The impact of revenue diversification on bank profitability and risk: evidence from MENA banking industry

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ABSTRACT

The aim of this paper is to investigate the effects of revenue diversification on bank performance while shedding light on the impact of the shift towards non-interest income sources. To this end, we use a sample of 275 banks from fourteen MENA countries over 1990–2011. The model estimation using the GMM system reveals that diversification, when taken as a whole, improves bank profitability. We also split the non-interest income and we find that trading-generating business lines contribute the most to boosting profitability and stability. Engaging in non-interest-related activities worsens the benefit-cost trade-off of diversification, induced by the increased insolvency risk.

1. Introduction

After a period of financial distress, a decline in bank profitability has been noticed as interest income sources become unsecure. The decreasing level of deposits as well as the increasing level of non-performing loans in banks' balance sheets renders the profitability of traditional banking activities; for instance, business lending will be less important (Pennathur, Subrahmanyam, and Vishwasrao 2012). Hence, banks will need to construct a new banking model that will help them to maintain their position as financial intermediaries through the combination of traditional and non-traditional activities to assure the stability of the banking system (Chiorazzo, Milani, and Salvini 2008). The state of the banking sector is critically significant for emerging economies since banking institutions play a leading role in the financing of private firms. Banks are even considered as a substitute for financial markets because the latter are less mature compared to their developed peers (Meslier, Tacneng, and Tarazi 2014).

Diversification, as a strategic decision influenced by the changes in the macroeconomic environment, is considered as a part of the drastic change in the bank behavior in the post-crisis period (Hidayat, Kakinaka, and Miyamoto 2012; Nguyen, Skully, and Perera 2012a; Lin et al. 2012). Banking institutions substitute their business model by another combining a wide range of financial activities to boost their profitability (Elsas, Hackethal, and Holzhauser 2010) and to mitigate their insolvency risk (Chiorazzo, Milani, and Salvini 2008) . This topic has been hugely debated so far (see Stiroh and Rumble 2006) due to the fact that bank stakeholders and supervisors/regulators are

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concerned with the level of the bank risk. In fact, shareholders consider the specific risk seeing that they are bank-dependent. From a regulator perspective, the total risk matters to assure the stability of the banking sector (Baele, Jonghe, and Vennet 2007).

However, the financial literature related to the diversification effects on the bank value and risk has been heavily concentrated on developed countries (mainly US and European markets). To the best of our knowledge, the emerging markets are still partially explored (see among others Berger, Hasan, and Zhou 2010; Hidayat, Kakinaka, and Miyamoto 2012; Lin et al. 2012; Nguyen, Skully, and Perera 2012a, 2012b; Pennathur, Subrahmanyam, and Vishwasrao 2012; Lee, Yang, and Chang 2014a; Lee, Hsieh, and Yang 2014b). This may be caused by the low degree of information disclosure and by imperfection and immaturity characterizing developing markets. Besides, it has been proven that the findings of previous studies (related to developed economies) could not be generalized to emerging economies owing to the differences in operating and regulatory environments where banks operate, to the divergence in the market level of maturity, to variabilities in the degree of banking freedom, to the presence (or absence) of activity restrictions, to the competition among banks and to other country specifications (Nguyen, Skully, and Perera 2012b; Meslier, Tacneng, and Tarazi 2014).

We deem it necessary to give a close scrutiny to MENA countries, a region whose financial sector in general and banking system in specific have undergone profound changes in their legal and institutional framework, which are slowly making steps towards liberalization, privatization of state owned-banks, removing barriers to foreign ownership entry, and allowing banks to operate in non-banking financial activities. This topic is appealing, especially in the context of a large emerging economies such as the MENA region, whose financial system is dominated by the banking sector.

Reflecting upon this, we have noticed that a little work has been undertaken to gauge the effects of functional diversification on the MENA banks' performance. Poghosyan and Hesse (2009) may be considered as the first study that sheds light on the MENA banks' profitability. Recently, more attention has been paid to the profitability diversification nexus for the MENA region. Focusing on the Tunisian banking market, Mnasri and Abaoub (2010) foregrounded the impact of the shift towards operating income components on banks' market profitability and risk. Abuzayed, Al-Fayoumi, and Molyneux (2018) explored the impact of diversification on bank stability in the GCC countries' banking system. Using a sample from the latter, Ashraf, Ramady, and Albinali (2016) empirically investigated the influence of the ownership structure and income diversification on the financial stability of banks. Again, the ownership structure was highlighted in a lately published paper as a factor that might influence the income diversification-risk relationship (Lassoued and Sassi 2017). In the same vein, Rajhi and Hassairi (2013) empirically assessed the impact of diversification while giving a close scrutiny as to whether Islamic banking institutions were more financially stable than their conventional peers.

Although the aforementioned papers addressed the issue of income diversity for MENA region using different methodologies and from various standpoints, none of them paid a close scrutiny to the impact of each non-interest income component (commissions, fees, trading and other non-interest revenue) on bank profitability and risk. More than that, our study includes some country-specific factors and other variables that have been frequently missed in the previous empirical studies, which considerably seem to influence the inference when included. Hence, assessing the impact of the different

types of product mixes on the performance of MENA banks is necessary for resolving the puzzle of the extant literature regarding the relationship of interest.

In spite of the richness of the diversification literature, there has been no consensus concerning the impact of revenue diversification on the bank profitability and risk. While some studies on developed countries have documented a negative effect of product expansion (Stiroh 2004; Acharya, Hasan, and Saunders 2002; Stiroh and Rumble 2006; Lepetit et al. 2008), the majority of empirical investigations in emerging markets (Lin et al. 2012; Nguyen, Skully, and Perera 2012a; Lee, Yang, and Chang 2014a) have shown a positive relationship between the revenue diversification and the bank profitability and/or risk. The divergence in findings for both developing and developed economies confirms our assumption, namely the negligence of some market characteristics and other country-specific factors are behind these inconclusive findings. Thus, they should be accounted for to reach more robust results.

The majority of studies in transitional economies have included some factors that have been mostly ignored by previous research. It has been proven that banking freedom, activity restrictions, financial development (Nguyen, Skully, and Perera 2012a), bank capitalization (Hidayat, Kakinaka, and Miyamoto 2012; Lin et al. 2012; Nguyen, Skully, and Perera 2012a, 2012b; Lee, Yang, and Chang 2014a; Lee, Hsieh, and Yang 2014b) and business cycle (Nguyen, Skully, and Perera 2012b; Shim 2013) considerably influence the relationship between the revenue diversification and the bank performance. There is a wide consensus that the way the non-interest income is split is one of the causes behind these inconclusive results (see among others, Lepetit et al. 2008; Hidayat, Kakinaka, and Miyamoto 2012; Sawada 2013; Lee, Yang, and Chang 2014a). The latter studies demonstrated that each component of non-traditional revenue had a specific effect on the bank profitability and risk. Hence, it looks tempting to sort out which revenue type will enhance the bank value and/or reduce the risk since this concerns stakeholders as well as policy-makers.

This paper aims to investigate whether revenue diversification produces positive effects as regards profitability and whether or not it mitigates the bank risk. To this purpose, our study uses the Generalized Method of Moments System (sys-GMM) estimation of a dynamic panel data model. We utilize one-period lagged dependent variables to check whether the profitability and insolvency risk of MENA-based banks are persistent. The dynamic panel two-step Sys-GMM solves the problems of endogeneity, heteroskedasticity and autocorrelation.

Our study contributes to the literature in several ways. This study tries to fill this gap in the financial literature by examining the impact of the functional diversification. More specifically, the effects of the shift toward non-traditional income generating activities in emerging countries which have been so far under-researched. In addition, this study includes some country-specific factors as well as other variables that have been often missed in the previous empirical studies, which seem to influence considerably the inference when included. Unlike the previous studies, we attempt to reveal the reason behind the discrepancies found in the empirical literature by employing six different diversification measures to effectively assess the potential effects of non-interest income components on bank performance.

