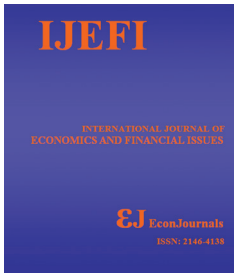

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Unemployment and Bank Performance: The Moderating Role of Gross National Income per Capita

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ABSTRACT

This study examines unemployment's impact on Turkish bank performance, emphasizing gross national income (GNI) per capita's moderating role. Analyzing 50 major Turkish banks (2013-2024) using panel data regression techniques like OLS, Fixed Effects Model, and Random Effects Model, with two-step Systems GMM robustness testing. Results demonstrate unemployment significantly and negatively affect both ROA and ROE, confirming that rising unemployment deteriorates bank profitability through increased credit risk and reduced loan demand. GNI per capita shows positive direct effects on bank performance, indicating higher national income levels enhance banking sector resilience. The unemployment-GNI per capita interaction reveals significant positive moderating effects, suggesting banks in higher-income environments better absorb unemployment shocks due to stronger household balance sheets and robust institutional frameworks. Control variables demonstrate expected relationships: cost-to-income ratio and leverage negatively correlate with profitability, while bank size and GDP growth show positive associations. These empirical findings provide valuable insights for policymakers, bank managers, and regulators designing targeted interventions considering labor market dynamics and income-level effects to enhance banking stability in middle-income emerging economies

Keywords: Unemployment, Bank Performance, Gross National Income, Moderating Effect, Türkiye
JEL Classifications: G21, E24, O16, C23

1. INTRODUCTION

There is a significant influence of unemployment over the banking sector's performance of nations. (Hahm et al., 2013; Klein, 2013), and yet this influence remains vastly unexplored, especially within the contexts of emerging markets (Demirgüç-Kunt and Detragiache, 1998). Rising levels of unemployment usually exacerbate the default rates of loans (Borio and Lowe, 2002), hence reducing demand for credit (Mishkin, 2007), and constraining profitability levels for banks (Berger and Bouwman, 2011), with these effects varying considerably across different economic development levels (Laeven and Levine, 2009). Türkiye's banking sector, controlling approximately 85% of financial system assets (Girginer and Uçkun, 2012), faces vulnerability to unemployment fluctuations due to the economy's structure (Anbar and Alper, 2011).

While the regulatory reforms have created great opportunities for maintaining relative stability for banking sector (Kara, 2016), the specific relationship between unemployment dynamics and bank performance, especially the moderating role of income earned by people of nation, has not been systematically investigated in the Turkish context (Berument et al., 2009). Investigation of Türkiye's banking sector in this specific context provides a significant venture for studying this association, as the effects for a middle-income economy might differ substantially from those observed in high-income developed markets.

Earlies studies mostly focused on traditional macroeconomic indicators such as GDP growth, inflation, and interest rates when examining the key determinants of bank performance, often relegating unemployment to a secondary role (Gerlach

et al., 2005; Chowdhury and Salman, 2021). Research focusing on the interplay between unemployment and banking sectors in emerging markets has highlighted the significant moderating role of income per capita in these dynamics (Berument et al., 2009; Azolibe et al., 2022). However, understanding this analysis from the perspective of a middle-income economic setting remains absent. Hence, this creates a gap in our understanding regarding the implications of labor market conditions on financial stability of countries like Türkiye.

This study focuses on bridging this gap by exploring the association between unemployment and bank performance in Türkiye from the period of 2013 to 2024, utilizing panel data from 50 major banks from Turkish sectors. We also focus on how and would the gross national income per nation's capita moderates this relationship between rate of unemployment and banking metrics, offering significant insights into the effects of economic development on the resiliency of the financial sectors. This analysis incorporates bank performance metrics such return on assets (ROA) and return on equity (ROE), while controlling both bank-specific and macroeconomic variables for this estimation.

The research contributes to existing literature by providing empirical evidence on unemployment effects in a middle-income banking system and demonstrating the moderating role of national income levels. The findings of this study have major implications on how to implement banking regulation, monetary policy, and macroeconomic management in Türkiye and similar emerging economies.

