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Article

# Income diversification and bank stability in the MENA region: Threshold effects

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**Abstract:** The aim of this study is to determine how bank diversification affects bank stability. To this end, it examines data of 136 commercial banks operating in 14 MENA (Middle East and North Africa) countries observed from 2005 to 2021, using the System Generalized Method of Moments (GMM) panel data regression analysis. The selected countries are Bahrain, Egypt, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Morocco, Lebanon, Algeria, Tunisia, Iran, Iraq, and the United Arab Emirates. The main results point to the enhancing effect of income diversification on bank stability. Our results underline the "Bright Side" of banking income diversification in the MENA region. However, this stabilizing income diversification effect is not always maintainable. The results also point to a non-linear relationship between interest/non-interest income and financial stability, suggesting that higher diversification reduces risk. We use a dynamic panel threshold model to determine income diversification thresholds that stabilize banks in the MENA region.

**Keywords:** income diversification; bank stability; threshold effects; MENA

## 1. Introduction

Recently, banks have witnessed major changes and downward trends in their credit and deposit market shares brought about by lifting regulatory restrictions on competition and by advances in information technology. Such changes have neutralized the traditional comparative advantages of commercial banks (Berger et al., 1995; Boyd and Gertler, 1994; Edwards and Mishkin, 1995; Kaufman and Mote, 1994). Banks have reacted to such a new environment by adopting a proactive strategy of broadening the range of products they offer their customers. Following the decline in the share of their traditional activities, banks are making up for lost time by producing and selling fee-based financial services. Indeed, while banks have long derived non-interest income from providing traditional banking services, they are now generating non-interest income from a number of new sources. The MENA (Middle East and North Africa) economy is predominantly a banking economy in which the banking sector dominates the financial system despite reforms to promote equity and bond markets (Ben Naceur and Omran, 2011; Creane et al., 2004; Shahriar et al., 2023). MENA countries outside GCC (Gulf Cooperation Council) suffer from limited development of equities and corporate bonds. Moreover, the region's banking sector is young, with most banks only established in the 1970s or later (Olson and Zoubi, 2011; Shahriar et al., 2023).

The basic literature, notably authors like Johnson and Meinster (1974), Heggestad (1975), Wall and Eisenbeis (1984), Litan (1985), Shahriar et al. (2023), Adem (2023) and Shabir et al. (2024) indicate that non- interest income is more stable than loan-based income, as it is considered less sensitive to interest rate movements

and economic downturns. Moreover, portfolios of traditional products consisting of activities that generate non-interest income tend to reduce earnings volatility and this by means of diversification. Specifically, controlling banking risk implies the combination of traditional banking activities and non-traditional activities such as securities, insurance and real estate. Accordingly, diversifying bank income and its effect on bank performance and stability still fuel the debate in the relevant literature.

The question "Should banks diversify their activities and revenues?" has been attractive to academics and professionals over the past few decades. Numerous empirical studies have been carried out on this question, showing an array of results. A wealth of literature has also emerged on the link between income diversification and banking stability. Several recent studies have highlighted the "bright side" of bank income diversification. In other words, diversification strategies contribute to banking sector stability, i.e., Sanya and Wolfe (2011), Lee et al. (2014), Köhler (2015), Moudud-Ul-Huq et al. (2018), Ammar and Boughrara (2019), Paltrinieri et al. (2020), Wu et al. (2020). However, other authors, namely Stiroh and Rumble (2006), Lepetit et al. (2008), De Jonghe (2010), Pennathur et al. (2012), DeYoung and Torna (2013), Hsieh et al. (2013), Williams (2016), Abuzayed et al. (2018), Yang et al. (2019) and Shahriar et al. (2023) highlight the "dark side" of bank income diversification.

This paper investigates how various diversification strategies used by banks affect their stability, using a detailed dataset of banks within the MENA region. The MENA region, with its unique blend of economic, regulatory, institutional, and geopolitical features, stands apart from other global regions. Its location, bridging developed and developing nations across Europe, Asia, and Africa, makes it a compelling subject for study. Additionally, the MENA region's strategic importance draws significant interest from international investors and financial institutions. However, this same strategic position also exposes MENA countries to heightened risks of political, economic, and financial instability. Some countries in the MENA region have committed themselves politically and economically to the diversification of state revenues. This is particularly interesting given that the region's banks are closely linked to this type of economic policy decision. As a first initiative, with the aim of shifting their energy-dependent economies to energy-free economies, the Gulf Cooperation Council (GCC) countries have all engaged in setting up diversification-based economic policies, with a special focus on the financial sector. As banks are the main institutions financing state projects focused on the energy industry, banks in the region are making efforts to diversify in order to benefit from the bright side of the diversification. Despite the desire among monetary professionals, banks and supervisors, there is a scarcity of work efforts in MENA region.

Bearing on the above proposals, this paper aims to address the following research questions: (1) How does income diversification affect the financial stability of banks in the MENA region? (2) Is the impact of income diversification on financial stability of MENA banks sensitive to income thresholds?

In order to explore the impact of income diversification policies pursued by 136 commercial banks in the MENA region on banking stability, we resort to a modelling approach similar to that of Stiroh and Rumble (2006), Mercieca et al. (2007), Sanya and Wolfe (2011), Amidu and Wolfe (2013), Lee et al. (2014), Abuzayed et al. (2018) and Adem (2023). We use the Two step system generalized method of moments

(System GMM) as proposed by Blundell and Bond (1998). This approach is preferred to study the dynamic evolution of the periodic diversification policy in our sample. It is known to solve endogeneity, heteroscedasticity and autocorrelation problems.

Despite mixed empirical results from studies in developed economies, there is limited understanding of how these findings apply to developing regions like MENA. To the author's knowledge, few studies have thoroughly examined the key areas of interest in this context, and those that have only explored certain MENA countries were limited. Identifying the non-linearity of the relationship without distinguishing income diversification thresholds remains a gap to be filled. In this regard, we used the threshold model to delineate the different thresholds and optimal cut-points and use the schematic figures to show the relationship between banking stability and risk on the one hand, and with each chosen diversification variable on the other.

This paper contributes to the literature in several ways. First, we study the direct impact of diversification on banking stability and risk through different diversification measures, namely DIV-Adj and Sh variables for each income type, which is not used for studies dealing with the MENA region. Second, we identify the non-linearity of the relationship between income diversification and banking stability and risk. To our knowledge, the dynamic panel threshold model method has not been used to examine the link between income diversification and bank stability and risk in the MENA region. Third, using the dynamic panel threshold model, we identify the different thresholds and optima at which MENA banks generate more stability.

Our results indicate that banks in MENA countries are pursuing an interest and non-interest income diversification strategy, through which they stabilize to a greater extent their banking systems. The obtained results support those found in the empirical literature which emphasized the "bright side" of bank income diversification strategy. Our results also reveal a non-linear link between interest and non-interest income and bank stability, as identified through Hansen's threshold model.

The remainder of this paper is structured as follows. Section 2 examines the link between income diversification and banking stability and risk as presented in the empirical literature. Section 3 presents the methodology used. Section 4 presents the results and econometric models. Section 5 concludes the paper.

## 2. Literature review

### 2.1. Non-traditional activities diversifying and bank's risks reduction

The previous banking literature does not articulate a clear answer to the question "should banks diversify or specialize?" (Adem, 2023; Berger et al., 2010; Shabir et al., 2024). The dilemma of whether or not to diversify has given rise to two important hypotheses. These are the conglomerate hypothesis and the strategic orientation hypothesis. Traditional arguments suggest that banks should be as diversified as possible, because since they are generally highly leveraged, diversification can reduce their default risk (Boyd and Prescott, 1986). On the other hand, some authors argue that financial institutions should focus on a single sector of activity in order to meet the challenge of expertise and reduce agency problems (Berger and Ofek, 1996; Servaes, 1996; Shahriar et al., 2023). An overall reading of the main empirical studies shows mixed results.