Our findings suggest that engaging in non-traditional activities improves bank profitability, but it increases its instability. To allow for deeper insights, we split non-interest income into its constituent components and we find that the trading revenue

contributes the most to boosting bank performance while engaging in commissions, fees and other non-interest income activities, worsens the benefit-cost trade-off of diversification through the rising volatile investments and the increased insolvency risk.

The remainder of this paper is organized as follows. The next section sheds light on the importance of this topic and reviews some of the research literature on the effects of diversification on the bank profitability and/or risk. The third section presents the econometric methods used and the data utilized. The fourth section reports the main findings as well as the sensitivity analysis. Finally, Section 5 presents the policy implications and concludes the paper.

2. Related literature review

We start by reviewing the existing literature to identify how this paper could contribute to the already growing body of revenue diversification-profitability nexus literature. At present, three main strands of empirical diversification literature can be identified. The first strand highlights the benefits of diversification. The second strand illustrates the dark-side effects of bank's revenue diversification. Finally, the third strand of diversification literature leads rather to inconclusive findings.

The first strand of literature that underlines the light side of bank's revenue diversification strategy has concerned developed and emerging country-based banks. The most representative studies that focused on developed countries concerned either European countries or the US. For instance, using the fixed-effects panel model, Chiorazzo, Milani, and Salvini (2008) documented a positive effect of income diversification especially for small Italian banks that started with a low level of non-interest income. Expanding the geographic coverage of their study and using the same methodology, Elsas, Hackethal, and Holzhauser (2010) found that diversification would directly boost bank performance and indirectly its market value through synergies provided by economies of scope. Those findings were consistent with those of Sawada (2013) who reported a great potential of risk reduction by diversifying revenue sources into fee activities, while the correlation between interest and non-interest income was either negative or weak.

As far as emerging country-based banks are concerned, some studies have highlighted the possibility for banks to reap benefits from revenue diversification. Pennathur, Subrahmanyam, and Vishwasrao (2012) concluded that the shift towards non-traditional activities would have different impacts according to the bank type. Using Sys-GMM estimation for 20 Asian-Pacific countries, Lee, Hsieh, and Yang (2014b) found that commissions and other non-interest income would lead to increased stability and profitability and to less risk for bank-based groups. Finally, Meslier, Tacneng, and Tarazi (2014) documented that economies of scope and the weak correlation between interest and non-interest income activities were beneficial for universal and commercial bank profitability. They also reported that engaging in trading-generating businesses increases risk-adjusted performance.

Other related studies have highlighted the benefits of shifting towards non-traditional activities. It has been found that engaging into new business lines would boost bank performance (Lin et al. 2012) especially for large banks that reaped benefits from economies of scale (Nguyen, Skully, and Perera 2012b) and for banking firms with a low degree of market power that sought for new growth opportunities (Nguyen, Skully, and Perera 2012a). Moreover, diversified banks exhibited low insolvency risk since non-traditional activities were associated with low-profit volatility (Shim 2013).

While the previous strand of literature have foregrounded the positive impact of strategic shifts on bank performance, a second strand of literature on diversification have supported the opposite conclusion. To begin with, using different empirical methodologies, Stiroh (2004) found that increased reliance on non-interest income activities did not produce benefits, especially when operating income components (fees and service charges with an interest revenue) were highly inter-correlated and when the high volatility of trading revenue makes the negative effects of diversification persistent. To allow for deeper insights, Stiroh and Rumble (2006) demonstrated that increased reliance on non-interest income-generating activities decreases risk-adjusted profitability as the volatility of non-traditional businesses would outweigh any diversification benefit.

Stiroh and Rumble (2006)'s findings were corroborated by Mercieca, Schaeck, and Wolfe (2007) who reported that small European credit institutions exhibited a decline in their risk-adjusted performance as they increased their focus on non-traditional activities. The negative impact was strong and robust for different samples, bank types and after controlling for the main factors that determined the state of the macroeconomic environment. Finally, Lepetit et al. (2008) stressed that greater reliance on fees and commission-generating activities raised the default risk probability for European commercial and cooperative banks.

The third strand of literature regarding the potential effects of revenue diversification have described mixed effects. Starting with studies related to developed country-based banks, Acharya, Hasan, and Saunders (2002) highlighted an improvement in the risk-return trade-off reached for Italian commercial banks with moderate risk level. Yet, sectorial and industrial diversification would deteriorate the performance of banking firms. On a different line of argument, Baele, Jonghe, and Vennet (2007) reported that diversification would boost the bank market value. Nonetheless, the over-diversified European banks might be exposed to specific shocks, mainly the large banking firms that might suffer from increased systematic risk. On a different level, Goddard, McKillop, and Wilson (2008) spent considerable effort to assess the effects of revenue diversification on the financial performance of 5,784 US credit unions over the period 1993–2004. Their cross-sectional regressions showed a positive 'direct exposure effect' derived from the non-interest revenue on the risk adjusted and unadjusted returns and showed a negative 'indirect exposure effects' since returns would decrease when credit unions tended to diversify. Finally, using a two-stage least square regression, Williams and Prather (2010) found that an increased focus on non-traditional activities did not improve the risk-return trade-off alone. However, it was rather the combination of interest and non-traditional income that would improve this trade-off.

The emerging country evidence has indicated that diseconomies of diversification will be mitigated when foreign ownership (both minority and majority) is included (Berger, Hasan, and Zhou 2010). In a well-done paper related to a developing banking market, Hidayat, Kakinaka, and Miyamoto (2012) investigated the relationship between shifting toward non-interest income-generating activities and the risk of 112 Indonesian commercial banks over the period 2002–2008. Their cross-sectional multivariate regression analysis revealed that as size went up, engaging aggressively in non-traditional activities would adversely impact on the bank risk. The authors also reported that even small Indonesian commercial banks that exhibited a greater reliance on the commission- and fee-based products experienced risk would grow. Finally, in another paper, Lee, Yang, and Chang (2014a) assessed the impact of non-interest income on the profitability and risk of the Southeast Asian banks' over the

period 1995–2009. Using 967 bank holding companies, commercial, cooperative, investment and savings banks from 22 Asian countries, their dynamic panel GMM model showed that the impact of non-traditional strategic shifts would vary according to the bank type and to the degree of the country's income level.

Few are the papers that have addressed this issue for the MENA region. Focusing on commercial Tunisian banks, Mnasri and Abaoub (2010) used a stock market-based evaluation metrics to study the impact of functional diversification on the bank value and risk. They found that diversification across traditional and non-interest-generating business lines would improve bank's profitability, but it would raise its systematic risk. Using a Sys-GMM methodology, Abuzayed, Al-Fayoumi, and Molyneux (2018) examined the influence of diversification on a sub-group of the MENA region and the GCC countries' banking sector. They found that the risk declined at higher levels of income diversity and that bank stability was backed by greater macroeconomic conditions, better institutional quality and other bank-specific factors. Ashraf, Ramady, and Albinali (2016) and Lassoued and Sassi (2017) looked at this topic from a different angle. While the former reported that a concentrated ownership increased the insolvency risk, the latter stressed on the importance of a foreign presence since it raised the competitive pressure on domestic banks and incited them to diversify their activities. Finally, Rajhi and Hassairi (2013) focused on Islamic banks and concluded that those set in the MENA region were more stable than their peers located in South East Asian countries that suffer from a higher insolvency risk.

The diverging findings of the prior research for both developing and developed banking markets have been driven by the differences in institutional and regulatory environments (Meslier, Tacneng, and Tarazi 2014; Nguyen, Skully, and Perera 2012b; Lee, Hsieh, and Yang 2014b) as well as banking industry characteristics (i.e. financial structures, financial reforms (Lee, Hsieh, and Yang 2014b), monitoring incentives, banking freedom, industry concentration, bank competition (Nguyen, Skully, and Perera 2012b), differences in the income structure of banks coming from various banking systems (Meslier, Tacneng, and Tarazi 2014) and countries' income levels (Lee, Yang, and Chang 2014a). All of these factors make the effects of non-traditional strategic shifts different. Moreover, the disparity in findings may be attributed to some bank specific factors, (i.e. ownership structure, governance (Meslier, Tacneng, and Tarazi 2014; Pennathur, Subrahmanyam, and Vishwasrao 2012) and bank specialization (Lee, Yang, and Chang 2014a). The focus of the line of research in developed countries is also attributed to data limitations and to the absence of detailed revenue accounts (Lee, Hsieh, and Yang 2014b) for emerging countries. Even within developed markets, some disparities between findings for banks set in US and European economies. Indeed, Chiorazzo, Milani, and Salvini (2008) argued that the disparity in findings between both continents on bank returns was caused by the differences in size.[1] Given these controversial results, we intend to discuss deeply this topic by considering various perspective and macroeconomic settings.