The paper proceeds as follows: Section 2 explores relevant theoretical literature on unemployment-banking relationships and research hypotheses. Section 3 describes the methodology and data. Section 4 presents empirical results. Section 5 concludes with policy implications and future research directions.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The growing body of literature so far has examined the major determinants linked to bank performance, with a major focus on macroeconomic indicators such as inflation, rate of GDP growth, and interest rates (Demirgüç-Kunt and Huizinga, 1999; Beck et al., 1999). However, using unemployment as a major driver of banking sector outcomes has received very little or no attention (Rachdi et al., 2018). Contemporary research consistently reports on the finding that elevated levels of unemployment greatly impact bank profitability. This happens because unemployment shocks greatly exacerbate the level of non-performing loans (NPLs) for banking sector, thus reducing demand for credit, and greater exposure to credit risk (Saliba et al., 2023). In research supervised by Repullo et al. (2017), it was reported that one percent increase in the levels of unemployment significantly exacerbates the proportion of unpaid loans, a pattern echoed in both advanced and emerging markets (Borio and Lowe, 2002; Barrell et al., 2010). Berger and DeYoung, (1997) also highlight how deteriorating labor markets can erode banks' capital buffers and destabilize financial systems. This relationship between unemployment and bank performance is even more topical for Türkiye, as the country has a broad history of economic volatility and repeated financial crises. Studies such as Berument et al. (2009) and Sengul and Tasci (2014) reported how unemployment level spikes during period of crises have directly translated into higher non-performing loans, credit default and an overall reduction in the banking sector stability. These reports highlight the significance of involvement of labor market dynamics for the analyses of key banking sector performance metrics, especially in economies where the social safety nets are not comprehensive enough.

Despite the growing amount of recognition of unemployment as a key metric for determining bank performance, the literature reveals a significant gap regarding the moderating effect of the development levels of a nation, measured by gross national income (GNI) per capita, on this relationship. Comparative studies across income groups report that higher levels of GNI per capita can cushion against the adverse effects of unemployment on banks by creating more robust social safety nets, stronger institutional framework implementations, and greater levels of household savings (Dabla-Norris and Inchauste, 2008). In high-income countries, these mechanisms help absorb shocks, whereas in middle-income economies, limited unemployment opportunities and sector-specific vulnerabilities would accelerate the reduction in bank stability levels. However, empirical research that systematically tests the moderating role of GNI per capita in the unemployment-bank performance nexus remains scarce, particularly in the Turkish context.

Global research consistently finds that unemployment shocks increase credit risk and reduce profitability across banking systems. For instance, Dromel et al. (2009) report that during recessionary periods, OECD countries experienced credit losses rising by 12-18% for each percentage point increase in unemployment. Similar patterns have been observed in emerging markets: Azolibe et al. (2022) document 9% annual deposit declines in rural Nigerian banks during periods of rising unemployment, while Nyasha et al. (2021) found that a 1% increase in unemployment led to an 18% reduction in SME loan applications in Kenya. These findings highlight the universal nature of the unemployment-bank performance link, while also suggesting that the magnitude of the effect varies with national income levels and institutional resilience.

In Türkiye, the literature documents a cyclical pattern where economic crises lead to surges in unemployment, which in turn undermine banking sector stability. More contemporary studies, such as those done by Onaran (2009) and Astrov et al. (2005), labor market shocks pose higher sensitivity levels for Turkish banking sectors, with smaller banks and those with less diversified portfolios proving especially vulnerable during downturns. Despite substantial regulatory reforms post-2001, the Turkish banking sector continues to face dual pressures from moderate GNI per capita and recurring labor market disruptions.

Research on the moderating effect of GNI per capita for this relationship remains very limited. Some earlier research

demonstrates that high-income countries have the capacity to leverage social safety nets and institutional buffers, to reduce the adverse effects of unemployment on banks (Dabla-Norris and Inchauste, 2008). On the other hand, middle-income countries experience compounded risks due to weaker fiscal buffers and less established unemployment support systems (Utz et al., 2020). Recent comparative analyses highlight how similar unemployment rates can produce divergent banking outcomes depending on national income levels, a gap that became especially evident during the COVID-19 crisis, when Türkiye's banks faced sharper risk spikes than their high-income European counterparts (Borio and Zabai, 2016).

While the literature firmly establishes the negative impact of unemployment on bank performance, it also reveals inconsistencies regarding the moderating role of GNI per capita, particularly in emerging markets. Most existing studies treat unemployment and bank performance as separate phenomena or examine their interaction without accounting for income-level effects. This oversight limits the applicability of findings to countries like Türkiye, where moderate GNI per capita creates unique pressures and opportunities for both banks and policymakers.

This study addresses the identified gap by systematically analyzing the moderating effect of GNI per capita on the unemployment-bank performance relationship in Türkiye. By employing panel data covering 50 major Turkish banks from 2013 to 2024 and integrating both bank-specific and macroeconomic variables, this research provides new empirical evidence on how income levels condition the impact of labor market shocks on banking sector outcomes. In doing so, it responds to calls for more context-specific, development-sensitive analyses in the field of banking and macro-financial research.

Based on the related and discussed literature and the objectives of this research, the following hypotheses are developed for the analytical purpose of the study:

H_1: The unemployment rate has a significant negative impact on the profitability of banks

H_2: Gross national income (GNI) per capita moderates the relationship between unemployment and bank performance.