Earlier studies demonstrated that banks could lower their risk by branching out into non-traditional activities. These studies employed various methods to compare revenue streams across different financial services industries and among companies within these sectors, and between bank holding companies with different product combinations. In general, these studies have revealed that combining traditional and non-traditional activities has the potential of reducing risk (Gallo et al., 1996; Heggestad, 1975; Johnson and Meinster, 1974; Litan, 1985; Wall and Eisenbeis, 1984). More recent studies, using individual data, conclude, however, that diversification into non-banking activities increases bank risk (Boyd and Graham, 1986; Demsetz and Strahan, 1995; Roland, 1997; Shahriar et al., 2023; Sinkey and Nash, 1993). Studies identify the relationship between income diversification and banking risk under normal economic conditions. Studies suppose the linearity of the relationship. The study of DeYoung and Roland (2001) is arguably the turning point in the empirical literature on this subject. Their empirical method significantly diverges from the standard approach commonly used in prior studies. The originality of DeYoung and Roland's (2001) study lies in the fact that they develop their analysis on the basis of revenues, rather than profits, like in previous studies. In addition, they observe the effects of product diversification within the integrated, established production process, instead of virtually merging revenue streams, collected from productions and marketing efforts. Data from 472 US commercial banks observed from 1988 to 1995 indicate that shifting from traditional lending to fee-based activities leads to increased earnings volatility and unsustainable debt levels, thus amplifying income fluctuations. Driven by financial liberalization and the integration of financial systems in Europe, Mercieca et al. (2007) explored whether diversifying into non-interest income activities enhances the performance of smaller European credit institutions.

Indeed, Mercieca et al. (2007) contribute to research on European banks in three distinct ways. The study examines whether there are diversification benefits in the small bank sector in Europe.

This paper adds to the understanding of small banks by examining their revenue diversification strategies in a growingly competitive market. The authors investigate whether specific types of small banks are more capable of gaining advantages from diversification. To this end, Mercieca et al. (2007) used measures of bank risk-adjusted performance such as risk-adjusted measures of return on equity and return on assets. They assess the insolvency risk for each bank using a Z-Score, based on returns on banking assets (ROA), used by Ben Lahouel et al. (2022), Ben Lahouel et al. (2023), Adem (2023), Shahriar (2023), Wu et al. (2024) and Shabir et al. (2024) and originally adopted by Boyd and Graham (1986). For diversification measures, the authors use the HHIREV, HHINON measures based on the Herfindahl-Hirschmann index. Their results, for 15 European countries, also deduce no direct diversification advantage for small credit institutions, either within or between business sectors over the 1997–2003 period. On the contrary, Lepetit et al. (2008), studying 734 European banks, show that greater reliance on non-interest-bearing activities is associated with higher risk, but that higher risk strongly correlates more with fee income than trading income. Lepetit et al. (2008) focus on the relationship between income structure and risk in the European banking industry. Their analysis includes a wide range of insolvency risk

indicators derived from accounting metrics, like the Z-score, as well as market-based measures such as the volatility of weekly stock returns and the beta coefficient of the bank's market model. The study evaluates the risk impact associated with various product combinations, including trading activities and commission-based income.

In contrast to Lepetit et al. (2008), Hidayat et al. (2012) show that bank size is a crucial factor in determining how non-interest income activities are associated with bank risk. The shift towards non-interest income activities tends to reduce risk for smaller banks but raises risk levels for larger ones. This result indicates that deregulation encouraging Indonesian banks to engage more in non-traditional activities could adversely affect the overall banking system, particularly given the significant role played by large banks.

It is unclear how diversified financial institutions will behave in adverse economic situations, and what the overall impact of income diversification will be on the stability of the banking sector in such circumstances. In this regard, De Jonghe (2010) attempted to fill this gap. Even so, as far as we can report, only Schoenmaker et al. (2005) adopted this perspective and examined dependence between European banks' risk reduction and insurance. However, their study is limited to 10 banks and 10 insurers. De Jonghe (2010) supports the idea that a shift to non-traditional activities reduces the stability of the banking system because interest income is less risky than all other income streams. In addition, the impact of alternative revenue shares (commission and fee income, trading income, other operating income) differs considerably from one another. Additionally, Demirguc-Kunt and Huizinga (2010) examine the impact of bank diversification and short-term funding strategies on bank risk and return, using an international sample of 1334 banks in 101 countries during the period leading up to the 2008 financial crisis. Demirguc-Kunt and Huizinga (2010) break down banking operations by analyzing the proportion of non-interest income, including fees, commissions, and trading income, as part of total operating income. On the liabilities side, they differentiate between deposits and other short-term funding sources like money market instruments, such as certificates of deposit (CDs) and interbank loans. Their study aims to explore the risk-return trade-offs associated with various financing strategies and activities employed by banks.

Their study fills this gap in the literature, because, as far as we know, no empirical study has considered the implications of financing strategies on bank risk and return. The findings reveal that venturing into non-interest income activities, such as capital market trading, boosts return on assets and may provide modest risk diversification benefits when pursued at minimal levels.

Wu et al. (2024) analyze the effects of banking diversification and focus strategies on the profitability and risk of Chinese banks in the post-crisis years (2008–2019). The main results indicate that Chinese banks do not gain much benefit in terms of profitability and risk from following income or asset diversification Utilizing a panel of 10 MENA countries. Shahriar et al. (2023) conduct a fixed-effect panel data regression analysis. The authors indicate that diversifying assets and funding can negatively affect bank stability, whereas diversifying income sources tends to enhance it. Moreover, the study finds that stronger governance at the national level and higher net interest margins are associated with greater bank stability across the 10 MENA countries examined.

Using a sample of 271 banks operating in the MENA countries during the period 2009–2020, Shabir et al. (2024) results show that the impact of enhancing banking diversification on stability is mixed. Diversifying a bank's income and assets strengthens its stability. However, as non-interest activities grow, the advantages of diversification begin to decline, revealing what is often referred to as the "dark side of diversification".

## 2.2. The non-linear connection between revenue diversification and financial stability

Recent studies have challenged earlier findings that suggested a linear link between diversification and banking stability. Instead, new evidence points to a non-linear relationship, where greater reliance on non-interest income actually decreases risk-adjusted earnings. Gambacorta et al. (2014) analyzed 98 international banks from 1994 to 2012, investigating the non-linear connection between income diversification—measured as the ratio of non-interest income to total income—and return on assets (ROA). The key finding is that income diversification boosts bank profitability, but only up to a threshold of 30% diversification. In a study of commercial banks in OECD (Organisation for Economic Cooperation and Development) countries, Kim et al. (2020) explored the impact of diversification on financial stability, uncovering a notable non-linear, inverted U-shaped relationship. Their results show that moderate diversification enhances bank stability, while excessive diversification undermines it. Unlike earlier research that identified a linear link between diversification and stability, Kim et al. (2020) demonstrated the presence of a non-linear connection. Their research indicates that while moderate diversification can enhance bank stability, excessive diversification has the opposite effect. Additionally, most earlier studies on bank diversification focused primarily on the period before the 2008 financial crisis. In contrast, Kim et al. (2020) expanded their analysis to include the years during and after the crisis. Their findings reveal that higher levels of income diversification, particularly into and within non-traditional banking activities, actually weaken bank stability. The authors demonstrate that income diversification in European banks is not ideal, as no advantages arise from "over-diversification". Shabir et al. (2021) investigated how economic policy uncertainty (EPU) influences bank stability using bank-level panel data. Their findings reveal a notable threshold effect in the relationship between EPU and bank stability, applying a non-linear threshold estimation method. In countries with strong institutional quality, the negative impact of policy uncertainty on bank stability is mitigated, while in regions with lower competition among banks, this negative effect is amplified.