3. Methodology

The aim of this section is to describe the data used in this study, present the empirical model as well as the diversification, profitability and risk measures included in the estimations. Lastly, the explanatory variables introduced to take into account the relationship of interest are displayed with their accurate definitions.

3.1. *Data description and sources*

We use bank-level data from BankScope, a database maintained by International Bank Credit Analysis Ltd. (IBCA), and the Brussels-based Bureau van Dijk. BankScope contains bank financial statements used in a number of other cross-country studies. The data cover both listed and unlisted banks. We construct a sample consisting of an unbalanced panel of annual report data ranging globally from 1990 to 2011 for a set of banks established in 12 MENA countries, namely the United Arab Emirates, Egypt, Bahrain, Lebanon, Morocco, Oman, Algeria, Tunisia, Jordan, Kuwait, Qatar and Kingdom of Saudi Arabia. Along with them, we include some banks from Iran and Turkey. The initial sample size of 325 banks has been restricted to 275 because of huge missing data in some balance sheets and income statements. Some banks were eliminated from the sample due to missing values of some relevant variables. The macroeconomic and institutional data are sourced from the World Development Indicators database (World Bank 2016) and from the Heritage Foundation (2016). Table 1 reports variable definitions for all variables used in the paper.

Table 1. Variable definitions.

Variable	Proxy	Definition
Panel A: Dependent variables		
RAROAA	Risk-adjusted return on average assets	Return on average assets/standard deviation of return assets
RAROAE	Risk-adjusted return on average equity	Return on average equity/standard deviation of return equity
Z-Score	Z-Score	Average return on assets and equity to assets to the standard
		deviation of return assets. It measures insolvency risk.
Panel B: Diversification variables		
div_rev	Herfindahl Hirschmann concentration Index	Evaluates the diversification between the major sources of income
div_non	Herfindahl Hirschmann concentration Index	Gauges diversification within non-interest income activities
nii_share	Non-interest income share	Non-interest income to total operating revenue
cnii_share	Commission income share	Commission income to non-interest revenue
tnii_share	Trading income share	Trading income to non-interest revenue
onii_share	Other non-interest income share	Other non-interest income to non-interest revenue
Panel C: Bank-specific variables		
size	Bank size	Natural logarithm of bank total assets
capitalization	Capital ratio	Book value of equity to total assets
liquidity	Liquidity	Loans to total assets
npl_ratio	Bad loan ratio	Non-performing loans to total loans
llp_ratio	Loan loss provision ratio	Loan loss provision to total assets
cti	Cost efficiency	Operating expenses (minus interest expenses) to total income
dta	Deposits ratio	Deposits to total assets
nim	Net Interest Margin	Interest income relative to earning assets
bank_growth	Growth rate of bank assets	Annual growth rate of real bank assets
Panel D: Industry-specific variables		
findev	Financial development	Annual market capitalization to Gross Domestic Product
gdp_growth	External macroeconomic determinant	Annual real gross domestic product growth
lnf	External macroeconomic indicator	Annual consumer price inflation
bankingfr	Financial freedom	Country-specific annual index of financial freedom

Notes: The variables are constructed based on prior literature and Bankscope, World Bank (world development indicators' database) and Heritage Foundation databases

3.2. *Empirical methodology*

3.2.1. *Model*

The methodological framework we consider in this study is the autoregressive dynamic panel modeling, where the basic model is the following:

$$y_{it} = \lambda y_{it-1} + \beta_2 Div_{it} + \beta_3 X_{it} + \alpha_i + u_{it} \tag{1}$$

where the subscripts i and t stand for the bank and year, respectively. y_{it} is the measure of profitability or risk for bank i during period t. y_{it-1} is its one-period lagged value,[2] Div_{it} is a measure of diversification, X_{it} is a vector of additional explanatory variables that include bank-specific variables (i.e. other control variables) as well as some macroeconomic variables, α_i denotes the unobserved bank-specific effect, and u_{it} is independent and identically distributed idiosyncratic random error with mean zero and variance σ_u^2. This error term is also supposed independent across banks.

One way to estimate the parameters of Equation (1) consists in running the Pooled Ordinary Least Squares (POLS), but this estimator does not account for the unobserved bank-specific effects, which bring about an omitted-variable bias, and does not tackle the reverse causality or potential endogeneity problems. Furthermore, POLS neglects the time-series dimension of the data. Likewise, the fixed-effects method that suppresses the specific effects by first-differencing Equation (1) does not seem appropriate. In fact, it generates an MA(1) error term which correlates with the lagged dependent variable, hence resulting in inconsistent estimates (Bun and Sarafidis 2015).

In this study, we run a dynamic model along with the sys-GMM estimation method introduced by Blundell and Bond (1998). The dynamic panel technique combined with sys-GMM solves the problems induced by endogeneity caused either by the presence of the missing data problem and/or the reverse causality running from the dependent variable (i.e. performance measures) to diversification proxies and other explanatory variables. This methodology is efficient and reliable as it controls for the serial correlation problem that may exist in the presence of the lagged dependent variables. The sys-GMM builds a system of two equations, the original equation expressed in levels Equation (1) where all variables are specified in levels and the transformed model where the variables are expressed in differences as follows:

$$y_{it} - y_{it-1} = \lambda(y_{it-1} - y_{it-2}) + \beta_1(Div_{it} - Div_{it-1}) + \beta_3(X_{it} - X_{it-1}) + u_{it} - u_{it-1} \tag{2}$$

where lags of performance variables (i.e. profitability, risk) and other explanatory variables are utilized as instruments. The use of instruments is required to deal with the likely endogeneity of the explanatory variables (most notably Div variable seeing it is the diversification that mirrors the banks' managerial choices) and with the fact that in both equations the error term is correlated with the lagged dependent variable. Assuming that the error terms are not serially correlated, the explanatory variables are weakly exogenous (i.e. explanatory variables are uncorrelated with the future realization of the error terms), and there is no correlation between the changes in the right-hand side variables and the country specific effects, α_i, so the following moment conditions can be applied to obtain unbiased estimates of the parameters of interest:

$$E[y_{it}(u_{it} - u_{it-1})] = 0 \text{ for } s \geq 2; \ t = 3, \ldots, T \tag{3}$$

$$E[Div_{it-s}(u_{it} - u_{it-1})] = 0 \text{ for } s \geq 2; \ t = 3, \dots, T \tag{4}$$

$$E[X_{it-s}(u_{it} - u_{it-1})] = 0 \text{ for } s \geq 2; \ t = 3, \dots, T \tag{5}$$

$$E[(y_{it-s} - y_{it-s-1})(\alpha_i + u_{it})] = 0 \text{ for } s \geq 2; \ t = 3, \dots, T \tag{3'}$$

$$E[(Div_{it-s} - Div_{it-s-1})(\alpha_i + u_{it})] = 0 \text{ for } s \geq 2; \ t = 3, \dots, T \tag{4'}$$

$$E[(X_{it-s} - X_{it-s-1})(\alpha_i + u_{it})] = 0 \text{ for } s \geq 2; \ t = 3, \dots, T \tag{5'}$$

Hence, the lagged (two or higher) values of the difference of regressors can be used as instruments to estimate the equation in levels (i.e. Equation (2)), and the lagged (two or higher) values of the level of regressors can be utilized as instruments for the regressors in the equation in first differences (i.e. Equation (3)).