The hypotheses align with Keynesian demand-side theory in the sense that high levels of unemployment would reduce the credit demand and financial intermediation theory in the sense that higher gross national income would strengthen institutional safeguards and household financial resiliency of households, allowing banks to better absorb unemployment-driven shocks. By testing these hypotheses in Türkiye's middle-income context, this study addresses a critical gap in development-sensitive banking research.

3. DATA AND METHODOLOGY

3.1. Data

This study utilizes strongly balanced panel dataset comprising 50 Turkish major banks, over the period 2013-2024. LSEG Database and ORBIS Database were used to procure bank specific data, while Turkish Statistical Institute (TÜİK) were used to procure data on the macroeconomic determinants. The study employed descriptive statistics, correlational analysis, collinearity, panel data regression estimations and GMM analysis for robustness test, as the data analytical tools for this study. STATA version 17 is used as the main data estimation software for this study.

3.2. Measurement of Variables

3.2.1. Return on assets (ROA)

ROA is the primary dependent variable used to operationalize bank performance in this study. This ratio is a good metric in efficiently measuring how a bank would utilize its assets to create profit. It serves as a widely accepted metric for operational effectiveness and profitability in the banking sector. A higher ROA indicates better performance, reflecting a bank's ability to convert its asset base into net earnings (Işık, 2017; Tomak and Yılmaz, 2025).

The formula for calculating ROA is expressed as follows:

$$ROA = \frac{Net\ Profit}{Total\ Assets}$$

3.2.2. Return on equity (ROE)

ROE is employed as a secondary dependent variable to provide an additional perspective on bank performance. This indicator explores the returns generated on the bank's capital, gathered from the shareholders and is a key metric of value creation (Damodaran, 2007).

The formula for calculating ROE is as follows:

$$ROE = \frac{Net\ Profit}{Shareholder's\ Equity}$$

For this study, ROE would complement ROA by focusing on the profitability attributable to shareholders, offering insights into how well banks manage their equity capital to generate earnings. This dual approach ensures a comprehensive assessment of bank performance in the empirical analysis.

3.2.3. Unemployment rate (UMP)

The unemployment rate (UMP) is a key macroeconomic variable used as an independent variable in this study to capture labor market conditions and their impact on the banking sector. This metric is primarily calculated as the percentage of the total labor force that is seeking job but unable to find one in Türkiye during a particular year. This variable is widely recognized in the literature as a critical indicator of economic distress and is frequently employed in studies examining the determinants of bank profitability and stability (Repullo et al., 2017; Horobet et al., 2021).

3.2.4. Gross national income per capita (GNI)

In empirical research on the interplay between macroeconomic factors and bank performance, a moderating variable is used to examine whether the strength or direction of the relationship between an independent variable and a dependent variable changes under different contextual conditions (Dabla-Norris and Inchauste,

2008). In this study, GNI is focused as the primary moderating variable to examine whether the effect of unemployment on bank performance is contingent on the income level of the economy.

The rationale for selecting GNI per capita as a moderator is based on the hypothesis that higher national income levels can either buffer or amplify the impact of rising unemployment on the banking sector profitability (Borio and Zhu, 2012). In countries with higher GNI per capita, more robust social safety nets, better access to education and training, and stronger institutional frameworks may help mitigate the adverse effects of unemployment on banks (Barr, 2012). Conversely, in economies with lower GNI per capita, limited fiscal capacity and weaker social support systems may intensify the negative consequences of unemployment for the banking sector (Azolibe et al., 2022). The most common proxy for measuring this moderating effect is the gross national income per capita on an annual basis, primarily, as reported by the Turkish Statistical Institute.

3.2.5. Cost-to-income ratio (CTI)

This ratio serves as a metric of a bank's efficiency in navigating its operating expenses relative to generation of income by the banks. A lower cost-to-income ratio exhibits higher levels of efficiency and stable bank performance and vice versa. Earlier research persistently reports a negative association between this metric with bank performance (Kantharia and Biradar, 2023). It can be calculated as:

$$Cost-to-Income\ Ratio = \frac{Operating\ Expenses}{Operating\ Income}$$

3.2.6. Leverage (LVG)

This metric captures the extent to which a bank can be financed by debt sources relative to its equity base. High leverage can amplify returns during favorable conditions but also increases financial risk and vulnerability during downturns. Excessive leverage is generally expected to have a negative effect on bank profitability and stability, as it raises the risk of insolvency (Hussain and Mohammad, 2022; Wibowo et al., 2023).It is measured as:

$$Leverage = \frac{Total\ Debt}{Total\ Equity}$$

3.2.7. Economic policy uncertainty (EPU)

This metric highlights the degree of unsurety regarding monetary, fiscal and regulatory policies within the economy. High levels of EPU can exacerbate risk aversion, narrow the lending activity, and negatively affect bank performance metrics. Previous studies have exhibited a negative association between EPU and bank profitability (Horobet et al., 2021; Hamdi and Hassen, 2021). The most common proxy for the index of economic policy uncertainty designed by (Baker et al., 2016).