## 2.3. The moderating effect of the macroeconomic and institutional variables

Previous studies have suggested that volatility of the macroeconomic and institutional environment in which banks operate compromises their role in effectively managing risk (Hackbarth et al., 2006). Most recently, Ovi et al. (2020) found that through income diversification, banks in the Association of Southeast Asian Nations

(ASEAN) region may have reduced their credit risk while achieving capital savings when facing economic downturns during the 1998 to 2018 period. Studying the effect of income diversification during the 2007–2008 financial crisis, DeYoung and Torna (2013) teste whether revenues from non-traditional banking activities contributed to the failure of hundreds of US commercial banks during the financial crisis. The originality of DeYoung and Torna's (2013) study lies in its methodology. Identifying the different activities generating non-interest and commission income, their risk-return is therefore likely to have different impacts on the probability of financial difficulties and insolvency. Their results show that the probability of bank failure decreased with purely non-traditional fee-based activities such as securities brokerage and insurance sales, but increased with non-traditional asset-based activities, such as venture capital, investment banking and asset securitization. Williams (2016) investigated the relationship between income diversification and bank risk using data from Australian banks. The author found that banks with lower non-interest income are less risky, which is consistent with previous international evidence. However, the author found that certain types of non-interest income are risk-reducing when bank specialization effects are taken into account. Williams (2016) also find that the 2008 financial crisis has altered some aspects of the relationship between bank risk and income diversification. Others such as Yang et al. (2019) have been able to contribute to the previous empirical literature on bank income diversification. They follow Wagner (2010) in examining the effects of bank income diversification on systemic risk. Furthermore, their study contributes to the literature in several ways. Firstly, of the different risk metrics, Yang et al. (2019) are the first to provide empirical evidence on the relationship between bank diversification and systemic risk. The previous literature has explored the effect of diversification on banking risk with risk measures using accounting data, such as the proportion of risky assets and non-performing loans, Z-score, idiosyncratic risk and standard deviation of performance (Lepetit et al., 2008). However, diversification effects are rarely linked to systemic risk. Although several recent studies have attempted to model theories on the role of diversification in systemic risk, related empirical studies are still scarce (Allen et al., 2012; Wagner, 2011). Secondly, although the current conclusive evidence on the determinants influencing systemic risk refers to the "Too big to Fail" phenomenon, Yang et al. (2019) contribute to the literature by arguing that diversification is also critical to systemic risk as large banks are burdened by a higher level of diversification. Gauthier et al. (2013) note that larger banks tend to have higher systemic risk. Yang et al. (2019) expanded on this debate by showing that, given bank size, the marginal effects of diversification on systemic risk are significant. However, these effects are only observable in large banks, suggesting that size and diversification play complementary roles in increasing systemic risk. Using bank revenue sources to measure diversification and examining US commercial bank data from 2000 to 2013, Yang et al. (2019) find that bank diversification is associated with an increase in systemic risk. Recently, Shabir et al. (2024) find that political instability and climate risk significantly affect the bank's stability and decrease the benefits of the bank's diversification strategy. Adem (2023) results suggest that income diversification technique could improve financial stability throughout typical and crisis periods which validate portfolio management theory. Capital regulations in the banking sector have

been shown to be an effective mechanism for reducing risks and promoting stability. Moreover, the results suggest that political institutions have a considerable and direct impact, with a positive correlation to increased bank fragility.

## 3. Methodology

### 3.1. Model

Like in Stiroh and Rumble (2006), Mercieca et al. (2007), Sanya and Wolfe (2011), Amidu and Wolfe (2013), Lee et al. (2014) and Abuzayed et al. (2018), we estimate the following model:

$$Z\text{score}_{i,j,t}/\text{NPLs}_{j,j,t} = \alpha_0 + \alpha_1 Z\text{score}_{i,j,t-1}/\text{NPLs}_{i,j,t-1} + \alpha_2 \text{DIV}_{i,j,t} + \alpha_3 \text{DIV}^2$$
$$\alpha_4 \text{LLR}_{i,j,t} + \alpha_5 \text{LDR}_{i,j,t} + \alpha_6 \text{LOANG}_{i,j,t} + \alpha_7 \text{SIZE}_{i,j,t} + \alpha_8 \text{GDPG}_{j,t} + \alpha_9 \text{INF}_{j,t} + \varepsilon_{i,t}$$

*Z*-score and NPLs denote the measures of banking stability and risk respectively, DIV presents the different measures of income diversification. Following Sanya and Wolfe (2011), Abuzayed et al. (2018), Kim et al. (2020), and Adem (2023) we added $\text{DIV}^2$ which is the squared value of different income diversification measures. This approach addresses the potential non-linear relationship between diversification, banking stability, and risk. The squared term was added based on the assumption that a certain level of diversification positively influences bank stability, particularly until an optimal threshold is reached. Other factors considered include bank-specific control variables, such as the loan-to-deposit ratio (LDR), loan loss reserve ratio (LLR), loan growth rate (LOANG), and bank size (SIZE). Additionally, macroeconomic indicators were included, such as GDP growth rate (GDPG) and inflation (INF), where *i, j,* and *t* represent the bank, country, and year, respectively.

We use the Two step system generalized method of moments (System GMM) as proposed by Blundell and Bond (1998). This approach is preferred to determine the dynamic evolution of a periodic diversification policy in our sample. The System GMM model applies first differences to remove any anticipated correlation between the lagged dependent variable and the error term. It addresses endogeneity by using the lagged values of the predetermined and endogenous variables as instruments.

We use the one-year lagged terms in addition to the various diversification measures to overcome an endogeneity problem and then complement our analysis with additional robustness checks. We also check for individual effects or heterogeneity when estimating the model. In our panel data, testing heteroscedasticity[1] and error autocorrelation[2] hypotheses are fundamental. The Durbin-Wu-Hausman test was employed to assess endogeneity. Under the null hypothesis, the ordinary least squares (OLS) estimator would produce consistent estimates. If the null is rejected, it suggests that instrumental variables are necessary and that the endogenous regressor significantly affects the estimates. Additionally, the Hansen test results indicate it cannot be rejected, confirming the validity of the instruments. Lastly, the AR (2) test was applied to the residuals to check for any correlation between the transformed error terms. These tests collectively confirm the appropriateness of the instruments.

In addition, to validate the presence of non-linear relationships between the economic variables in our basic relationship, we resort to the threshold model in a

second phase. To our knowledge, the dynamic panel threshold model method has not been used to examine the link between income diversification and bank stability and risk in the MENA region.

## 3.2. Study variables

### 3.2.1. The dependent variable: Bank stability and risk

The accounting-based measure of risk considered in this study is the widely-used *Z*-score. This score measures distance to insolvency. This index is generally considered in the banking literature as a measure of stability (Beck et al., 2013; Lepetit and Strobel, 2013; Shahriar et al., 2023).

$$Z\text{score} = \frac{\text{ROA} + \text{CAR}}{\text{GROA}}$$

Return on assets (ROA) is an indicator of bank quality. CAR is the capital ratio, equal to equity over total assets, and measures bank capitalization. Moreover, in order to measure volatility of bank revenues, which reflects risk-taking strategies, we use the standard deviation of return on assets $\sigma$ ROA. We choose the approach used by Lepetit and Strobel (2013) and calculate the mean and standard deviation of return on assets over the entire study period. We also use the value representing the capital ratio.

We consider the *Z*-Score as an inverse risk proxy that represents an overall measure of the bank's individual risk. This could be seen as risk-taking level, i.e., the risk paid for. The *Z*-Score can be interpreted as the number of standard deviations by which a bank's return must fall below its expected value to make the bank insolvent (Nguyen et al., 2012). Then, the *Z*-Score inversely relates to the probability of a bank's insolvency. A higher *Z*-score implies a lower insolvency probability. Indeed, a bank becomes insolvent when its asset value falls below its debt.

Measures of banking stability should take better account of the default risk associated with the NPLs portfolio. Therefore, measures of loan quality have an independent effect on banking stability. Essentially, they relate to the probability of the borrower defaulting on its obligations, where a higher value indicates a riskier loan portfolio. For the purposes of this study, we chose bad debts as an indicator of loan portfolio risk and as a measure of robustness. We use the ratio of impaired loans to total gross loans. This ratio is used to represent loan portfolio risk. In other words, it is an indicator of loan quality. A higher ratio suggests that the bank also has a higher risk. *Z*-score and NPLs data are author's own calculations based on bank scope database.