A crucial assumption for the relevance of the sys-GMM is the exogeneity of instruments. If the model is over-identified, the Hansen test J of the over-identifying restrictions that assess the validity of the instruments (relevant, valid orthogonal to the disturbance terms and correlated with the endogenous regressors) can be run. Under the null hypothesis, the J statistics follows a Chi-distribution with k degree of freedom, where k is the difference between the number of instruments and the number of regressors (Roodman 2006, 2009). In addition, Arellano and Bond (1991) developed a test for the serial correlation in residuals. If this correlation exists, it would render some lags invalid as instruments. The consistency of the model estimations depends crucially on the validity of the aforementioned tests.

3.2.2. Measures of diversification

In a first step and following Mercieca, Schaeck, and Wolfe (2007), we construct the Herfindahl Hirschmann Index (HHI) to assess whether or not banks diversify their revenue sources. The div_rev is computed as follows:

$$Div \ rev = \left(\frac{NON}{TOP}\right)^2 + \left(\frac{NET}{TOP}\right)^2 \tag{6}$$

where TOP, NON and NET stand for the operating revenue, net non-interest income and the net interest income, respectively. Div_rev index evaluates each bank diversification between the major sources of income. High values of div_rev indicate that banking institutions are more concentrated. To gauge diversification within non-interest income generating activities, we reconstruct HHI as follows:

$$Div \ non = \left(\frac{COM}{NON}\right)^2 + \left(\frac{TRAD}{NON}\right)^2 + \left(\frac{OTHOP}{NON}\right)^2 \tag{7}$$

where COM captures commission and fee revenues, TRAD is the trading income and OTHOP captures other non-interest revenues. A high value of div_non means that banks are not diversifying through non-interest revenue generating activities. A detailed breakdown of the different product mixes allows an in-depth analysis of the impact of each activity on bank profitability and stability. Along with the HHI measures, we use four additional diversification measures, namely nii_share (the share of non-interest income

to total operating income), cnii_share (the share of commission income to non-interest revenue), tnii_share (the trading income to total non-interest income) and onii_share (other non-interest income to total non-interest revenue).

3.2.3. *Performance measures*

To gauge bank profitability, we follow the empirical literature and use the risk-adjusted return on average assets (RAROAA) and the risk-adjusted return on average equity (RAROAE), which are computed as the risk-adjusted return on average assets RAROAA $= \left(\frac{\text{ROAA}}{\text{SDROAA}}\right)$ and the risk-adjusted return on average equity RAROAE $= \left(\frac{\text{ROAE}}{\text{SDROAE}}\right)$ respectively. The profitability measures are adjusted to the risk to make banks more comparable. ROAA is the return on average assets (net income to total average assets), ROAE is the return on average equity (net income to total average equity) and SDROAA and SDROAE are the standard deviation of return on average assets and the standard deviation of return on average equity, respectively. RAROAA and RAROAE give an idea about how much risk is involved in bank returns over a given period of time t. Following Goddard, McKillop, and Wilson (2008) and Chiorazzo, Milani, and Salvini (2008), we adjusted profitability measures for risk while ROA and ROE are unadjusted measures. RAROAA and RAROAE can be thought of as accounting returns per unit of risk (Stiroh and Rumble 2006). To measure the bank risk, we employ the Z-score (Stiroh and Rumble 2006; Mercieca, Schaeck, and Wolfe 2007).

$$Z - score = \frac{ROAA + capitalization}{SDROAA} \qquad (8)$$

Capitalization is equity to assets ratio (or capital ratio). A higher value of the Z-score indicates greater bank stability.

3.2.4. *Control variables*

This sub-section describes the key control variables included in the different model specifications this paper considers. These variables are supposed to capture the various strategic choices and/or characteristics of the various banks, which have an impact on the performance. We concisely describe, hereafter, the main control variables as well as the reasons why we do so.

3.2.4.1. *size.* It stands for the bank size. It is measured by the natural logarithm of bank total assets and it is generally used to capture potential economies or diseconomies of scale in the banking sector. As the latter increases, banks become more stable and their idiosyncratic risk decreases. Although raising bank size may be beneficial to their performance, an adverse effect might emerge because more complex and larger banking institutions tend to aggressively engage in diversification strategies as documented by Chiorazzo, Milani, and Salvini (2008) and Hidayat, Kakinaka, and Miyamoto (2012). Consequently, we are uncertain about the potential effect of the size on performance.

3.2.4.2. *capitalization.* It represents the ratio of the book value of equity to total assets, called also the capital ratio. This ratio captures the probability of default. When the value of assets falls, capital tends to absorb large shocks and protects banks, leading therefore to a decrease in the risk of bank failure. However, a higher degree of capitalization is a proxy

for risk aversion. In other words, cautious managers will try to maintain their banks' soundness and forgo profitable investment opportunities. As a result, we are uncertain about the possible impact of capitalization on bank performance.

3.2.4.3. *liquidity.*

To assess the effect of liquidity on bank performance, several formulas may be used: the ratio of loans over total assets used as a proxy for liquidity in Tan and Floros (2012), and the ratio of liquid assets/total assets (Shim 2013). While the former sign is expected to be negative, the latter may bear a positive coefficient. A negative sign might appear for liquid to total assets ratio since exceeding a certain level of low-revenue-generating-liquid assets may adversely affect a bank's ability to generate revenues.

3.2.4.4. *bank_growth.*

It denotes the annual growth rate of real bank assets. This variable measures the effects of rapid growth on bank strategic choices (Lee, Hsieh, and Yang 2014b). Banks with larger growth in assets may be inclined to pursue non-traditional income sources. Growth can be thought of as a proxy for bank managers' preference for risk-taking seeing that risk-taking managers usually prefer fast growth to more stable profits (Chiorazzo, Milani, and Salvini 2008; Meslier, Tacneng, and Tarazi 2014). Although assets growth may show a negative sign, increasing bank real assets boosts small banks' risk-adjusted performance as stressed by Mercieca, Schaeck, and Wolfe (2007). Therefore, we are uncertain about the potential sign of the coefficient of bank_growth.

3.2.4.5. *dta.*

dta variable stands for the ratio of deposits to total assets. This ratio is an indicator of funding choices as deposit activities have the most stabilizing effect on bank revenues (Lee, Hsieh, and Yang 2014b). Banks benefit from greater profits by purchasing deposits at low interest rates then resell those funds at a higher interest rate (DeYoung and Rice 2004). As a consequence, a positive effect of the deposits ratio on bank performance is expected.

3.2.4.6. *cti.*

Efficiency represents the cost to income ratio.[3] To measure the impact of cost efficiency in bank performance, we use the cost to income ratio, which is defined as the operating costs[4] over total generated revenues. This ratio gives a clear picture of how efficiently the bank is being run as it captures the managers' ability to reduce the bank costs through the improvement of fee quality, trading and commission-based products. A reduction in a bank's cost to income ratio, brought about by ameliorated managerial efficiency is expected to boost profitability (Goddard et al. 2013). Thus, we expect an inverse relationship between the cost-to-income ratio and the bank's profitability.

3.2.4.7. *nim.*

It stands for the ratio of the interest income to the total earning assets. In our case, it cannot be used as a profitability measure since it is only helpful to track the profitability of traditional/interest-generating-business lines. The sign is unpredictable as it relies upon the efficacy of lending and investments that generate interest revenues.

3.2.4.8. *npl_ratio.*

npl_ratio is the ratio of non-performing loans to total loans. This ratio is being used as a leading indicator of a bank crisis (an ex-post measure of a credit risk). As a matter of fact, as NPL goes up, bank profitability systematically falls. A higher value of non-performing loans leads to increases in credit losses (Nguyen, Skully, and

Perera 2012a) and to riskier loan portfolios (Lee, Hsieh, and Yang 2014b). Thus, we expect an inverse relationship between this ratio and bank performance.

3.2.4.9. *llp_ratio.* llp_ratio is the ratio of loan loss provision to total assets. This ratio reflects loan quality. It is expected to see banks shifting towards non-traditional activities to substitute for the interest income that is lost due to NPL (Baele, Jonghe, and Vennet 2007). It can be thought of as an ex-ante measure of the expected losses from traditional lending activities (Berger, Hasan, and Zhou 2010). Although some studies document an inverse relationship between LLP and bank performance indicators, Lee, Yang, and Chang (2014a) reported a positive effect of the LLP ratio on bank profitability since higher profits are accompanied with an increased risk. Accordingly, the sign of the LLP coefficient cannot be determined a priori.