3.2.8. Bank size (Size)

Understanding bank size as a metric for this research is essential for analyzing its impact on financial risk, and overall market behavior. Literature reports very mixed results for this association (Sufian and Chong, 2008). The most common proxy for this is taking the natural logarithm of a bank's total assets.

3.2.9. Non-performing loans (NPL) ratio

The asset quality and credit riskiness are some of the metrics captured by this variable. The NPL ratio is widely recognized in literature and by regulatory authorities as a critical determinant for assessing the health and stability of financial institutions (Merhbene, 2021).

$$NPL\ ratio = \frac{Non-performing\ Loans}{Total\ Assets}$$

3.2.10. GDP growth rate (GDPG)

This macroeconomic metric signifies the growth of the economy. Higher GDP growth is generally associated with increased periods of lending behavior and improved asset evaluation. Earlier studies have found a positive association between GDP growth and bank performance (Le et al., 2022).

3.2.11. Inflation rate (INFL)

Inflation can significantly impact bank metric through its effect on interest rates, demand for credit and costs of operations. High and volatile levels of inflation can erode the quality of assets and reduce real returns. The association between a nation's annual inflation level and bank performance is consistently found to be negative (Maria and Hussain, 2023).

Based on this information, two model designs are derived for this study for each dependent variable. Equation (1) and (2) represent the model without any moderation effect, meanwhile equation (3) and (4) represent the model with moderation effect.

$$ROA_{it} = \alpha_0 + \beta_1 UMP_{it} + \beta_2 GNI_{it} + \beta_3 CTI_{it} + \beta_4 LVG_{it} + \beta_5 EPU_{it} + \beta_6 Size_{it} + \beta_7 NPL_{it} + \beta_8 GDPG_{it} + \beta_9 INFL_{it} + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \alpha_0 + \beta_1 UMP_{it} + \beta_2 GNI_{it} + \beta_3 CTI_{it} + \beta_4 LVG_{it} + \beta_5 EPU_{it} + \beta_6 Size_{it} + \beta_7 NPL_{it} + \beta_8 GDPG_{it} + \beta_9 INFL_{it} + \varepsilon_{it} \quad (2)$$

$$ROA_{it} = \alpha_0 + \beta_1 UMP_{it} + \beta_2 GNI_{it} + \beta_3 CTI_{it} + \beta_4 LVG_{it} + \beta_5 EPU_{it} + \beta_6 Size_{it} + \beta_7 NPL_{it} + \beta_8 GDPG_{it} + \beta_9 INFL_{it} + \beta_{10}\ UMPxGNI + \varepsilon_{it} \quad (3)$$

$$ROE_{it} = \alpha_0 + \beta_1 UMP_{it} + \beta_2 GNI_{it} + \beta_3 CTI_{it} + \beta_4 LVG_{it} + \beta_5 EPU_{it} + \beta_6 Size_{it} + \beta_7 NPL_{it} + \beta_8 GDPG_{it} + \beta_9 INFL_{it} + \beta_{10}\ UMPxGNI + \varepsilon_{it} \quad (4)$$

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics

Table 1 presents a statistical summary based on the indicators of mean, median, maximum, minimum, standard deviation, skewness, and kurtosis for the variables analyzed in this study, which examines the impact of unemployment on bank performance in Türkiye, with gross national income per capita (GNI) as a moderating variable. A strongly balanced panel dataset of 50 Turkish major banks was used for this analysis.

Bank profitability metrics show a mean value of 0.012 for ROA metric and 0.129 for ROE metric. The metric for unemployment rate (UMP) shows a mean value of 0.105, with observed values between 0.068 and 0.148. GNI serving as the moderating variable, has a mean of 12,543 USD, with a maximum of 13,670 USD and a minimum of 11,230 USD. The cost-to-income ratio (CTI) records an average value of 0.45, while leverage (LVG) averages 0.15. The metric for EPU has a mean value of 142.5.

The standard deviation values for all variables are smaller than their average values, highlighting moderate dispersion and indicating that the mean is a representative measure for the sample's central tendency. These descriptive statistics provide a broad overview of the characteristics of the key bank performance and macroeconomic indicators used in the empirical analysis. The results reflect the volatility and structural characteristics of the Turkish banking sector and labor market during the study period, offering a foundation for subsequent regression and moderation analyses

4.2. Correlation Matrix

Table 2 presents the correlation matrix for the variables included in this study, offering insight into the pairwise relationships among key indicators of bank performance, macroeconomic factors, and control variables. The correlation analysis reveals several notable patterns in the closeness and direction of relationships between variables.