### 3.2.2. The independent variables: Income diversification

For the purposes of this study, we selected different diversification variables based on three distinct criteria. The first criterion distinguishes between interest and non-interest income diversification. Accordingly, referring to Stiroh and Rumble (2006), Yang et al. (2019), Liang et al. (2020), Paltrinieri et al. (2020), Adem (2023), Shahriar (2023) and Wu et al. (2024), we opted for the adjusted Herfindahl-Hirschman index, namely "DIV-Adjusted".

$$\text{DIV-Adjusted} = 1 - [(\text{NET/TOR})^2 + (\text{NON/TOR})^2]$$

Case 1: if DIV-Adjusted = 0, the bank specializes in a particular activity.

Case 2: if DIV-Adjusted = 0.5, the bank diversifies its business income in a balanced way between interest and non-interest income.

Some authors, namely Mercieca et al. (2007), Sanya and Wolfe (2011), Meslier et al. (2014), Ahamed (2017) used an unadjusted form to measure diversification, in this case:

$$DIV = (NET/TOR)^2 + (NON/TOR)^2$$

Case 1: if DIV = 0.5, the bank diversifies its income in a balanced way.

Case 2: if DIV = 1, the bank specializes in a particular type of income.

The second criteria of diversification, the "FOC-No" variable, measures the diversification degree between non-interest income in an adjusted form. According to Abuzayed et al. (2018), the FOC- Non-Adjusted variable is written as follows:

$$FOC\text{-}Non\text{-}Adjusted = 1 - [(TRAD/NON)^2 + (COM/NON)^2 + (OTH/NON)^2]$$

Case 1: if FOC-Non-Adjusted = 0, the bank specializes in one non-interest income generating activity.

Case 2: if FOC-Non-Adjusted = 0.67, the bank diversifies its non-interest income in a balanced way between three banking activities: net commission income (COM), net trading income (TRAD) and all other net operating income (OTH).

It is also possible to measure non-interest diversification under an unadjusted entry like in Ahamed (2017), Zouaoui and Zoghlami (2020). In this case, FOC-Non is written as follows:

$$FOC\text{-}Non = (TRAD/NON)^2 + (COM/NON)^2 + (OTH/NON)^2$$

Case 1: if FOC-Non = 0.32, the bank diversifies its business income in a balanced way.

Case 2: if FOC-Non = 1, the bank specializes in a particular non-interest income generating activity.

**Table 1.** Diversification variables and sources.

| Variables | Definition | Sources |
|---|---|---|
| DIV-Adj | DIV-Adjusted = 1 – $[(NET/NETOP)^2 + (NON/NETOP)^2]$ where NETOP = NON + NET. NON represents non-interest income; net interest income entered as NET; NETOP represents net operating income | Author's own calculations based on Bankscope database |
| FOC-Non-Adj | FOC-Non-Adjusted = 1 − $[(TRAD/NON)^2 + (COM/NON)^2 + (OTH/NON)^2]$ where NON = COM + TRAD + OTH COM measures commission income, TRAD captures trading income and OTH represents other operating income. Higher FOC-NON values indicate greater concentration. | |
| SH-Int | SH-Int = INT/TOR shows interest income as a percentage of total net operating income | |
| SH-Non | SH-Non = NON/TOR shows the share of non-interest income in total net operating income | |
| SH-Co | SH-Com = COM/TOR presents commission income as a percentage of total net operating income | |
| SH-Tr | SH-Trad = TRAD/TOR shows trading revenues as a proportion of total net operating income | |
| SH-Oth | SH-All Other = OTH/TOR shows the share of other net operating income in total net operating income | |

Source: Author.

The third diversification measure used, "HS", measures the contribution of each type of income to total operating income, derived from the four main banking activities, namely net interest income, commission income, trading income, and all other net operating income (Demirguc-Kunt and Huizinga, 2010; Kim et al., 2019; Lepetit et al., 2008; Ovi et al., 2020; Shabir et al., 2023; Stiroh and Rumble, 2006; Wu et al., 2020; Wu et al., 2024). The different diversification variables retained in this study are presented in the **Table 1** above.

#### 3.2.3. The control variables: Macroeconomic and bank-specific variables

The macroeconomic variables include GDPG, which presents the GDP growth rate, and INF, the consumer price index. Data are collected from the World Development Indicators (WDI) of the World. The Bank-specific variables include the LDR, which measures the loans to deposit ratio; LLR measures the loans loss reserves to total loans; SIZE measures the log value of total assets; and LOANG measures the loans growth ratio. Data are collected from author's calculation based on Bankscope Database.

### 3.3. Data

With the study period of the dataset from 2005 to 2021, a System GMM panel data regression analysis is conducted, using a sample of 136 commercial banks from 14 MENA countries: Bahrain (15), Egypt (17), Jordan (13), Kuwait (10), Oman (6), Qatar (9), Saudi Arabia (11), Morocco (6), Lebanon (15), Algeria (3), Tunisia (10), Iran (2), Iraq (2), and the United Arab Emirates (17). The dataset draws from multiple sources. The bank-level data was compiled using Bank Scope, a resource made available by Bureau van Dijk and Fitch Ratings.

### 3.4. Descriptive statistics

The descriptive statistics of the mean value and the standard deviation (Std. Dev.) of the different variables of banks operating in the MENA region and the macroeconomic variables are recorded below in **Table 2**.

The average of two variables Z-score-ROA and NPLs are approximately equal, respectively at 23.51 and 9.11. Our results are of the same order as those of Chaffai (2019), Albaity et al. (2019) and Turk-Ariss (2010). Regarding the portfolio risk measure of loans, the average of NPLs is 9.11. This result is consistent with that of Kabir et al. (2017) for an average of 9.33, on a sample including 10 countries in the MENA region, which tends to underline the good performance of the estimates carried out. Furthermore, our results show that banks in the MENA region are diversifying between interest income and non-interest income (DIV-Adj) and are specializing (FOC-Non-Adj) in a non-interest generating activity, as shown by their mean values of 0.357 and 0.296, respectively. A thorough analysis of non-interest income sources shows that banks typically focus more on fee-based activities (average value = 0.712), while they allocate less emphasis to trading income (average value = 0.0703) and other types of non-interest income (average value = 0.217). MENA banks, which operate in less mature financial markets and are gradually diversifying their approaches, may not possess the necessary expertise to develop trading operations as effectively as their counterparts in more developed markets. Additionally, other macroeconomic and

bank-specific control variables exhibit considerable variation around their average values.

**Table 2.** Descriptive statistics.

| | Obs | Mean | Std. dev. |
|---|---|---|---|
| Z-Score | 2115 | 23.51 | 18.52 |
| NPLs | 1459 | 9.114 | 11.41 |
| DIV-Adj | 2044 | 0.357 | 0.215 |
| FOC-Non-Adj | 2061 | 0.296 | 0.562 |
| SH-Int | 2091 | 0.687 | 0.211 |
| SH-Non | 2091 | 0.313 | 0.211 |
| SH-Co | 2070 | 0.712 | 0.661 |
| SH-Tr | 2070 | 0.0703 | 0.691 |
| SH-Oth | 2070 | 0.217 | 0.315 |
| LDR | 2115 | 1.170 | 4.715 |
| LLR | 2115 | 3.581 | 3.342 |
| SIZE | 2115 | 4.029 | 0.845 |
| LOANG | 2115 | 4.461 | 1.251 |
| GDPG | 2294 | 4.347 | 3.362 |
| INF | 1857 | 4.045 | 3.907 |

## 4. Results

**Tables 2** and **3** present, respectively, the main results of the impact of income diversification on banking stability and risk. Three groups of diversification indicators, namely DIV-Adj, FOC-Non-Adj and SH for each type of income, are used in seven models to study this relationship in **Table 3** from column (1) to (7). The column (1) shows the results of the estimates of the effect of interest and non-interest income diversification on banking stability as measured by Z-ROA. In essence, we note that the variable DIV-Adj has a positive and statically significant effect on bank stability. This finding indicates that interest and non-interest income diversification promotes bank stability in MENA countries. The results of model (2) presented below also support the positive and statistically significant impact of the FOC-Non-Adj variable, reflecting the fact that specialization in a particular type of non-interest income promotes the stability of the banks in the sample. As far as the SH variables are concerned, we found that the share of trading income Sh-Tr and the share of other non-interest income Sh-Oth have a significantly positive impact on bank stability. These results suggest that increasing the shares of these two types of income promotes the stability of banking systems. In addition, we notice that the coefficients of the Sh-Int, Sh-Non and Sh-Co variables are negative and statistically significant. These results show that the shares of interest income, non-interest income and commission income, respectively, have a banking destabilizing effect.