3.2.4.10. *listed.* listed is a dummy variable that takes the value of one for banks listed in the stock exchange every year. Listed banks are generally the largest and best performing banks and they are able to generate more non-interest revenue from their activity expansion (Nguyen, Skully, and Perera 2012a, 2012b). Hence, a positive sign of listed is expected on MENA banks' performance.

3.2.4.11. *ownership.* ownership is a dummy variable that captures a bank's ownership structure: foreign versus domestic institution. It takes the value of 1 for banks that are 50% or more owned by foreigners and 0 for domestic institutions. Arguably, foreign banks (or majority-owned by foreigners) typically diversify their business lines more than their domestic counterparts. Thereby, we expect a positive effect of the foreign owner-ship presence on MENA banks performance and stability.

3.2.4.12. *Inf.* It is the annual consumer price inflation. The relationship between infla-tion and banks performance depends on whether the inflation is anticipated or unanti-cipated (Perry 1992). In the first case, banks can timely adjust interest rates, which consequently results in revenues that grow faster than costs, with a positive impact on profitability. In the second case, banks may be slow in adjusting their interest rates resulting in a faster rise in bank costs than bank revenues. This will consequently have a negative impact on bank profitability and increase its insolvency risk. Thus, the effect of inflation on bank performance cannot be determined a priori.

3.2.4.13. *gdp_growth.* It stands for the annual real GDP. It is an external determinant for macroeconomic conditions. In upturns, high economic growth facilitates credit expansion and may motivate managers to undertake risky aggressive strategies. In downturns, when real GDP growth is decreasing and when loan demand goes down (credit crunch), foreign investors will be discouraged to invest in the domestic markets and financial instability will increase (Nguyen, Skully, and Perera 2012a,2012b). The variable gdp_growth is expected to have a positive impact on bank's performance according to the well-documented literature on the association between economic growth and financial sector performance.

3.2.4.14. *bankingfr.* bankingfr is the economic freedom index. We follow Mercieca, Schaeck, and Wolfe (2007) and Nguyen et al. (2012a,2012b) and we use a country-specific

annual index called 'economic freedom' or 'financial freedom'. This index measures the overall banking security as well as the overall economic freedom (from the government control) on the performance of the countries' banking sector. The index is graded using a scale from 0 to 100, where 100 represents maximal freedom. As a result, the expected effect of FREEDOM on bank performance is rather positive (Heritage Foundation 2016).[5]

3.2.4.15. *findev*. Some studies have stressed the importance of financial development to the banking industry. The financial sector development is proxied in our study by the ratio of annual market capitalization to GDP. This ratio measures the importance and size of the stock market in a given country. Nguyen, Skully, and Perera (2012b) stressed that countries with growing economies and greater financial development had more stable banks. We expect that financial development (findev) as measured by the market capitalization ratio has a positive impact on bank performance (see Demirguc-Kunt and Huizingha, 1999).

4. Empirical results

4.1. Estimation and discussion

We start by displaying (see Table 2) comparative descriptive statistics for the whole sample of 275 MENA banks and their set of peers set in an advanced economy (Japan). We compare the composition of non-interest income for MENA banks with the levels of diversification in an advanced country (Japan). Our results show that MENA banks diversify into (div_rev) and within (div_non) non-interest income activities, as depicted by their mean values of 0.614 and 0.568, respectively (see Table 2). The detailed breakdown of non-interest income sources demonstrates that banks mostly tend to shift towards commission-generating activities (mean value = 0.528) while giving less attention to trading-related businesses (mean value = 0.162) and other non-interest income (mean value = 0.267). For Japanese banks, we rather find and engagement in trading business lines (the trading income share represents nearly 50% of the non-interest income share), while showing less interest towards fee-generating activities (0.119 which represents 38% of the non-interest income share). MENA banks that operate in less developed financial markets and that are slowly diversifying their strategies may lack the expertise and skills needed to develop trading business lines unlike their peers in developed markets.

In what follows, we display the dynamic two-step sys-GMM estimation results of the relationship between the income diversification, the bank risk-adjusted profitability and the insolvency risk.[6] Concerning the tests of the dynamic sys-GMM specification, the

Table 2. Summary statistics for regression variables.

Variable	MENA Banks			Japanese Banks		
	Obs	Mean	Std. Dev.	Obs	Mean	Std Dev.
div_rev	1982	.614	.119	991	0.6066	0.1571
div_non	1982	.568	.218	-	-	-
nii_share	1982	.392	.213	991	0.3116	0.0967
cnii_share	1982	.527	.280	991	0.1191	0.0443
tnii_share	1982	.161	.208	991	0.1402	0.0948
onii_share	1982	.267	.272	991	0.0532	2.148

Notes: This table presents a comparative analysis of the summary statistics for the income diversification proxies used in the regressions and in Sawada (2013).

validity of the model based on instruments (Hansen test of over-identifying restrictions) and the absence of serial correlation of residuals (Arellano-Bond test) are confirmed.[7] As expected, it stands out from the estimation of all the specifications that, as expected, the coefficients of the one-period lagged dependent variable (e.g. RAROAA_lag and RAROAE_lag) and the insolvency risk (Z_score_lag) are positive and statistically significant. This finding lends support to the dynamic character of the model specification and indicates that MENA-based bank performance is rather persistent. Such findings corroborate those of previous studies which highlight the evidence of autoregressive properties in bank performance (see among others, Lee, Yang, and Chang 2014a; Lee, Hsieh, and Yang 2014b; Meslier, Tacneng, and Tarazi 2014).

The coefficients of the Herfindahl-Hirschmann concentration indexes indicate that shifting towards (div_rev) and within (div_non) non-interest revenue sources has a positive effect on bank risk-adjusted profits. Such findings are consistent with those obtained by Meslier, Tacneng, and Tarazi (2014), an emerging-country-based study, which confirms the presence of diversification benefits for bank performance. To allow for deeper insights, we run our models using an additional measure of income diversification. More specifically, we follow Stiroh and Rumble (2006), Chiorazzo, Milani, and Salvini (2008) and Meslier, Tacneng, and Tarazi (2014) and consider the share of non-interest revenue (nii_share). Once again, the positive effect of non-traditional activities on bank risk-adjusted profits is confirmed because the coefficient of nii_share is positive and statistically significant. This finding reinforces the idea found in many previous studies that shifting towards non-interest revenue-generating activities entails a diversification premium. Such conclusion corroborates Lee, Hsieh, and Yang (2014b)'s who stressed that bank profits were boosted via a product diversification strategy. This lends support to the hypothesis of a portfolio diversification effect.

Following Hidayat, Kakinaka, and Miyamoto (2012), we split the non-traditional revenue into its constituent components (i.e. commissions, trading income and other non-interest revenues). The rationale behind this breakdown is to allow for an in-depth consideration of the impact of each activity on bank performance and stability. Results reported for commissions (cnii_share) indicate a positive impact of the latter on bank profits (see Tables 3 and 4). A similar finding is documented by Lee, Hsieh, and Yang (2014b) who found that shifting towards commission revenue-generating activities would enhance bank profitability. As for trading share (tnii_share), the coefficient is positive and statistically significant reflecting the fact that the MENA banks reap diversification benefits from their trading activities (see Tables 3 and 4). This finding is supported by Meslier, Tacneng, and Tarazi (2014) who showed an enhancement in profits as banking institutions engaged in trading businesses.

Unexpectedly, our estimations show that other non-interest income-related activities[8] (onii_share) are negatively related to bank risk-adjusted profitability (see Tables 3 and 4). Similar evidence was highlighted by Stiroh and Rumble (2006), Mercieca, Schaeck, and Wolfe (2007) and Meslier, Tacneng, and Tarazi (2014).

Turning to Z_score, our estimations (see Table 5) display a negative sign for all the measures of product diversification, except for the trading share. This means that shifting towards and within commission-based as well as other non-interest income-related activities has an adverse effect on the bank insolvency risk, hence its stability. This finding is consistent with those reported by Stiroh and Rumble (2006) and Mercieca,

Table 3. Revenue diversification and RAROAA for MENA banking industry over the 1990–2011 period.