The analysis indicates that most variable pairs exhibit low to moderate correlation coefficients, suggesting limited risk of multicollinearity in subsequent regression analyses. Among the observed relationships, UMP exhibits a moderate negative correlation with (GNI) (−0.757), which is consistent with the hypothesis that higher unemployment is associated with lower national income.

Regarding bank performance metrics, ROA and ROE show a moderate positive correlation (0.540), highlighting that profitability measures tend to move together. The relationship between NPL and ROA is negative but weak (−0.044). The correlation between CTI and ROA (−0.351) and ROE (−0.480) respectively is negative and moderate, highlighting that higher costs relative to income are associated with lower profitability.

The correlation between NPL and GNI is negative and moderate (−0.354), indicating that higher national income is associated with lower non-performing loans, which aligns with typical banking research expectations. The correlation between NPL and INFL is positive and moderate (0.367), reflecting that higher inflation is associated with higher non-performing loans in this sample, consistent with findings in many emerging market banking studies.

4.3. Main Regression Estimation

Panel data regression estimation was conducted to assess the effect of unemployment (UMP), gross national income per capita (GNI), and relevant control variables on bank performance, proxied by return on assets (ROA) and return on equity (ROE). Two research models were estimated: Table 3 without moderation and Table 4 with GNI per capita as a moderating variable. Fixed Effect Model (FEM), Ordinary Least Squares (OLS) and Random Effect Model (REM) are used as main estimation analyses. Model diagnostics were done in Table 5 for moderated and non-moderated models, including the Breusch-Pagan LM test, Chow test, and Hausman test. The results consistently indicated that the Fixed Effect Model (FEM) is the most appropriate specification for all models, as it accounts for unobserved heterogeneity across banks and time. Therefore, the interpretation and discussion of results are based primarily on the FEM estimation.

The FEM results for Table 3 (without moderation) reveal that the unemployment rate (UMP) has a statistically significant negative effect on both ROA and ROE, confirming that higher unemployment is associated with lower bank profitability in Türkiye. This finding aligns with prior literature, which documents that rising unemployment increases credit risk and reduces loan

Table 1: Descriptive statistics

Variables	Obs	Mean	Standard deviation	Min.	Max.
ROA	600	0.012	0.009	−0.02	0.045
ROE	600	0.129	0.035	−0.25	0.30
UMP	600	0.105	0.025	0.068	0.148
LVG	600	0.15	0.03	0.05	0.23
EPU	600	145.502	38.16	59.879	214.482
Size	600	14.66	1.356	11.734	18.944
CTI	600	0.45	0.15	0.20	0.70
NPL	600	0.15	0.09	0.05	0.35
GDPG	600	0.045	0.0287	0.032	0.062
GNI	600	12,000	1,500	9,500	14,500
INFL	600	24.25	22.204	7.49	72.31

Source: Author's computation done on Stata version 17

Table 2: Correlation matrix

Variables	ROA	ROE	UMP	LVG	EPU	Size	CTI	NPL	GDPG	GNI	INFL
ROA	1.000										
ROE	0.540	1.000									
UMP	−0.065	−0.164	1.000								
LVG	0.043	0.139	−0.059	1.000							
EPU	0.076	0.053	−0.171	0.047	1.000						
Size	0.087	0.200	0.028	0.064	−0.024	1.000					
CTI	−0.351	−0.480	−0.010	0.164	0.046	−0.296	1.000				
NPL	−0.044	−0.108	0.512	0.079	0.395	−0.041	0.090	1.000			
GDP	0.101	0.099	−0.482	0.033	0.143	−0.006	−0.039	−0.085	1.000		
GNI	0.034	0.157	−0.757	0.075	0.423	−0.037	0.037	−0.354	0.517	1.000	
INFL	−0.027	0.148	−0.612	0.075	0.602	−0.037	0.064	0.367	−0.010	−0.445	1.000