Our results are consistent with those of the empirical literature which highlighted the “bright side” of bank income diversification strategies (Ammar and Boughrara, 2019; Köhler, 2015; Lee et al., 2014; Moudud-Ul-Huq et al., 2018; Paltrinieri et al.,

2020; Sanya and Wolfe, 2011; Shabir et al., 2023; Wu et al., 2020; Wu et al., 2024). A contrary, our results differ from those supporting the "dark side" of diversification. The authors prove that the benefits of diversification may diminish due to increased exposure to volatile non-traditional activities (Abuzayed et al., 2018; Ben Lahouel et al., 2022; Ben Lahouel et al., 2023; De Jonghe, 2010; DeYoung and Torna, 2013; Lepetit et al., 2008; Shahriar et al., 2023; Shim, 2018; Stiroh and Rumble, 2006; Williams, 2016; Yang et al., 2019).

**Table 3.** Income diversification and banking stability: Results obtained from Z-ROA.

| **Z-ROA** | | | | | |
|---|---|---|---|---|---|
| **Variables** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| | **DIV-Adj** | **Foc-Non-Adj** | **Sh-Int** | **Sh-Non** | **Sh-Co** |
| **L.Z-ROA** | 0.855*** | 0.704*** | 0.939*** | 0.930*** | 0.927*** |
| | (0.0560) | (0.0122) | (0.00451) | (0.00389) | (0.00191) |
| DIV | 41.18*** | 0.367*** | −0.357*** | −1.060** | −1.077*** |
| | (14.87) | (0.0194) | (0.0685) | (0.439) | (0.0862) |
| $DIV^2$ | 0.484*** | 3,63e-05*** | 1.618*** | 2.035* | 0.0480*** |
| | (0.168) | (1.94e-05) | (0.491) | (1.173) | (0.00386) |
| LDR | 0.140* | 0.0458 | 0.0138 | 0.112** | 0.0410*** |
| | (0.0800) | (0.0279) | (0.0422) | (0.0487) | (0.0147) |
| LLR | −0.0618*** | −0.00473*** | 0.00954 | 0.00664 | 0.00644*** |
| | (0.00904) | (0.000457) | (0.00968) | (0.00442) | (0.000363) |
| SIZE | 3.419** | 0.940*** | 0.165* | 0.694*** | 0.128*** |
| | (1.359) | (0.0553) | (0.0919) | (0.124) | (0.0160) |
| LOANG | 0.0310 | −0.0783*** | −0.0248*** | −0.0388*** | −0.0135*** |
| | (0.0474) | (0.00615) | (0.00831) | (0.0133) | (0.00149) |
| GDPG | 0.501* | 0.309*** | 0.0855*** | 0.108*** | 0.101*** |
| | (0.269) | (0.0224) | (0.0329) | (0.0408) | (0.0173) |
| INF | −0.368** | −0.170*** | −0.120*** | −0.0706** | −0.182*** |
| | (0.161) | (0.0212) | (0.0343) | (0.0343) | (0.0240) |
| Constant | −39.82*** | 0.0588 | −0.156 | −3.830*** | 2.077*** |
| | (13.53) | (0.263) | (0.621) | (1.211) | (0.146) |
| Observations | 1,310 | 1,310 | 1,299 | 1,299 | 1,291 |
| Number of id | 114 | 114 | 114 | 114 | 114 |
| *P*-value AR (2) test | 0.170 | 0.422 | 0.502 | 0.433 | 0.413 |
| *P*-value Hansen test | 0.553 | 0.200 | 0.132 | 0.153 | 0.220 |

Note: ***, **, * means significance at 1%, 5%, and 10%, respectively.

The $Div^2$ coefficients in columns (1) to (7) of **Table 4** show the effects of diversification on banking stability at different income levels. The $Div^2$ variable is used to reflect the possible non-linear dynamics between income diversification and bank stability. By including the squared term, we account for the idea that a certain degree of diversification might enhance bank stability, particularly up to or beyond an optimal level of diversification. Notably, the relationship is non-linear for statistically

significant $\alpha 3$ coefficients and this with $\alpha 3 > 0$ or $\alpha 3 < 0$.

**Table 4.** Diversification of banking income and loan portfolio risk: Results obtained from the NPLs ratio.

| **NPLs** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Variables** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
| | **DIV-Adj** | **FOC-Non-Adj** | **Sh-Int** | **Sh-Non** | **Sh-Co** | **Sh-Tr** | **Sh-Oth** |
| LNPLs | 0.762*** | 0.732*** | 0.797*** | 0.775*** | 0.729*** | 0.744*** | 0.735*** |
| | (0.00681) | (0.000884) | (0.00873) | (0.0112) | (0.000856) | (0.00853) | (0.00908) |
| DIV | −5.215*** | −1.719*** | −4.662*** | 3.162*** | 4.375*** | −5.226*** | −3.266*** |
| | (0.809) | (0.00343) | (0.803) | (0.616) | (0.0182) | (0.352) | (0.219) |
| $DIV^2$ | −0.0608*** | 2.05e-04*** | 0.617*** | 0.464*** | −0.204*** | 0.0183*** | −0.187*** |
| | (0.00932) | (3.78e-06) | (0.113) | (0.132) | (0.000912) | (0.00230) | (0.0133) |
| LDR | −0.457* | 0.263*** | 0.267*** | 0.0505 | 0.178*** | −7.288*** | −8.357*** |
| | (0.275) | (0.00602) | (0.0730) | (0.395) | (0.00541) | (1.685) | (1.781) |
| LLR | 0.0120 | −0.0116*** | −0.00889*** | −0.00596** | −0.0118*** | 0.0730*** | 0.0611*** |
| | (0.00738) | (6.92e-05) | (0.00249) | (0.00256) | (8.71e-05) | (0.0223) | (0.0219) |
| SIZE | −2.214*** | −2.162*** | −1.031*** | −1.335*** | −2.150*** | −0.892*** | −0.610*** |
| | (0.0882) | (0.00335) | (0.134) | (0.139) | (0.00831) | (0.188) | (0.185) |
| LOANG | −0.198*** | −0.304*** | −0.187*** | −0.211*** | −0.284*** | −0.188*** | −0.175*** |
| | (0.00594) | (0.000769) | (0.00534) | (0.00582) | (0.00107) | (0.00625) | (0.00687) |
| GDPG | 0.144*** | 0.0337*** | −0.0227 | 0.0427 | 0.0694*** | −0.0205 | −0.0162 |
| | (0.0419) | (0.00639) | (0.0297) | (0.0344) | (0.00718) | (0.0425) | (0.0422) |
| INF | 0.250*** | 0.336*** | 0.188*** | 0.198*** | 0.214*** | 0.191*** | 0.142*** |
| | (0.0230) | (0.00417) | (0.0276) | (0.0291) | (0.00578) | (0.0276) | (0.0177) |
| Constant | 21.40*** | 20.49*** | 13.25*** | 11.94*** | 17.12*** | 15.71*** | 14.38*** |
| | (0.682) | (0.0322) | (0.894) | (1.368) | (0.0893) | (0.775) | (0.743) |
| Observations | 926 | 957 | 957 | 957 | 957 | 957 | 957 |
| Number of id | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| *P*-value AR (2) test | 0.369 | 0.286 | 0.368 | 0.369 | 0.347 | 0.392 | 0.354 |
| *P*-value Hansen test | 0.106 | 0.558 | 0.317 | 0.055 | 0.379 | 0.421 | 0.534 |

Note: ***, **, * Significance at 1, 5, and 10%, respectively.

