



Searching for a Threshold effect in the Diversification-profitability Relationship. Evidence from the MENA Banks

Mohamed Ali Khemiri*

VPNC Lab, Faculty of Law, Economics and Management of Jendouba, University of Jendouba, Tunisia.

*Email: mohamedalikhemiri20@yahoo.com

Received: 15 July 2023

Accepted: 16 October 2023

DOI: <https://doi.org/10.32479/ijefi.15004>

ABSTRACT

This paper investigates the non-linear relationship between bank diversification and bank profitability in the MENA region. More specifically it checks whether there exists a threshold effect in the diversification-profitability relationship. To achieve this goal, we used a panel of 83 retail MENA banks during the period 2005-2020 and we performed the Panel Smooth Transition Regression (PSTR) model as empirical approach. The results confirm the existence of a threshold effect in the non-interest income and bank profitability relationship. To get benefit from bank diversification, the ratio of non-interest income in the MENA region should exceed 22% when profitability is ROA and 25.41% for ROE. Below these thresholds, bank diversification significantly decreases the level of bank profitability. The findings of this research have substantial implications for both policymakers and bankers. The MENA banks should be engaged in more diversified bank activities in order to enhance their overall revenues.

Keywords: Bank Diversification, Non-interest Income, Bank Profitability, PSTR Model, MENA Banks

JEL Classifications: C23, G21, O16

1. INTRODUCTION

The research on the linear relationship between diversification and profitability reveals contradictory and ambiguous findings. Several empirical investigations indicated the importance of non-interest income for bank profitability (e.g., Sharma and Anand, 2018; Chiorazzo et al., 2008; Stiroh, 2004; De Young and Roland, 2001). The opposing point of view is supported by another part of the literature. According to a number of empirical researches, non-interest income lowers bank profitability and raises bank risk. (e.g., Trung, 2021; Githaiga, 2020; Duho et al, 2019). When reviewing the literature, we have noted that most of the empirical studies are based on a linear approach. However, no studies explored the non-linear relationship between bank diversification and bank profitability.

The purpose of this paper is to investigate whether there is a threshold effect in the diversification-profitability relationship in

the MENA region. For the purpose of this, we made use a panel of 83 retail MENA banks during the period 2005-2020 and we conducted the PSTR model. This study contributes to the pool of literature by extending previous studies on the impact of bank diversification on bank profitability. First, no study has, to our knowledge, examined the non-linear relationship between bank diversification and bank profitability for the MENA region. The only study that investigates the threshold effect of bank diversification is the work of Ben Lahouel et al. (2022). However, this study focuses on the nonlinear relationship between bank diversification and bank stability. Second, searching for a bank diversification threshold will be very useful to bankers and policymakers to modify their business model and choose whether to engage in more varied banking activities or keep to their fundamental banking activities.

The remainder of this paper is structured as follows. The next section provides a brief review of relevant literature Section 3

displays data and methodology. Section 4 presents the empirical findings and section 5 concludes.

2. LITERATURE REVIEW

Regarding the significance of banks in the financial system and their effect on economic growth, several studies have been done to look into the factors that affect banking profitability. These factors have been categorized into four sections in the literature on the factors affecting bank profitability: Bank-specific factors, industry-specific factors, financial and macroeconomic environment factors, and institutional context factors. In some other research, the connection between bank diversity and bank profitability has been the main topic. (e.g. Young and Roland, 2001; Smith et al., 2003; Stiroh, 2004a). The U.S. market and other developed economies are the focus of the vast majority of these studies. These empirical studies' findings have contradictions and indicate that there is no conclusive evidence for this relationship.

On the positive side of the effects of bank diversification, according to Young and Roland (2001), bank diversification has positive effects. By looking at data from 472 commercial banks in the United States between 1988 and 1995. They demonstrated that earnings volatility rises as the proportion of income coming from fee-based activities rises. Stiroh (2004a) looked into the relationship between income diversification and risk return performance in the same setting. Between 1984 and 2000, he employed a sample that included American community banks. According to the author, increasing reliance on non-interest income, particularly trading revenue, is associated with less predictable returns and lower risk-adjusted profitability.