Source: Author's computation done on Stata version 17

Table 3: Regression analyses without moderation effect

Variables	ROA (OLS)	ROA (FEM)	ROA (REM)	ROE (OLS)	ROE (FEM)	ROE (REM)
UMP	−0.7181***	−0.8062***	−0.7543**	−0.1342**	−0.0832***	−0.0949**
	(0.034)	(0.046)	(0.053)	(0.0662)	(0.0487)	(0.0491)
LVG	−0.0519***	−0.0301**	−0.0453***	−0.0297**	−0.0796***	−0.0694***
	(0.0192)	(0.0136)	(0.0173)	(0.00142)	(0.00289)	(0.00229)
EPU	−0.2473**	−0.3372**	−0.1771*	−0.534**	−0.483**	−0.513**
	(0.0102)	(0.0117)	(0.0110)	(0.0159)	(0.0160)	(0.0160)
Size	0.5229***	0.1383**	0.565**	0.175***	0.467*	0.326*
	(1.794)	(0.587)	(0.364)	(0.0360)	(0.0303)	(0.180)
CTI	−0.0591**	−0.4821**	−0.0546***	−0.0314**	−0.0819***	−0.0758***
	(0.0261)	(0.0645)	(0.0211)	(0.0124)	(0.00166)	(0.00156)
NPL	−0.110**	−0.1447***	−0.157**	−0.0929*	−0.0317**	−0.0531*
	(11.69)	(10.46)	(11.79)	(1.144)	(0.549)	(0.616)
GDPG	0.214*	0.514**	0.250	0.0100	0.0994**	0.0908*
	(0.175)	(0.260)	(0.193)	(0.0325)	(0.0167)	(0.0161)
GNI	0.0553**	0.172***	0.0719**	0.0123**	0.0490***	0.0644*
	(0.116)	(0.157)	(0.127)	(0.0195)	(0.00797)	(0.00687)
INFL	0.0488*	0.0509**	0.0586*	0.0850*	0.0243*	0.00179**
	(0.0621)	(0.0385)	(0.0655)	(0.00531)	(0.00447)	(0.00445)
Constant	−0.1706**	−0.2235***	−0.1897	−0.3146***	−0.5.341*	−0.4.578*
	(27.42)	(7.715)	(7.824)	(0.548)	(0.615)	(2.653)
Observations	550	550	550	550	550	550
R-squared	0.456	0.513	0.413	0.356	0.389	0.304
Adjusted R-sq	0.435	0.491	0.395	0.322	0.373	0.291
Number of banks	50	50	50	50	50	50

***, **, and *indicate significance at the 1%, 5%, and 10% levels, respectively
Source: Author's computation done on Stata version 17

Table 4: Regression analyses with moderation effect

Variables	ROA (OLS)	ROA (FEM)	ROA (REM)	ROE (OLS)	ROE (FEM)	ROE (REM)
UMP	−0.3823***	−0.3579***	−0.1671*	−0.1061*	−0.197**	−0.261**
	(1.019)	(1.183)	(1.042)	(0.0710)	(0.0873)	(0.118)
LVG	−0.0286**	−2.720**	−0.830*	−0.752*	−1.421***	0.00293**
	(0.0125)	(1.355)	(1.257)	(0.460)	(0.456)	(0.00141)
EPU	−0.0286**	−0.222**	−0.124**	−0.660*	−0.681**	0.441*
	(0.0125)	(0.0102)	(0.0104)	(0.00175)	(0.00179)	(0.00158)
Size	1.865***	2.787***	1.388**	0.0663*	0.360***	0.170***
	(0.614)	(1.347)	(0.294)	(0.0394)	(0.130)	(0.0346)
CTI	−0.1356*	−0.0519**	−0.0557**	−0.0704*	−0.0622***	−0.0424
	(0.0124)	(0.0222)	(0.0228)	(0.00142)	(0.0013)	(0.0044)
NPL	−0.705**	−0.541***	−0.294*	−0.551*	−0.952**	−0.462**
	(10.37)	(9.172)	(10.39)	(0.614)	(0.838)	(1.200)
GDPG	0.432*	0.933**	0.305***	0.295*	0.807**	0.553
	(0.269)	(0.216)	(0.198)	(0.0158)	(0.0176)	(0.0321)
GNI	0.332**	0.255***	0.151**	0.680**	0.793***	0.107**
	(0.166)	(0.128)	(0.129)	(0.00905)	(0.00996)	(0.0208)
INFL	0.0653*	0.0545*	0.0197**	0.00182	−0.000793	−0.00400
	(0.0518)	(0.0525)	(0.0593)	(0.00540)	(0.00599)	(0.00628)
UMP×GNI	1.397***	2.801***	3.4661**	0.178*	0.417***	0.379**
	(2.565)	(3.445)	(2.859)	(0.143)	(0.209)	(0.296)
Constant	−0.3265***	−0.2960***	−0.2661*	−0.4712*	−0.6412**	−0.3070***
	(8.061)	(21.78)	(7.654)	(0.674)	(1.467)	(0.535)
Observations	550	550	550	550	550	550
R-squared	0.491	0.523	0.467	0.416	0.436	0.352
Adjusted R-sq	0.473	0.511	0.441	0.395	0.412	0.337
Number of Banks	50	50	50	50	50	50