RAROAA	Spec 1	Spec 2	Spec 3	Spec 4	Spec 5	Spec 6
L.raroaa	0.248***	0.257***	0.244***	0.257***	0.258***	0.249***
div_rev	0.780***					
div_non		0.018				
nii_share			0.239***			
cnii_share				0.327***		
tnii_share					1.087***	
onii_share						−0.316***
size	−0.252***	−0.137***	−0.154***	−0.144***	−0.292***	−0.267***
capitalization	0.004*	0.007***	0.007***	0.007***	0.002	0.003
liquidity	−0.923***	−0.309***	−0.274***	−0.181**	−1.115***	−0.873***
dta	1.300***	0.449***	0.395***	0.277***	1.556***	1.226***
bank_growth	0.004***	0.003***		0.003***	0.003***	0.006***
cti	−0.061***	−0.045***	−0.047***	−0.043***	−0.062***	−0.058***
nim	0.014***	0.013***	0.010***	0.013***	0.015***	0.013***
npl_ratio	−0.012***	−0.026***	−0.028***	−0.024***	−0.007***	−0.012***
llp_ratio	−0.254***	−0.004***	−0.006***	−0.003***	−0.293***	−0.213***
bankingfr	−0.006**	−0.006***	−0.009***	−0.011***	−0.019***	−0.010***
findev	0.001	0.003***	0.005***	0.003***	0.000	0.001***
gdp_growth	0.101***	0.091***		0.094***	0.089***	0.096***
inf	0.011***	0.022***	0.033***	0.022***	0.013***	0.013***
Constant	5.407***	4.344***	5.112***	4.520***	6.792***	6.106***
#obs/#groups	704/170	825/181	825/181	825/181	704/170	704/170
J-test	1	1	1	1	1	1
AR(1)/AR(2)	0.044/0.473	0.035/0.518	0.038/0.613	0.035/0.501	0.047/0.524	0.0471/0.460

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively

Table 4. Dynamic two-step system GMM estimation results – RAROAE.

RAROAE	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroae	1.820***	1.856***	0.526***	0.535***	0.589***	0.548***
div_rev	1.794***					
div_non		0.206*				
nii_share			1.245***			
cnii_share				0.524***		
tnii_share					1.125***	
onii_share						-0.505***
size	-0.322***	-0.336***	-0.052***	-0.033***	-0.116***	-0.109***
capitalization	0.038***	0.042***	-0.022***	-0.012***	-0.014***	-0.012***
liquidity	-1.065***	-1.209***	-0.043	0.197***	-0.787***	-0.581***
dta	1.567***	1.794***	0.008	-0.315***	1.137***	0.818***
bank_growth	0.034***	0.028***			0.009***	0.012***
cti	0.015***		-0.036***	-0.037***	-0.035***	-0.038***
nim	0.022***	0.022***	0.010***	0.009***	0.009***	0.008***
npl_ratio		0.026	-0.031***	-0.024***	0.002	-0.003**
llp_ratio	0.141***		-0.007***	-0.004***	-0.296***	-0.201***
bankingfr	-0.025***	-0.057***	-0.032***	-0.035***	-0.018***	-0.029***
findev		-0.007***	0.001***	0.002***	0.000	0.001***
gdp_growth	0.039***	0.036***	0.090***	0.103***	0.071***	0.081***
inf	-0.022***	-0.015***	0.019***	0.015***	0.012***	0.016***
Constant	-2.512***	1.474***	5.048***	5.111***	3.805***	5.078***
#Obs/#Groups	1,151/245	1,014/235	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.005/0.48	0.005/0.32	0.002/0.41	0.002/0.38	0.005/0.84	0.005/0.70

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 5. Dynamic two-step system GMM estimation results – Z_score.

Z_score	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.z_score	0.911***	0.906***	0.907***	0.905***	0.906***	0.907***
div_rev	−3.852***					
div_non		−6.559***				
nii_share			−0.101			
cnii_share				−2.839***		
tnii_share					6.095***	
onii_share						−0.267*
size	−0.204***	−0.320***	−0.201***	−0.252***	−0.334***	−0.233***
capitalization	0.241***	0.257***	0.240***	0.244***	0.244***	0.246***
liquidity	−1.932***	−2.074***	−2.149***	−2.492***	−3.038***	−2.038***
dta	2.628***	2.765***	2.895***	3.482***	4.077***	2.729***
bank_growth	−0.043***	−0.044***	−0.042***	−0.045***	−0.045***	−0.041***
cti	0.000	0.002*	−0.001	−0.003*	0.005***	0.001
nim	0.000	0.006***	0.003	0.007***	0.004***	0.002
npl_ratio	−0.009***	−0.025***	−0.015***	−0.016***	−0.004	−0.015***
llp_ratio	−0.652***	−0.434***	−0.620***	−0.542***	−0.648***	−0.519***
bankingfr	0.007	−0.036***	0.005	−0.019**	−0.036***	0.006
findev	0.008***	0.006***	0.008***	0.006***	0.007***	0.008***
gdp_growth	0.048***	0.045***	0.058***	0.045***	0.024***	0.065***
inf	0.018***	0.012***	0.016***	0.018***	0.021***	0.015***
Constant	0.746	5.802***	−1.454***	2.096***	0.304	−1.325**
# obs/#groups	704/170	704/170	704/170	704/170	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.013/0.429	0.014/0.412	0.014/0.432	0.015/0.417	0.017/0.412	0.014/0.433

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Schaeck, and Wolfe (2007). In our case, commissions and other non-interest income activities entail increased earnings' volatility, which might adversely affect MENA banks' stability and soundness. However, following trading activities, such as foreign exchange, private securities or financial futures/options and contracts seems to provide a stabilizing effect on their stability.

For bank-specific characteristics, we find that an increase in bank size adversely affects the bank profitability and risk. Agency problems have emerged since then, as MENA banks have become complex and large and managers tend to engage in new business lines to raise their power and to consume perquisites instead of increasing the shareholders' wealth. This conflict of interest, accompanied with a growing rigidity of the cost structure and a higher complexity of the organisational form make MENA banks less stable.

As for the capital ratio (capitalization) which is measured by the equity-to-assets ratio, we rather find mixed results as some estimates report a negative impact while others display a positive effect. For Z_score (see Table 5), the reported positive sign shows that capital has a stabilizing effect on bank revenues. In fact, MENA banks use it as a cushion against potential risks. For profitability measures (see Tables 3 and 4), the positive sign may be interpreted as follows. By lowering the bankruptcy costs, increased capital fuels the managers' incentives to engage in non-traditional activities, making them more profitable. A similar finding was stressed by Brighi and Venturelli (2014). The negative impact signals the increased risk-aversion attitude of some MENA bank managers as they flee risky investment opportunities that generate higher profits.

It is generally agreed upon that holding a certain degree of liquid assets, rapidly converted to cash such as cash and government securities is necessary for banks to meet their financial obligations as they come due. However, exceeding a certain threshold has made the effect reversed. Actually, the reported negative sign demonstrates that MENA banks are holding an excessive volume of low-return-generating liquid assets that adversely affect their capacity to generate revenues.

The Deposits to total assets ratio (dta) shows a positive sign. As this ratio goes up, MENA banks have the possibility to fund their assets using an inexpensive source that not only allows them to shift away from costly external funding but also guarantees the stability and sustainability of their revenues.

We also control for bank growth (bank_growth). The coefficient shows a positive sign with profitability while being negative with Z_score. Although the reported negative sign for assets growth reflects the risk-taking attitude of MENA bank managers as they engage aggressively in non-traditional business lines, the positive effect signals that risky diversification opportunities are the most profitable. MENA banks raise their profitability at the expense of the increased risk. Our results corroborate the empirical investigation of Lee, Yang, and Chang (2014a) who reported that growth strategies were favorable to profitability but increased the risk as well.