Smith et al. (2003) examined how interest and non-interest income varied in the European environment. They employed a sample of 15 EU nations between 1994 and 1998 to achieve this goal. The majority of the empirical results show that higher non-interest income stabilizes earnings in the European banking sector. De Jonghe and Vander Vennet (2007) additionally investigated the exchange-listed banks from 17 different European nations between 1989 and 2004. To assess long-term performance, bank franchise value was computed, and a risk assessment was made using a single index model with the addition of the interest rate factor. The outcomes are in line with the earlier investigations. They have demonstrated that the level of bank diversity and profitability have a substantial positive link. Using information from 85 Italian banks between 1993 and 2003. In their 2008 investigation into the relationship between non-interest income and profitability, Chiorazzo et al. concluded that income diversification improves risk-adjusted return. Lepetit et al. (2008) discovered, using data from European banks, that diversification from traditional banking to non-traditional banking increased bank failure likelihood and bank risk.

Data on Italian banks were used by Acharya et al. (2006) in their analysis, which revealed that diversifying a loan portfolio reduces return and raises risk. This occurs as a result of the adverse selection and inefficient monitoring that characterizes diversification and eventually results in diseconomies of diversification. This can also be explained by the fact that diversification increases agency expenses, which result in expenditures that outweigh the benefits.

By using annual financial data from Malaysian banks from 2005 to 2015, Brahmana et al. (2018) investigated the Asian context. The impact of diversity on bank profitability was investigated by the authors. They examined the relationship between non-interest income and risk-adjusted performance in particular, and they discovered that revenue diversification improves bank performance. Similar to this, Nisar et al. (2018) investigated how revenue diversification affected bank profitability in eight South Asian nations and came to the conclusion that non-interest income positively affects profitability. In a recent study, Vidyarthi (2020) examined the relationship between income diversification and performance using a sample of 38 listed Indian banks from 2004 to 2016. He discovered an inverted U-shaped relationship between income diversification and estimated efficiency parameters for the entire panel. Mostak (2017) investigated the connection between asset quality, non-interest income, and bank profitability using a sample of commercial banks in India from 1998 to 2014. The author concluded that when banks engage in more trading activities, a higher ratio of non-interest income results in higher profits and risk-adjusted profits.

Using data from 967 banks spread across 22 Asian nations from 1995 to 2009, Lee et al. (2014) examined the associations between non-interest income, profitability, and risk. According to empirical research using the dynamic panel generalized method of moments (GMM) method, Asian banks' non-interest activities lower risk but do not improve profitability.

Sharma and Anand (2018) investigated how income diversification affected bank performance in BRICS economies. In order to achieve this, they employed a panel data collection that sampled 169 BRICS banks between 2001 and 2015. Fixed effect models and system-generalized method of moments approaches show that diversification and performance have a positive relationship.

Alkhourri and Arouri (2018) used a sample of 69 conventional and Islamic banks listed in GCC markets between 2003 and 2015 for the GCC nations. They discovered that asset-based diversity has a beneficial impact on bank performance, whereas non-interest income diversification has a negative impact on GCC banks.

Hamdi et al. (2017) explored whether bank diversity influences bank risk and performance in Tunisia using annual data from 20 Tunisian banks from 2005 to 2012. Non-interest income improves bank performance for both ROA and ROE metrics, according to empirical findings from dynamic panel data. Additionally, they discovered that non-interest revenue considerably reduces bank risk.

Many research studies show that diversification has a negative impact on bank stability and performance, which is considered to be the negative aspect of diversification. For instance, Laeven and Levine (2007) discovered adverse effects of activity diversification on the market valuation of financial institutions utilizing data from 43 nations in various regions of the world. Similarly, the performance of Australian banks and income diversification were found to be negatively correlated by Delpachitra and Lester (2013). According to the findings, non-interest income and revenue

diversifications generally decreased profitability and did not reduce banks' total default risk, so any future development into non-interest income activities would not be advantageous to banks.

Berger et al. (2010) used a sample of 88 Chinese banks between 1996 and 2006 to find that diversity reduces earnings. They create a brand-new definition of diversity that takes into account loans, deposits, assets, and location in four different ways. They discover that lower profitability and higher costs are connected to all four aspects of diversity.

Trung (2021) investigated how bank diversification methods affected the performance of the Vietnamese bank in this scenario. He employs the System Generalized Method of Moments (SGMM) regression with a sample of 13 listed banks from 2010 to 2019 to do this. According to empirical data, income diversity lowers bank profitability. Githaiga (2020) recently looked into the connection between income diversification, human capital, and bank performance. He runs a hierarchical multiple regressions using panel data for the years 2010 to 2018 and a sample of 53 banks. According to the author, income diversification has a detrimental impact on bank profitability. Although there is a strong correlation between bank profitability and human capital.