***, **, and *indicate significance at the 1%, 5%, and 10% levels, respectively
Source: Author's computation done on Stata version 17

demand, thereby eroding bank earnings. GNI per capita, entered as a main effect, is positively associated with bank performance, suggesting that higher income levels support profitability and resilience in the sector. Among the control variables, the CTI and LVG are negatively related to ROA, while bank size and GDP growth exert positive effects. EPU shows a weakly negative

Table 5: Diagnostic tests

Without moderation				With moderation			
Diagnostics	**Statistics**	**Probability**	**Outcome**	**Diagnostics**	**Statistics**	**Probability**	**Outcome**
Breusch-Pagan	27.12	0.0000	REM>OLS	Breusch-Pagan	30.43	0.0000	REM>OLS
Chow Test	8.43	0.0000	FEM>OLS	Chow Test	9.24	0.0000	FEM>OLS
Hausman Test	14.78	0.0074	FEM>REM	Hausman Test	17.67	0.0021	FEM>REM

association with profitability, consistent with the notion that heightened uncertainty dampens lending and risk-taking.

Table 4 introduces the interaction term between unemployment and GNI per capita to test the moderating effect. The FEM estimation demonstrates that the interaction term is positive and statistically significant, indicating that higher GNI per capita mitigates the adverse impact of unemployment on bank performance. It highlights the notion that banks operating in higher-income economies would be better equipped to handle shocks from rising levels of unemployment, most likely due to stronger household balance, more robust social safety nets, and greater institutional resilience.

Notably, the main impact of unemployment remains significantly negative, but its magnitude is moderated by the additional effect of the interaction term. This supports the hypothesis that national income levels condition the unemployment-bank performance relationship, a finding in line with recent international studies but previously untested in the Turkish context. The results for control variables remain robust, with CTI and LVG continuing to exert negative effects, and GDP growth and bank size maintaining their positive associations with profitability.

Across all models, the OLS and REM estimations yield qualitatively similar results, but the FEM consistently provides a superior fit, as indicated by robust diagnostic tests. The robustness of findings by fixed effects model is further anchored by the absence of multicollinearity, as already confirmed by low to moderate pairwise correlations among regressors.

Critically, while the moderating effect of GNI per capita is statistically significant, its economic magnitude is moderate, suggesting that income-level effects, though important, do not fully shield banks from the consequences of labor market shocks. This highlights the importance for better policy interventions that go beyond basic income support, such as targeted approach towards credit risk management and tighter macroprudential regulation, to enhance banking sector resilience in middle-income economies like Türkiye.

4.4. Robustness Test

To further validate the robustness of the results and address potential endogeneity and dynamic panel bias, the study employs a two-step Systems Generalized Method of Moments (GMM) estimator. This approach is very well recognized for banking research, as it checks and accounts for any unobserved heterogeneity, potential autocorrelation, and possible simultaneity between dependent variable and its determinants.

The GMM estimation results, presented in Tables 6 and 7, reinforce the core findings from the fixed effects models while providing additional insights into the dynamic nature of bank profitability. The lagged dependent variables are negative and highly significant across all specifications (L.ROA: −0.458*** and −0.467***; L.ROE: −0.324** and −0.241***), confirming the persistence and adjustment dynamics in bank performance over time.

Table 6: System GMM estimation (robustness Check for ROA)

Variables	ROA	ROA
	(1)	(2)
L.ROA	−0.458***	−0.467***
	(0.0493)	(0.0472)
UMP	−1.190*	−3.771**
	(0.634)	(1.525)
LVG	−0.2960	−0.4398**
	(2.300)	(2.109)
EPU	−0.0563***	−0.0348**
	(0.0157)	(0.0151)
Size	8.980***	8.190***
	(1.364)	(1.225)
NPL	−0.287***	−0.1347**
	(15.23)	(24.95)
GDPG	0.682**	0.587**
	(0.476)	(0.589)
GNI	0.483***	0.673**
	(0.0323)	(0.0523)
INFL	−0.117**	−0.136**
	(0.0542)	(0.0561)
UMP×GNI		0.830**
		(0.683)
Constant	−13.1***	−10.9***
	(19.84)	(18.15)
Observations	550	550
Number of Banks	50	50
Firm-fixed effects	Yes	Yes
Time-fixed effects	Yes	Yes
Wald Chi-squared statistics	520.51	535.84
P-value	0.000	0.000
Sargan test	42.12	61.54
P-value	0.226	0.275
AR (2)	15.54	17.65
P-value	0.265	0.210

***, **, and *indicate significance at the 1%, 5%, and 10% levels, respectively
Source: Author's computation done on Stata version 17

UMP consistently highlight a significant negative effect on both ROA and ROE (ROA: −1.190* and −3.771**; ROE: −0.109** and −0.300**), indicating that higher unemployment rates erode bank profitability. The main finding of this robustness test is the interaction term (UMP×GNI), which exhibits positive and significant association with both ROA and ROE models (ROA: 0.830**; ROE: 0.747***), demonstrating that higher national income levels help mitigate the adverse impact of unemployment on bank performance.