With regard to the squared terms of the variables DIV-Adj, FOC-Non-Adj, Sh-Int, Sh-Non, Sh-Co, Sh-Tr and Sh-Oth, these admit a positive and significant relationship with banking stability in all columns, respectively, from (1) to (7). Our results consistently support a non-linear relationship between banking stability and income diversification. We then found that banking stability improves from minimum diversification levels, taking the form of a normal U. It seems to us that, for MENA banks, the results indicate that diversification gains accumulate from a certain degree. Furthermore, the results show that stability of local banks decreases as income diversification moves towards an optimal level, but increases as diversification continues to increase beyond the minimum optimal threshold. We opt to use the NPLs ratio, an indicator of loan portfolio allocation and risk-taking behavior, to test the relationship between income diversification and bank risk. **Table 4** reports the results

of the econometric estimates model. Indeed, most of our results are opposed to those obtained with Z-ROA, as expected. The first column reveals that the Div-Adj variable shows a negative and statistically significant effect on the NPLs ratio. Then, income diversification reduces the loan portfolio risk of MENA banks. In addition, we examined the effect of bank specialization into a non-interest income-generating activity, directly on risk, without however reaching totally conclusive results. The coefficient of the FOC-Non-Adj variable is negative and statistically significant, suggesting that specialization in a particular type of non-interest income makes it possible for local banks to reduce the risk of their loan portfolios. As for the different types of income shares, we note that non-interest income shares and commission income shares have a positive and statistically significant impact on the NPLs ratio. In other words, these two types of income have a destabilizing effect, suggesting that increasing the Sh-Non interest income share and the Sh-Co commission income share stimulates bank risk. The other types of income share, namely interest income share Sh-Int, trading income share Sh-Tr and other non-interest income share Sh-Oth, have negative and statistically significant effects on bank risk. Then, increasing the share of one type of income reduces the risk associated with the loan portfolio of MENA banks.

Our results are supported by those of Pennathur et al. (2012) who concluded that diversification of domestic public and private banks in India reduced banking risk. Similarly, Shim (2018) highlights the diversification benefits. Insolvency risk probability decreases in diversified banks, and banks with high income diversity achieve capital savings.

For the linearity versus non-linearity of the relationship between income diversification and bank risk, the estimated coefficients of $Div^2$, in particular, points to the statistical significance of the variable as shown in columns from (1) to (7). Bearing on these findings, we validate the non-linearity of the basic relationship. Indeed, the variables DIV-Adj, Sh-Co and Sh-Oth indicate that income diversification decreases the loan portfolio risk of MENA banks from a certain maximum degree. Conversely, the other variables, i.e., FOC-Non-Adj, Sh-Int, Sh-Non, and Sh-Tr, have a destabilizing effect as they increase risk from a minimum degree of specialization. In fact, Abuzayed et al. (2018) highlighted a non-linear relationship between non-interest (non-financial) income and stability, indicating that banks are able to reduce risk at higher diversification levels.

Identifying the non-linearity of the relationship without distinguishing income diversification thresholds remains a gap to be filled. In this regard, we use the threshold model to delineate the different thresholds and optimal cut-points and use the schematic figures to show the relationship between banking stability and risk on the one hand, and with each chosen diversification variable on the other. **Tables 4** and **5**, columns (1) to (7), report the different thresholds and optima for each income diversification variable, as a function of the "Z-ROA" and "NPLs" variables. **Figures 1** and **2** show, respectively, the plot of the relationship between, on the one hand, each income diversification variable on the *x*-axis, on the other hand, banking stability and risk. **Figure 1a–g** shows a diversification variable, respectively DIV-Adj, FOC-Non-Adj, Sh-Int, Sh-Non, Sh-Co, Sh-Tr and Sh-Oth. These graphs provide more details than statistical inference does.

At first glance, the **Figure 1a** shows a positive relationship between the variables

DIV-Adj and Z-ROA at a threshold of 0.422. In other words, from a diversification degree of 0.422, the more MENA banks diversify their interest and non-interest income-generating activities, the greater their banking stability. Similarly, the relationship between FOC-Non-Adj and banking stability takes the normal U-shape, implying that specialization into a non-interest income-generating activity is beneficial for the stability of MENA banking systems up to a certain threshold of around 0.5, while at a threshold of 0.663 diversification between non-interest income will be beneficial for MENA banks. **Figure 1b** considers the normal U-shaped relationship between interest income share and banking stability. Above the threshold of 0.710, we observe a positive relationship between interest income share and banking stability. **Figure 1c** implies that increasing the share of interest income is beneficial for banking stability above a threshold of 71% of total operating income. Similarly, for the Sh-Non variable, **Figure 1d** shows a positive relationship between the share of non-interest income and banking stability above a threshold of 0.288. This finding implies that increasing the share of non-interest income above 28.8% of total operating income has a stabilizing effect on MENA banks. For the Sh-Co variable, **Figure 1e** shows a positive relationship between the share of commission income and Z-ROA banking stability above a threshold of 0.592.

More prosaically, from a threshold of 59.2% of commission income of total non-interest income, traditional income boosts the stability of MENA banks. Furthermore, **Figure 1f** shows a positive relationship between trading income and the stability of MENA banks at a threshold of 0.177 and above. This result implies that above 17.7% of total non-interest income, increase in income from this activity generates a stabilizing effect. In **Figure 1g**, the relationship between other non-interest income and banking stability remains positive above a threshold of 0.124. In particular, whenever the share of other non-interest income exceeds 12.4%, MENA banks become more stables. **Table 5** presents the thresholds and optima of income diversification with Z-ROA.

**Table 5.** Thresholds and optima of income diversification with Z-ROA.

| **Z-ROA** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Variables** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
| | **DIV-Adj** | **FOC-Non-Adj** | **Sh-Int** | **Sh-Non** | **Sh-Co** | **ShT-r** | **Sh-Oth** |
| Threshold | 0.422 | 0.563 | 0.710 | 0.288 | 0.489 | 0.177 | 0.124 |
| Minimum | 0.289 | 0.499 | 0.501 | 0.185 | 0.377 | 2.19E-4 | 0.001 |
| Maximum | 0.493 | 0.565 | 0.815 | 0.307 | 0.980 | 0.262 | 0.556 |

Source: Author's calculations.