The cost efficiency ratio (cti) bears a negative sign and appears to be statistically significant with profitability specifications. This suggests that MENA banks are effectively managing their operating costs owing to their investments in managerial expertise. Higher efficiency helps them use their internal resources more productively. More than that, an efficient cost management does not only shelter MENA banks from potential risks, but also enables them to reap higher profits through the exploitation of economies of scale and scope provided by revenue diversification.

Our results demonstrate that the coefficient of the net interest margin ratio (nim) is positive and statistically significant in all the model specifications. Since this proxy mirrors the profitability stemming from traditional banking activities, such finding may be explained by the fact that – although MENA banks are entering new markets – they are maintaining their mainstream activities and that the latter are still profitable. Hence, the strategic shift adopted by MENA banks does not come from the need to compensate losses from traditional business lines but to respond to the need of a liberalized and fast-growing environment in which they operate. Diversification helps banks to reinforce their positioning and to counter increased competition.

The coefficient of non-performing loans (npl_ratio) displays a negative sign. A low ratio means that MENA banks are offering loans with great quality to their customers and bearing lower losses from their lending activities, which in turn improve their risk-adjusted profits.

Turning to the second proxy for bank's credit quality, the loan loss provision ratio (llp_ratio)[9] bears a negative sign as well. In our case, loan loss provisioning is diminishing in importance which makes MENA banks less likely to be subject to a credit risk and be more stable.

Controlling for macroeconomic factors, the coefficient of financial development (findev) exhibits a positive sign. The growing financial system of the MENA region, characterized by increased deregulation and liberalization accompanied with technological innovations of products and services enables banks to expand the scope of their activities and to develop new business lines in order to widen their profits margins and to preserve their stability, soundness and sustainability.

Unexpectedly and unlike previous studies that have illustrated the positive impact of financial freedom (bankingfr) on bank product expansion (Nguyen, Skully, and Perera 2012b), alleviating/removing regulatory restrictions and/or monitoring and state control over banks' activities has an adverse effect on their profitability and stability. Due to the liberalization and deregulation of the financial system in which they operate, MENA banks tend to myopically enter new markets where they lack the managerial expertise and experience needed to single out profitable investment opportunities. Hence, the absence of monitoring leads MENA banks to undertake risky activities that adversely affect their stability and soundness.[10]

The coefficients of gdp_growth, which proxies for the state of the macroeconomic environment, show that in upturns MENA banks are increasing their reliance on non-traditional products and services. An aggressive engagement, accompanied with an under-estimation of the risks underlying some investment opportunities and/or myopic choice of risky business lines raise the instability of the bank, which leads to financial constraints in downturns.

Finally, inflation is found to be significantly and positively related to the bank performance. Apparently, the inflation is anticipated and interest rates are adjusted accordingly, making MENA banks' mainstream operations safe and profitable.[11] Proper steps are undertaken in the MENA banking system to counter any potential adverse effect of inflation.

It is worth addressing the income diversification issue by adding foreign ownership and listed dummies to see whether listed and foreign banks exhibit higher performance

when they diversify their revenue streams. Consequently, we interact each of these two variables with all income diversification proxies.

Although RAROAA and RAROAE estimations do not show similar signs for div_rev and div_non (see Tables 6 and 7),[12] there is a consensus that foreign banks that shift towards trading and other non-traditional activities suffer from lower profitability. The same thing is noticed on the insolvency risk side (Z_score). In fact, except for other non-interest revenue, engaging in new business lines that generate non-traditional income makes foreign banks less stable (see Table 8). Our findings go against Lassoued and Sassi (2017) who reported risk reduction in the presence of diversified foreign banks. Although both of us examined the impact of foreign ownership on bank stability, we got different findings. We believe that these differences stem from our use of various performance measures (we used profitability measures adjusted to risk that accounted for the total volatility of profits as well as a stability proxy, the z-score, which is a comprehensive measure that combines accounting proxies of profitability, leverage and volatility into a single measure), which accurately capture the impact of foreign presence in the bank ownership structure.

We also use a longer span of time (from 1990 to 2011) and we gauge the effect of foreign ownership for all non-interest income components. In our study, the negative effect reveals that the current level of foreign ownership present in MENA banking sector is not value-adding and does not contribute to the sector sustainability. Perhaps, the foreign ownership has not gained strong foothold in the domestic market and/or faced fierce competition from well-established domestic banks; if so, any positive impact of foreign expertise, technology proficiency, etc… cannot be noticed.

On the other hand, data do not seem to be informative enough about the impact of being listed on the stock exchange (as the results found for RAROAA and RAROAE are inconclusive, except for the trading revenue, see Tables 9 and 10), so the interaction terms of this dummy with income diversification proxies bear positive signs for all the Z_score specifications (see Table 11). A similar finding was reported by Nguyen, Skully, and Perera (2012a, 2012b). MENA listed banks reaped diversification benefits when they shifted towards trading business lines (their profitability improves). When they diversified their revenue streams in general, they would become more stable (were less subject to increases in insolvency risk). MENA listed banks are more efficient and more experienced when it comes to trading-generating activities and to non-traditional business lines.

In sum, product diversification strategies operated in MENA banking industry are certainly profitable for banks via economies of scope, cost reduction…, as found in previous studies related to diversification. However, as the finance theory stipulates, these profitable investment opportunities are accompanied with greater insolvency risk.

4.2. Robustness checks

A set of robustness tests are carried out to check as to whether the impact of the different types of product mixes are insensitive to any modification of the models used. We present two sensitivity tests in Tables 12-17. Firstly, we discard the net-interest margin (nim) from the model. For the second sensitivity test, we re-run the analysis by including a squared term of the capital ratio (cap_sq).

Table 6. Dynamic two-step system GMM estimation results – RAROAA (with interaction terms/foreign).

RAROAA	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroaa	0.257***	0.260***	0.253***	0.259***	0.268***	0.267***
div_rev	1.016***					
div_non		0.170***				
nii_share			1.081***			
cnii_share				0.338***		
tnii_share					1.530***	
onii_share						0.705***
foreign×div_rev	−0.758***					
foreign×div_non		−0.727***				
foreign×nii			−1.330***			
foreign×cnii				−0.291***		
foreign×tnii					−1.853***	
foreign×onii						−2.148***
#Obs/#groups	704/170	825/181	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.044/0.453	0.038/0.501	0.039/0.633	0.036/0.504	0.051/0.541	0.047/0.470

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 7. Dynamic two-step system GMM estimation results – RAROAE (with interaction terms/foreign).

RAROAE	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroae	1.808***	1.846***	0.533***	0.541***	0.608***	0.573***
div_rev	2.310***					
div_non		−0.067				
nii_share			1.135***			
cnii_share				0.319***		
tnii_share					1.242***	
onii_share						−0.284***
foreign×div_rev	0.367***					
foreign×div_non		1.060***				
foreign×nii			−0.406***			
foreign×cnii				0.010		
foreign×tnii					−0.529***	
foreign×onii						−0.347**
#Obs/#groups	1,151/245	1,014/235	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.006/0.487	0.005/0.326	0.003/0.423	0.002/0.395	0.005/0.853	0.005/0.673

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 8. Dynamic two-step system GMM estimation results – Z_score (with interaction terms/foreign).

Z_score	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.z_score	0.912***	0.904***	0.908***	0.907***	0.910***	0.909***
div_rev	−4.025***					
div_non		−6.693***				
nii_share			−0.073			
cnii_share				−2.778***		
tnii_share					5.871***	
onii_share						−0.592***
foreign×div_rev	0.066					
foreign×div_non		−0.300				
foreign×nii			−0.730***			
foreign×cnii				−0.432		
foreign×tnii					−0.800**	
foreign×onii						1.325**
#Obs/#groups	704/170	704/170	704/170	704/170	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.014/0.431	0.014/0.410	0.014/0.435	0.015/0.418	0.017/0.413	0.014/0.437

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 9. Dynamic two-step system GMM estimation results – RAROAA (with interaction terms/listed).