KCT Duho (2019) discovered that revenue diversification affects profit and financial stability using data from 32 Ghanaian banks from 2000 to 2015. The results suggest that income diversification decreases profit, profit efficiency and financial stability.

All studies that looked at the connection between bank diversity and bank profitability were found to be based on linear methods that either used fixed, random effect, or dynamic panel data. The potential non-linear relationship between non-interest revenue and bank profitability has not been studied. Only Ben Lahouel et al.'s study from 2022 examined the dynamic changes in bank diversification. However, the non-linear impacts of income diversification on bank stability in the European banking system are the main emphasis of this study. The empirical findings of this study demonstrate that increased income diversification has a negative impact on bank stability. In the present research, we build on the findings of Ben Lahouel et al. (2022) and examine the threshold impact of non-interest revenue on bank profitability in the MENA area.

3. SAMPLE AND METHODS

3.1. The Sample

We examined the connection between bank performance and bank diversification as defined by non-interest income using a sample of conventional banks in MENA nations from 2005 to 2020. By 109 banks, the basic sample is created. However, a few institutions have been left out due to the accessibility and consistency of bank information. For instance, we didn't include Islamic banks or banks for which non-interest revenue data had been missing for more than 3 years. Thus, 83 typical banks made up the final sample.

We divided the MENA region into two sub-regions based on the classification of the International Monetary Fund's World

Economic Outlook in order to gain a better grasp of and trustworthy data about the impact of NII on bank profitability. A sample of 40 banks from the Gulf Cooperation Council (GCC) countries make up the first bloc, whereas a sample of 43 banks from non-GCC nations makes up the second (Table 1).

3.2. Data

We used a sample of 83 conventional banks in MENA countries from the years 2005 to 2020 to investigate the non-linear connection between bank diversification and bank profitability. The non-interest income ratio evaluates bank diversification. As additional indicators of bank profitability, we also use return on assets (ROA) and return on equity (ROE). We employed several bank-specific factors as the explanatory variables. Data for banks are gathered from annual reports of each bank and the Refinitiv Eikon database. However, information at the national level that reflects macroeconomic conditions and industry-specific characteristics is gathered from two key sources. The World Bank Indicators Database and the Global Financial Indicators Database are the first two. All variable definitions and measurements are provided in Table 2.

3.2.1. Methodology

We employ the non-linear relationship between bank diversification and bank profitability in MENA countries. The nonlinearity of panel data was specified by the Panel Threshold Regression Model (PTR) initially introduced by Hansen (1999) and, the Panel Smooth Threshold Regression (PSTR) model proposed by González et al. (2005). The PSTR model is an extension of the PTR model and, can be expressed as follows:

$$y_{i,t} = \mu_i + \beta_0^i x_{i,t} + \beta_1^i x_{i,t} g(q_{i,t}, \gamma, c) + \varepsilon_{i,t} \quad (1)$$

Where; $i = 1, \dots, N$, and $t = 1, \dots, T$,

The $g(q_{i,t}, \gamma, c)$ is the transition function. This transition function is dependent on three parameters: the transition variable ($q_{i,t}$), the optimal threshold (C) and the smooth transition parameter (γ). González and al. (2005), Granger and Teräsvirta (1993), have proposed the following logistic form of m orders in the equation (3):

$$g(q_{i,t}, \gamma, c) = \left[1 + \exp(-\gamma \prod_{j=1}^m (q_{i,t} - C_j)) \right]^{-1} \quad (2)$$

To study the nonlinear relationship between bank diversification and bank performance in MENA countries, we have written the following nonlinear model in equation (3).

$$\begin{aligned} PROF_{i,t} = & \mu_i + \alpha PROF_{i,t-1} + \beta_0^1 NII_{i,t} + \beta_0^2 NPLS_{i,t} \\ & + \beta_0^3 LTD_{i,t} + \beta_0^4 BS_{i,t} + \beta_0^5 CAR_{i,t} + \beta_0^6 CONC_{i,t} \\ & + \beta_0^7 LERN_{i,t} + \beta_0^8 CRISIS_{i,t} + \beta_0^9 GDPG_{i,t} + \beta_0^{10} INF_{i,t} + \\ & \left[\begin{aligned} & \beta_1^1 NII_{i,t} + \beta_1^2 NPLS_{i,t} + \beta_1^3 LTD_{i,t} + \beta_1^4 BS_{i,t} \\ & + \beta_1^5 CAR_{i,t} + \beta_1^6 CONC_{i,t} + \beta_1^7 LERN_{i,t} \\ & + \beta_1^8 CRISIS_{i,t} + \beta_1^9 GDPG_{i,t} + \beta_1^{10} INF_{i,t} \end{aligned} \right] \\ & g(NII_{i,t}, \gamma, c) + \varepsilon_{i,t} \end{aligned} \quad (3)$$

