Yamamoto causality test results presented in Table 10, a unidirectional causality relationship was observed between CO_2 emissions and NREN consumption. Furthermore, significant causality relationships were identified between REN consumption and external debt to NREN consumption. Furthermore, a unidirectional causality relationship was found between economic growth, REN and NREN consumption, and external debt. These findings reveal a complex interaction between the energy consumption structure and financial dynamics (especially external debt) in the Turkish economy, which directly or indirectly affects environmental quality.

Table 10. Fourier Toda-Yamamoto Causality Test Results

H_0 Hypothesis	W-Statistics	Bootstrap Prob.	Frequency (k)
lnGDP => $lnCO_2$	1.215	0.278	0.6
lnREN => $lnCO_2$	0.356	0.554	0.6
lnNREN => $lnCO_2$	0.406	0.522	0.6
lnEXTD => $lnCO_2$	0.022	0.884	0.6
$lnCO_2$=> lnGDP	1.452	0.236	0.6
lnREN => lnGDP	1.491	0.228	0.6
lnNREN => lnGDP	0.612	0.437	0.6
lnEXTD => lnGDP	2.468	0.127	0.6
$lnCO_2$ => lnREN	1.298	0.263	0.6
lnGDP => lnREN	0.135	0.717	0.6
lnNREN => lnREN	0.022	0.891	0.6
lnEXTD => lnREN	1.985	0.157	0.6
$lnCO_2$=> lnNREN	7.817	0.006***	0.6
lnGDP => lnNREN	0.94	0.339	0.6
lnREN=> lnNREN	4.008	0.049**	0.6
lnEXTD=> lnNREN	4.295	0.044**	0.6
$lnCO_2$ => lnEXTD	1.397	0.246	0.6
lnGDP => lnEXTD	5.195	0.029**	0.6
lnREN=> lnEXTD	5.909	0.020**	0.6
lnNREN => lnEXTD	8.358	0.005***	0.6

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% significance levels, respectively. The lag length was determined to be 1 according to the AIC information criterion.

Source: Author's calculations.

5. Conclusion and Recommandations

While the relationship between environmental sustainability and external debt is an important area of research in academic and policy circles globally, analysing the dynamics specific to emerging economies such as Türkiye is critical to better understanding this interaction. An increasing EXTD, which is integral to Türkiye's economic growth strategy, can significantly affect the country's environmental performance. The influence of debt structure, the sectors to which it is directed, and repayment terms on environmental protection efforts are essential questions that need to be addressed. Empirical evidence from Türkiye enhances our understanding of this complex relationship by examining the environmental consequences of external debt from various perspectives. It is vital to design external debt management strategies in an integrated manner with environmental policies, enabling Türkiye to achieve both sustainable economic development goals and protect its environmental assets.

This study analyses the long-run impact of Türkiye's external debt burden on environmental sustainability between 1970 and 2023. CO_2 emissions are employed as the dependent variable to represent environmental quality, and economic growth, REN consumption, and NREN consumption variables are also included in the model while the EKC hypothesis is tested. The FFF-ARDL bounds test method is used to explore the long-run relationship, following unit root tests such as ADF, Fourier ADF, and ZA, to account for structural breaks. The results indicate that all series are non-stationary at the level but become stationary at the first differences. Long-run findings reveal that increases in external debt decrease CO_2 emissions, economic growth initially raises emissions but declines after a certain income threshold, confirming the EKC hypothesis, REN consumption reduces emissions, and NREN consumption increases emissions. The Fourier Toda-Yamamoto test results indicate unidirectional causality from CO_2 emissions, REN, and external debt to NREN consumption. There is also unidirectional causality from economic growth, REN, and NREN consumption to external debt. These findings align with those of similar studies in the literature and emphasise that managing external debt and promoting REN are crucial for reducing CO_2 emissions. These findings align with similar studies in the literature by researchers such as Beşe, Friday, and Özden (2021b), Xu et al. (2022), Beşe and Friday (2022), Sadiq et al. (2022), Bachegour and Qafas (2023), and Shamwil et al. (2024).

These results indicate that Türkiye's external debt management strategies are critical to environmental sustainability. Effective and efficient external debt management can significantly contribute to achieving environmental sustainability. Proper management of external debt, increased investments in REN sources, and incentivising these investments can effectively reduce carbon emissions. Policymakers should consider environmental factors in external borrowing processes and support economic growth with sustainable energy policies. Moreover, promoting REN consumption will substantially contribute to ensuring long-term sustainability. Utilising REN sources decreases dependence on fossil fuels, reduces carbon emissions, and minimises environmental pollution. Therefore, increasing investments in REN projects and supporting technological advancements in this sector are crucial for achieving environmental sustainability. This study serves as an important reference for understanding the environmental impacts of external debt and achieving sustainable development goals. By integrating external debt management and REN policies, policymakers can sustain economic growth while ensuring the environmental sustainability. A comprehensive and holistic approach should be adopted to minimise the environmental impacts of external debt. Future research following this study can explore various variables and methods across different countries and country groups to contribute significantly to the literature.

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