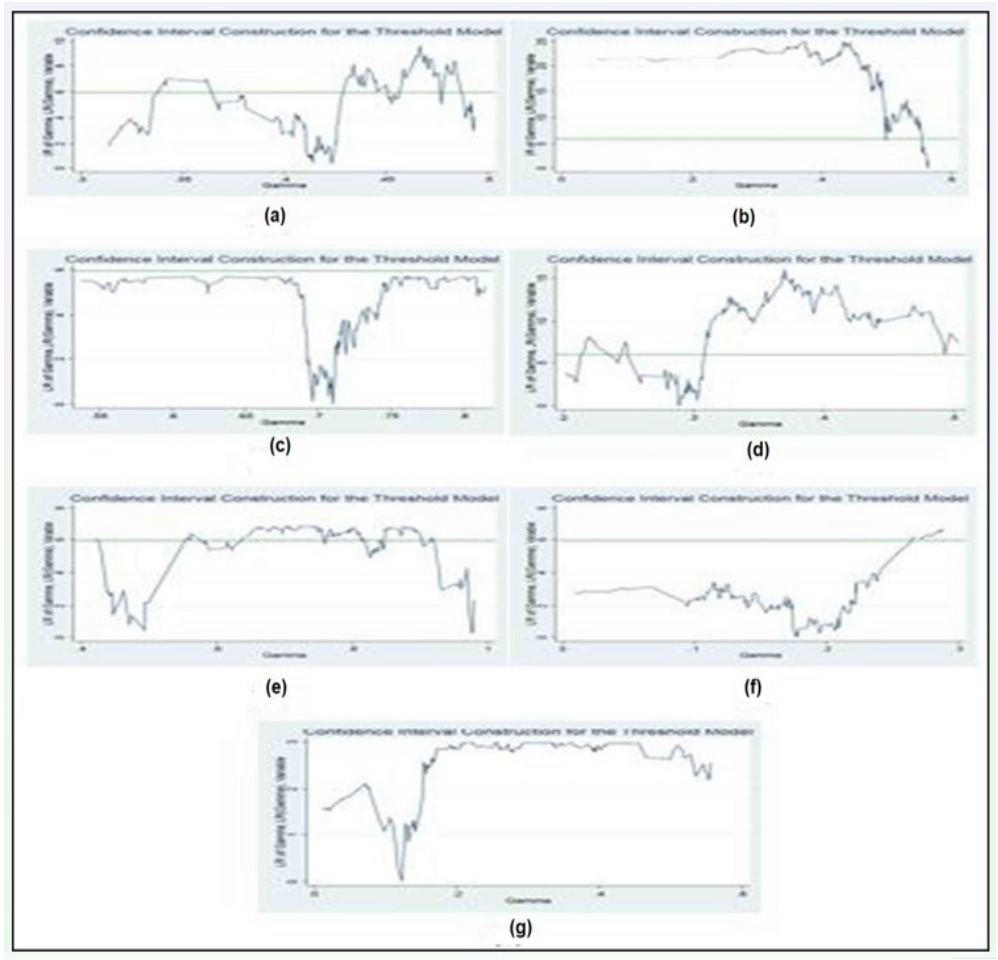


**Figure 1.** The relationship between income diversification and banking stability. **(a)** DIV-Adj; **(b)** FOC-Non-Adj; **(c)** Sh-Int; **(d)** Sh-Non; **(e)** Sh-Co; **(f)** Sh-Tr; **(g)** Sh-Oth.

Note: The **Figure 1a–g** illustrate the relationship between Z-ROA (on the ordinate) and the different income diversification variables (on the abscissa), namely respectively: DIV-Adj, FOC-Non-Adj, Sh-Int, Sh--Non, ShCo, Sh-Tr and Sh-Oth.

**Table 6.** Thresholds and optima of income diversification with NPLs.

| **NPLs** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Variables** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
| | **DIV-Adj** | **FOC-Non-Adj** | **Sh-Int** | **Sh-Non** | **Sh-Co** | **Sh-Tr** | **Sh-Oth** |
| Threshold | 0.468 | 0.644 | 0.625 | 0.320 | 0.592 | 0.220 | 0.418 |
| Minimum | 0.351 | 0.386 | 0.552 | 0.190 | 0.387 | 2.19E-4 | 1.2E-3 |
| Maximum | 0.488 | 0.738 | 0.809 | 0.449 | 0.968 | 0.286 | 0.516 |

Source: Author's calculation.

**Figure 2** illustrates the relationship between the different income diversification variables and bank risk. **Figure 2a** highlights the positive effect of income diversification on bank risk up to a diversification threshold of around 0.468. These results point to the concave relationship between diversification across interest and non-interest income and loan portfolio risk. Additionally, **Figure 2b** shows the convexity of the relationship between specialization in a type of non-interest income and banking risk. In other words, specialization up to a threshold of 0.664 reduces

bank risk. Furthermore, **Figure 2c,d** point, respectively, to a normal U-shaped relationship between bank risk and the share of interest and non- interest income. For this reason, MENA banks should not increase their interest and non-interest income shares beyond the thresholds of 0.625 and 0.320, respectively. Similarly, increasing commission income reduces the banking risk of MENA banks beyond a threshold of 0.592, as shown in **Figure 2e**. For trading income, **Figure 2f** shows a U-shaped relationship, indicating that banking risk decreases if the share of this type of income does not exceed a threshold of 0.228. Finally, a concave relationship of the inverse U-shaped relationship presented in **Figure 2g** shows that increasing the share of other non-interest income reduces the risk of MENA banks above a threshold of 0.418. **Table 6** presents the thresholds and optima of income diversification with NPLs.

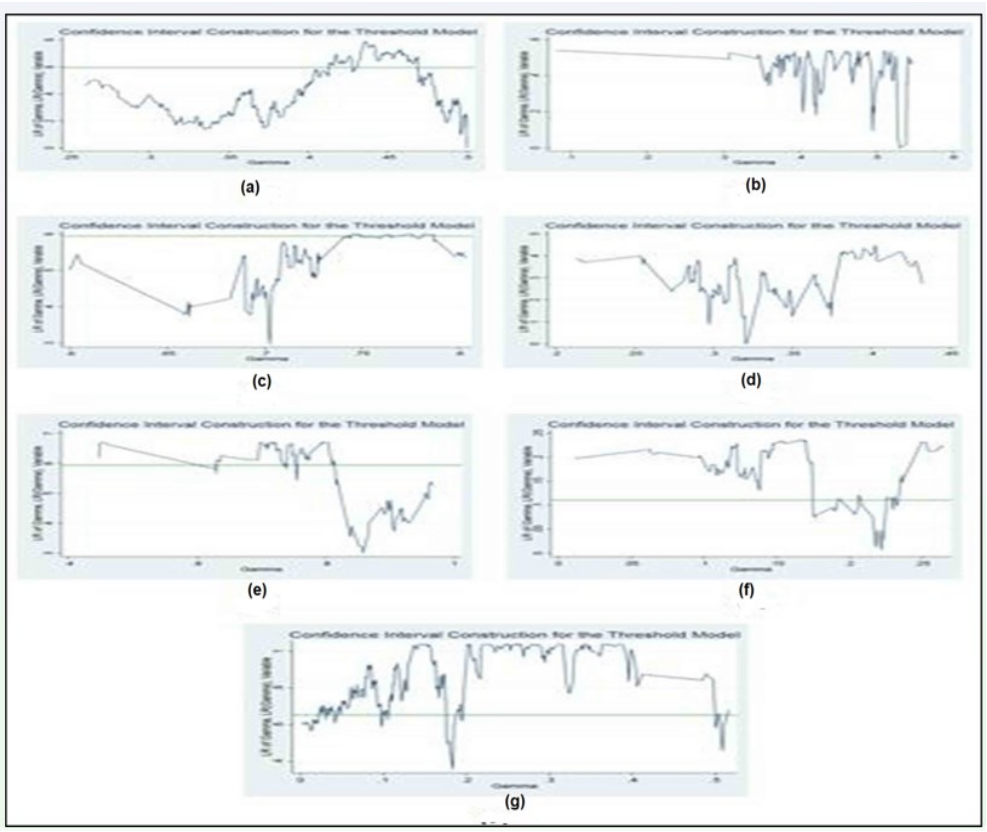


**Figure 2.** The relationship between income diversification and banking risk. **(a)** DIV-Adj; **(b)** FOC-Non-Adj; **(c)** Sh-Int; **(d)** Sh-Non; **(e)** Sh-Co; **(f)** Sh-Tr; **(g)** Sh-Oth.

Note: **Figure 2a–g** show the relationship between bank risk NPLs (ordinate) and the different income diversification variables (abscissa), namely: DIV-Adj, FOC-Non-Adj, Sh-Int, Sh-Non, Sh-Co, Sh-Tr and Sh-Oth.

**Table 7** synthesizes the results of the nonlinearity of the relationship between income diversification and banking stability. The form and the threshold are presented. The different income diversification variables used are: DIV-Adj, FOC-Non-Adj, Sh-Int, Sh-Non, Sh-Co, Sh-Tr and Sh-Oth. The banking stability variables are Z-Score and NPLs.