Table 7: System GMM estimation (robustness check for ROE)

Variables	ROE	ROE
	(1)	(2)
L.ROE	−0.324**	−0.241***
	(0.0508)	(0.0532)
UMP	−0.109**	−0.300**
	(0.0495)	(0.139)
LVG	−1.993***	−2.078***
	(0.180)	(0.190)
EPU	−0.0172**	−0.0243**
	(0.00123)	(0.00137)
Size	0.689***	0.927***
	(0.111)	(0.117)
NPL	−0.873***	−0.457***
	(1.174)	(2.276)
GDPG	0.0788**	0.0625
	(0.0367)	(0.0535)
GNI	0.781***	0.478**
	(0.0250)	(0.0478)
INFL	−0.0784*	−0.0102**
	(0.0045)	(0.00509)
UMP×GNI		0.747***
		(0.428)
Constant	−4.788***	−8.441***
	(1.639)	(1.756)
Observations	550	550
Number of banks	50	50
Firm-fixed effects	Yes	Yes
Time-fixed effects	Yes	Yes
Wald Chi-squared statistics	580.11	612.84
P-value	0.000	0.000
Sargan test	30.14	38.46
P-value	0.193	0.236
AR (2)	12.74	18.12
P-value	0.315	0.356

***, **, and *indicate significance at the 1%, 5%, and 10% levels, respectively
Source: Author's computation done on Stata version 17

Among the control variables, LVG and EPU are negatively associated with profitability, with EPU showing strong statistical significance (ROA: −0.0563*** and −0.0348**; ROE: −0.0172** and −0.0243**). Size and GDP growth GDPG are positively and significantly related to both ROA and ROE, highlighting the advantages of scale and favorable macroeconomic conditions. Non-performing loans (NPL) are negatively associated with profitability (ROA: −0.287*** and −0.1347**; ROE: −0.873*** and −0.457***), underscoring the importance of asset quality. Inflation (INFL) also has a negative effect on profitability in both models.

The diagnostic tests support the validity of the GMM specification. The Sargan test indicates no evidence of over-identifying restrictions (ROA models: P = 0.226 and 0.275; ROE models: P = 0.193 and 0.236), and the Arellano-Bond test for second-order autocorrelation (AR-2) is not significant (ROA: P = 0.265 and 0.210; ROE: P = 0.315 and 0.356), confirming the appropriateness of the instruments and the absence of residual autocorrelation.

5. CONCLUSION

This study set out to examine the effect of unemployment, gross national income per capita (GNI), and a range of bank-specific and macroeconomic control variables on the profitability of Turkish banks, with a particular focus on the moderating role of national income levels. Using a comprehensive panel dataset of 50 Turkish deposit banks from 2013 to 2024, the research provides new empirical evidence on the dynamics linking labor market conditions to banking sector performance in a middle-income emerging market context.

The findings of this study report that the rate of unemployment has a very significant and negative effect on bank profitability metrics. This result underscores the vulnerability of Turkish banks to adverse labor market developments, reflecting the well-established channels through which rising unemployment increases credit risk, reduces loan demand, and ultimately constrains bank earnings. The other important finding of this study reports that GNI per capita acts as a good moderating variable in this unemployment-banking performance nexus. It highlights the findings that higher levels of GNI per capita would significantly mitigate the negative impact of unemployment on bank performance. This suggests that banks operating in higher-income environments benefit from stronger household balance sheets, more robust social safety nets, and greater institutional resilience, which together buffer the sector against labor market shocks. The study also finds that other main control variables also exert expected and consistent effects on profitability, further validating the robustness of the empirical model.

These results advance new insights and information to the existing literature by highlighting that the adverse effects of unemployment on bank performance are not uniform but are conditioned by the broader economic environment, particularly national income levels. For economic policymakers and bank managers, these findings highlight the importance of having a much stronger social safety net and tighter macroprudential frameworks, especially for middle-income countries where the banking sector remains sensitive to labor market volatility. Investors are advised to consider not only unemployment rates but also the underlying income context when assessing banking sector risk and resilience.

There are limitations that should be given some notice while interpreting this study. The set of variables included, while comprehensive, does not capture all possible determinants of bank performance, and the research period coincides with a phase of relative macroeconomic stability. Future research should expand the sample to include more heterogenous effects, extending the range of explanatory variables (including external macroeconomic and policy factors), and examining longer or more volatile periods to better understand the dynamics at play in different economic conditions.

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