Table 1: Number of banks by country

GCC countries		Non-GCC countries	
Countries	Number of banks	Countries	Number of banks
Bahrain	4	Egypt	8
Kuwait	5	Morocco	8
Oman	5	Tunisia	10
Qatar	4	Jordan	13
Saudi Arabia	8	Lebanon	4
United Arab Emirates	14		
Number of banks	40	Number of banks	43
Whole sample		83 banks	

Table 2: Definition of variables

Variables	Definitions	Measurements
Dependent variables (PROF)		
ROA	Return on assets	Net income after tax to total assets (%)
ROE	Return on equity	Net income after tax to total equities (%)
Bank specifics		
NII	Bank diversification	Non-interest income in % of total income
NPLs	Non-performing loans	Bank nonperforming loans to gross loans (%)
BS	Bank size	Natural logarithm of total assets
CAR	Capital adequacy ratio	Bank capital to total assets (%)
LTD	Liquidity risk	Loans to deposits ratio (%)
Industry specifics		
CONC	Bank Concentration	Bank concentration (%)
LERN	Bank competition	The Lerner index
Financial environment and macroeconomic conditions		
CRISIS	Global financial crisis of 2008	Dummy variable that takes 0 before the crisis of 2008 and 1 after
GDPG	The growth rate of GDP	Annual growth rate of GDP (%)
INF	The inflation rate	Consumer price index (%)

Table 3: Test of linearity

Transition variables	NII→ROA		NII→ROE	
	Statistics	P-value	Statistics	P-value
Lagrange	33.352	0.000***	26.845	0.002***
Multiplier Wald test				
Lagrange	2.777	0.000***	2.207	0.017***
Multiplier F-test				
Likelihood-ratio test	35.160	0.000***	27.954	0.001***

***Indicates the level of significance at 1%

Where; PROF is profitability measured by ROA and ROE and NII is bank diversification measured by the ratio of non-interest income.

4. RESULTS

4.1. The Pre-tests of the PSTR Model

Three tests are performed to reject the linearity between non-interest income and bank performance. These three tests are the Lagrange Multiplier (Wald test), the Lagrange Multiplier (F-test) and the Likelihood-ratio test (LR). Results of the linearity tests are given in Table 3.

Table 2 shows that the null hypothesis is rejected at the 1% level of significance for the three tests which confirm the non-linearity between bank diversification (NII) and both ROE and ROA in

MENA countries. As for the number of regimes for the transition variable (NII), Table 4 displays the results.

From Table 3, we observed that both hypothesis: With ($r = 2$) and without threshold ($r = 0$) are rejected at the 1% level of significance for the two tests. Hence, we reject the null hypothesis and we admit that it exists at least two functions of transition and the model has one threshold for both ROA and ROE.

The initial condition of the PSTR model is the rejection of linearity. However, the fundamental objective of this approach is to define the optimal threshold of the transition variable that can affect the dependent variable. By defining this threshold, we can discuss the effect within two regimes: below the threshold and above the threshold. Results are given in Table 5.

From Table 5, we notice that the threshold of non-interest income that may affect bank performance (ROA) in the MENA region is 22% for ROA and 25.41% for ROE.