**Table 7.** The nonlinearity of the relationship between income diversification and banking stability.

| **Z-Score** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Variables** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
| | **DIV-Adj** | **FOC-Non-Adj** | **Sh-Int** | **Sh-Non** | **Sh-Co** | **Sh-Tr** | **Sh-Oth** |
| DIV | + | + | − | − | − | + | + |
| $DIV^2$ | + | + | + | + | + | + | + |
| Form | U | U | U | U | U | U | U |
| Threshold | 0.422 | 0.563 | 0.710 | 0.288 | 0.489 | 0.177 | 0.124 |
| NPLs | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| DIV | − | − | − | + | + | − | − |
| $DIV^2$ | − | + | + | + | − | + | − |
| Form | U inverted | U | U | U | U inverted | U | U inverted |
| Threshold | 0.468 | 0.644 | 0.625 | 0.320 | 0.592 | 0.220 | 0.418 |

Source: Author's Calculations.

## 5. Discussion

We prove that banks in MENA countries are pursuing, on the one hand, a strategy of interest and non-interest income diversification by which they efficiently stabilize their banking systems. On the other hand, they are following a specialization strategy in one type of non-interest income from which they can generate more banking stability, and this was mainly done via trading and other non-interest income. Not surprisingly, MENA banks need to develop a new banking framework that blends both traditional and innovative activities to maintain their role as financial intermediaries and ensure the stability of their systems. The health of the banking sector is vital for MENA economies, given that banks are crucial for financing private enterprises. In fact, banks often act as an alternative to financial markets, which are less developed compared to those in more advanced economies (Meslier et al., 2014). Financial liberalization, deregulation, technological advancements, a rising demand for diverse and sophisticated financial products, and heightened competition have all pushed MENA banks to explore new avenues for activity diversification.

Banks in MENA countries are diversifying into new business areas not merely to offset declines in their traditional activities, but to bolster their market positions. Their aim is to expand their range of products and services and to retain their current customer base. They also seek to attract new clients, maintain competitive edges, increase their profit margins, and safeguard against potential risks.

According to our findings, diversification strategy in MENA countries depends on the type of income and the income-generating activity. It seems that MENA banks adopt a favorable diversification policy that stimulates banking stability from a minimum threshold of 0.422, on the one hand, and restricts risk up to a maximum diversification threshold of around 0.468, on the other. Indeed, banks in the sample should favor the strategy of diversifying between interest and non-interest income. Moreover, it seems that banks in the sample have mastered specialization in a business generating non-interest income, and for them, specialization favors banking stability

above a minimum threshold of 0.563. We recommend that these banks place greater emphasis on specialization in one type of non-interest income, provided they do not exceed a threshold of 0.644 in order to control banking risk. In particular, beyond a specialization threshold of around 0.644, MENA banks will face an increased level of loan portfolio risk.

Like for the shares of each type of income Sh, we examine the sub-optimal diversification from the interest income Sh-Int perspective. We notice that banks had to keep their interest income shares[3] below an optimal threshold of 0.710 in order to control for loan portfolio risk, which increases from a threshold of 0.625 onwards. We can see that the banks in our sample have an under-diversification problem when it comes to non-interest income Sh-Non. This critical problem is a source of banking destabilization. This is why decision-makers need to reconsider revising the contribution of non-interest income by improving its share from a minimum threshold of 0.288. On the other hand, banks need to limit loan portfolio risk by restricting themselves to a diversification threshold of 0.320. Furthermore, MENA countries suffer from under-diversification in terms of Sh-Co fee income. Under these conditions, decision-making authorities are required to further focus on commission income by increasing their shares. On the one hand, they should opt for a minimum threshold of 0.489 to stimulate banking stability, and on the other, for a minimum threshold of 0.592 to lower risk. As for the share of trading income, we notice that local banks follow a strategy that focuses more on this type of income. In order to improve stability of banking systems, banks are expected to increase the share of trading income from 17.7% upwards, without exceeding a minimum threshold of 22%, in order to manage banking risk. As for other non-interest income, MENA banks are required to increase the share of this type of income in order to boost banking stability from a minimum threshold of around 0.124, although they have to exceed such a threshold in order to limit banking risk at a maximum threshold of 0.418.

## 6. Conclusion

This paper has examined the effects of income diversification on the banking stability. With the study period of the dataset from 2005 to 2021 and using a sample of 136 commercial banks from 14 MENA countries: Bahrain, Egypt, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Morocco, Lebanon, Algeria, Tunisia, Iran, Iraq, and the United Arab Emirates, we conduct a System GMM panel data regression analysis. With a rich literature on the subject, we first reviewed the relevant empirical findings. Apart from the fact that the effects of diversification appeared to be particularly ambiguous, the literature also revealed that relevant studies had mainly focused on diversification measures in terms of interest and non-interest income and income shares of microeconomic design, largely ignoring the policy of specialization and the different potential non-traditional activities. With this in mind, and in the wake of debates and studies questioning the appropriateness of diversification policies between interest and non-interest income, on the one hand, and a policy of specialization in one type of non-interest income on the other, we decided to study the repercussions of these two policies on banking stability and risk. Thus, we first studied the direct impact of diversification on banking stability and risk through different diversification

measures, namely DIV-Adj and Sh for each type of income. In particular, it turns out that the direct impact of diversification between interest and non-interest income tends to reduce bank risk in MENA countries and promote their stability (Ammar and Boughrara, 2019; Moudud-Ul-Huq et al., 2018; Paltrinieri et al., 2020; Shabir et al., 2023; Wu et al., 2020; Wu et al., 2024). Specifically, as the shares of interest income, non-interest income and commission income decline, banking stability increases and loan portfolio risk decreases. In fact, the higher the shares of trading income and other non-interest income, the greater banking stability is. However, our interest goes beyond this finding alone, as it also shows sensitivity of conclusions to the diversification measure chosen. By considering measures of specialization in a particular type of non-interest income (FOC-Non-Adj), estimates on the same dataset have, in fact, delivered complementary conclusions. It seems that specialization in a particular type of non-interest income tends to increase the individual stability of local banks. To explain the striking contrast of these results, we invoke the "bright side" hypothesis of income diversification. In line with this hypothesis, a non-linear relationship would lead banks to limit their diversification level on the one hand, and specialization on the other. It should be stressed that the non-linearity of the relationship in question presents our second contribution. It seems that, for MENA banks, the data indicate that benefits on diversification accumulate from a certain threshold. The results show that the stability of MENA banks decreases as income diversification tends towards an optimal threshold, but increases as diversification continues to increase beyond a minimum optimal threshold. This sequence of thresholds supports the idea that income diversification does not necessarily lead to banking stability until a certain optimal threshold is reached (Ben Lahouel et al., 2022; Ben Lahouel et al., 2023). This then justifies, if need be, the considerable efforts made to detect the different diversification thresholds beyond which banks in MENA countries become more stable and less fragile. This is the contribution of our dynamic panel threshold model. We found that a diversification strategy in MENA countries depends on the type of income and the income-generating activity.

It seems that MENA banks have adopted a favorable diversification policy that stimulates banking stability from a minimum threshold of 0.422, on the one hand, and restricts risk from a maximum diversification threshold of around 0.468, on the other. Indeed, banks in the sample should favor a strategy that diversifies between interest and non-interest income. Moreover, it seems that banks in the sample have mastered a specialization strategy in a non-interest income generating business, and for them, specialization favors banking stability above a minimum threshold of 0.563. We recommend that these banks place greater emphasis on specialization in a type of non-interest income, provided they do not exceed a threshold of 0.644 in order to control banking risk. To summarize, MENA banks must develop a new banking framework that integrates both conventional and innovative activities to sustain their role as financial intermediaries and maintain system stability. It is essential to acknowledge that factors such as financial liberalization, deregulation, technological advancements, rising demand for diverse and advanced financial products, and intensified competition have driven MENA banks to explore new diversification strategies. These efforts are aimed at fortifying their market position, securing competitive advantages, and mitigating potential risks.

**Conflict of interest:** The author declares no conflict of interest.

## Notes

[1] Breusch-Pagan Test.

[2] Intra-individual auto-correlation Test: Wooldrigde test, programmed by xtserial command on STATA 16.

[3] Share of interest income is on average around 0.70.

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