4.2. Findings of the PSTR Regression

Results of the PSTR regression are displayed in Table 6. This table shows that below the threshold of 22%, bank diversification negatively affects bank profitability. However, surpassing this threshold, the effect of NII becomes positive and significant. Bank's profitability in the MENA region benefits from a higher capital adequacy ratio and a more concentrated banking sector. However, it is more sensitive to an increase in the NPLs ratio. In addition, we found that the global financial crisis negatively and

Table 4: Test of the number of regimes

Transition variables		NII→ROA		NII→ROE	
Hypotheses	Tests	Statistics	P-value	Statistics	P-value
(1) $H_0: r=0; H_1: r=1$	LRT	58.256	0.000***	57.357	0.000***
	F	4.105	0.000***	4.256	0.000***
(2) $H_0: r=1; H_1: r=2$	LRT	95.317	0.000***	140.782	0.000***
	F	4.427	0.000***	7.814	0.000***

***indicates the level of significance at 1%

Table 5: Results of threshold values

	NII→ROA	NII→ROE
γ	5.000	1.900
C	22.00%	25.41%
AIC	-0.148	4.473
BIC	0.105	4.720

Table 6: Results of the PSTR model estimation (ROA and ROE are the dependent variables)

Variable	NII→ROA		NII→ROE	
	Coeff	T-stat	Coeff	T-stat
NPLs	-0.109	-3.274***	-0.341	-4.033***
LTD	-0.011	-0.755	-0.039	-1.138
BS	-0.186	-0.512	-1.665	-1.337
CAR	1.418	3.108***	0.159	1.294
CONC	0.336	7.462***	0.030	1.112
LERN	0.743	0.299	-0.547	-4.643***
CRISIS	-0.793	-2.132**	0.052	0.818
GDPG	0.021	0.851	0.067	1.947*
INF	0.005	0.210	-1.741	-2.051**
NII<22%	-1.662	-2.017**	-9.218	-4.010***
NII>22%	1.879	2.203**	10.252	3.979***
γ	5.00		1.900	
C	22%		25.41%	
R2	39.18%		19.23%	
Durbin-Watson	1.954		2.30	
Obs	838		861	

***, ** and * indicate significance levels respectively at 1%, 5% and 10%

significantly affects the level of profitability. Findings also show that liquidity risk and bank size do not exert any significant effect.

Results indicate that below the threshold of 22% bank diversification exerts a negative and significant effect on bank profitability measured by the ROA. Exceeding this threshold, a more non-interest income significantly increases the level of bank profitability.

Using the ROE as a dependent variable, the result of the PSTR confirms the non-linearity between bank diversification and bank profitability. Findings indicate that below the threshold of 25.41% non-interest income significantly decreases the bank profitability. However, surpassing the threshold of 25.41%, bank profitability benefits from more bank diversification. This means that banks in the MENA region should operate in more diversified banking activities to improve their profitability. Non-interest income remains an important source of revenue for banks. A higher level of non-interest income positively affects bank profit through bank risk diversification. This finding indicates that diversification is considered as one of the most important mechanisms and channels to boost profitability and operational efficiency. Hence, it is recommended for banks to engage in more diversified banking

activities and to adapt their strategies to the business cycle and the evolution of technology. This result is in line with the work of Sharma and Anand (2018); Brahmana et al. (2018).

The results reveal that bank performance in the MENA region is sensitive to an increase of the credit risk measured by the NPLs ratio. They also reveal that more competition significantly decreases the level of bank performance. The coefficient of the global financial crisis is negative and significant confirming the harmful effect of banking crisis on bank profitability. The empirical findings show that bank performance gets benefits from a higher level of bank capital. Contrary to Aldomy et al. (2020), we found that bank concentration increases bank profitability through reducing bank risk-taking and bank fragility.

5. CONCLUSION

In this paper, we investigated whether bank income gets benefit from diversified activities for a panel of 83 MENA Banks. Findings of the PSTR model confirm the existence of a threshold effect between the non-interest income and both ROA and ROE. More specifically, we found that to benefit from bank diversification, banks in the MENA region should surpass the ratio of non-interest income of 22% when profitability is ROA and 25.41% for ROE. However, below these thresholds, bank diversification significantly decreases the level of bank profitability.

The results of this paper could have important policy implications for both policymakers and bankers. First, based on the defined thresholds, MENA banks should be engaged in more diversified bank activities in order to enhance their overall revenues. Furthermore, they should adapt their banking strategies to the new business model and the evolution of technology. Investing modern payment systems and financial technology could be a great start. Second, MENA banks should have a higher capital adequacy ratio (buffers) to improve their profitability. A higher capital adequacy ratio improves bank profitability through the monitoring channel of shareholders. Moreover, a higher capital adequacy ratio improves bank rating which reduces the cost of debt and increases bank profitability. Finally, given the multiple events that MENA countries have witnessed during the past 15 years: social unrest, demonstrations and wars, the results show that banks in the MENA improve their profitability in a stable macroeconomic environment marked by a high level of economic growth and low level of inflation.

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