RAROAA	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroaa	0.259***	0.261***	0.253***	0.255***	0.267***	0.256***
div_rev	0.584**					
div_non		−0.119				
nii_share			−0.522***			
cnii_share				0.555***		
tnii_share					−2.213***	
onii_share						−0.854***
listed×div_rev	1.391***					
listed×div_non		0.549***				
listed×nii			0.965***			
listed×cnii				−0.333***		
listed×tnii					5.036***	
listed×onii						1.205***
#Obs/#groups	704/170	825/181	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.040/0.446	0.038/0.504	0.038/0.588	0.035/0.510	0.049/0.578	0.046/0.464

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 10. Dynamic two-step system GMM estimation results – RAROAE (with interaction terms/listed).

RAROAE	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroae	0.925***	0.906***	0.908***	0.908***	0.904***	0.911***
div_rev	2.857***					
div_non		0.483***				
nii_share			0.913***			
cnii_share				0.795***		
tnii_share					−0.346*	
onii_share						0.146
listed×div_rev	−1.767***					
listed×div_non		−2.341***				
listed×nii			0.045			
listed×cnii				−0.802***		
listed×tnii					2.123***	
listed×onii						−0.906***
#Obs/#groups	1,151/245	1,014/235	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.005/0.483	0.005/0.333	0.002/0.398	0.002/0.420	0.005/0.863	0.004/0.719

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 11. Dynamic two-step system GMM estimation results – Z_score (with interaction terms/listed).

Z_score	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.z_score	1.815***	1.843***	0.534***	0.545***	0.609***	0.574***
div_rev	−2.837***					
div_non		−7.157***				
nii_share			−3.545***			
cnii_share				−4.100***		
tnii_share					−1.223***	
onii_share						−0.292
listed×div_rev	2.582***					
listed×div_non		2.342***				
listed×nii			5.150***			
listed×cnii				2.629***		
listed×tnii					11.593***	
listed×onii						0.574*
#Obs/#groups	704/170	704/170	704/170	704/170	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.012/0.433	0.014/0.424	0.014/0.441	0.015/0.430	0.018/0.406	0.014/0.436

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 12. Dynamic two-step system GMM estimation results – RAROAA (without net interest margin).

RAROAA	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroaa	0.250***	0.251***	0.242***	0.246***	0.254***	0.246***
div_rev	0.546**					
div_non		0.075				
nii_share			0.301***			
cnii_share				0.480***		
tnii_share					1.428***	
onii_share						−0.409***
# obs/#groups	704/170	825/181	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.042/0.470	0.036/0.528	0.037/0.632	0.035/0.514	0.048/0.524	0.046/0.459

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 13. Dynamic two-step system GMM estimation results – RAROAE (without Net Interest Margin).

RAROAE	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroae	1.824***	1.831***	0.521***	0.527***	0.573***	0.544***
div_rev	2.925***					
div_non		0.782***				
nii_share			1.134***			
cnii_share				0.503***		
tnii_share					1.407***	
onii_share						−0.586***
# obs/#groups	1,151/245	1,024/237	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.005/0.482	0.005/0.316	0.002/0.412	0.002/0.395	0.006/0.925	0.005/0.716

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively

Table 14. Dynamic two-step system GMM estimation results – Z_score (without Net Interest Margin).

Z_score	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.z_score	0.907***	0.907***	0.904***	0.904***	0.904***	0.908***
div_rev	−4.165***					
div_non		−7.153***				
nii_share			0.105			
cnii_share				−3.042***		
tnii_share					6.402***	
onii_share						−0.313**
# obs/#groups	704/170	704/170	704/170	704/170	704/170	704/170
J test	1	1	1	1	1	1
AR(1)	0.013/0.423	0.013/0.404	0.013/0.427	0.015/0.416	0.0170.412	0.013/0.431

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Since nim reflects the profitability stemming from the mainstream banking activities, one might think that our previous findings are driven by them rather than being the impact of non-interest-revenue-earning businesses. Discarding this proxy from our model shows that our findings are robust, indicating that the observed effects on performance are the consequence of banks' embarking upon non-traditional business lines rather than being related to the traditional lending activities (see Tables 11-13).

We have also conducted a further examination by including a squared term of the capital ratio (cap_sq). Up to a certain level, the capital ratio has a smoothing

Table 15. RAROAA (Inclusion of a squared term of the capital ratio).

RAROAA	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroaa	0.262***	0.263***	0.258***	0.263***	0.269***	0.266***
div_rev	0.144*					
div_non		0.308***				
nii_share			0.178***			
cnii_share				0.489***		
tnii_share					1.521***	
onii_share						−0.418***
size	−0.242***	−0.127***	−0.146***	−0.113***	−0.276***	−0.242***
capitalization	0.037***	0.047***	0.034***	0.046***	0.036***	0.039***
cap_sq	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***	−0.000***
# obs/#groups	704/170	825/181	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.046/0.477	0.038/0.514	0.039/0.607	0.037/0.499	0.050/0.552	0.046/0.464

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively

Table 16. RAROAE (Inclusion of a squared term of the capital ratio).

RAROAE	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.raroae	1.820***	1.828***	0.538***	0.543***	0.607***	0.565***
div_rev	2.906***					
div_non		1.345***				
nii_share			0.989***			
cnii_share				0.570***		
tnii_share					1.230***	
onii_share						−0.644***
size	−0.308***	−0.348***	−0.065***	−0.033***	−0.088***	−0.073***
capitalization	0.270***	0.200***	0.039***	0.047***	0.032***	0.041***
cap_sq	−0.003***	−0.002***	−0.001***	−0.001***	−0.001***	−0.001***
# obs/#groups	1,151/245	1,024/237	825/181	825/181	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.006/0.500	0.005/0.320	0.002/0.381	0.001/0.356	0.004/0.881	0.003/0.691

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 17. Z_score (Inclusion of a squared term of the capital ratio).

Z_score	Spec_1	Spec_2	Spec_3	Spec_4	Spec_5	Spec_6
L.z_score	0.902***	0.901***	0.880***	0.901***	0.902***	0.900***
div_rev	−5.616***					
div_non		−6.660***				
		(0.166)				
nii_share			−0.325***			
cnii_share				−3.144***		
tnii_share					7.100***	
onii_share						−0.899***
size	−0.287***	−0.397***	−0.239***	−0.282***	−0.375***	−0.263***
capitalization	0.491***	0.482***	0.467***	0.441***	0.481***	0.471***
cap_sq	−0.003***	−0.003***	−0.003***	−0.003***	−0.003***	−0.003***
#Obs/groups	704/170	704/170	825/181	704/170	704/170	704/170
J test	1	1	1	1	1	1
AR(1)/AR(2)	0.009/0.432	0.009/0.416	0.009/0.433	0.011/0.421	0.012/0.414	0.009/0.442

Notes: *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

and stabilizing impact on MENA banks' performance. It absorbs large shocks and mitigates the probability of financial distress, making it easier for MENA banking institutions to develop and gain a strong foothold in non-traditional business lines, and hence the reap diversification benefits that enable banks to boost their profitability and reinforce their stability and soundness. However, the coefficient of the displayed squared term (see Tables 14-16) shows a negative sign implying that, above a certain threshold, the effect of capitalization becomes reversed. MENA banks that aggressively diversify their businesses, without being cognizant of the potential risks involved in doing so, make their earning revenues more volatile, therefore raise their probability of financial distress. Above a certain extent, a higher capital ratio mirrors the presence of risky revenues that stem from a sub-optimal engagement in non-traditional business lines.

In sum, the findings robustly indicate that the impact of diversification on bank performance stems exclusively from non-interest-earning business lines rather than being the impact of the mainstream activities. Such findings prove that MENA banks diversify their business lines not for the purpose of shifting away from traditional lending businesses, as they appear profitable. Nevertheless, capital has a positive effect on MENA banks but only to a certain extent, above which the impact becomes reversed.

5. Concluding remarks and policy implications

This paper provides a new empirical evidence on how revenue diversification influences banks performance (i.e. risk-adjusted profitability and stability) using a sample of 275 banks established in MENA countries from 1990 to 2011. On the one hand, our findings suggest that engaging in non-traditional activities improves banks' profitability. On the other hand, an increased reliance on commissions, fees and other non-interest income-generating activities has an adverse impact on bank stability and sustainability. The detailed breakdown of non-interest income reveals that embarking upon trading-related business lines has by far the most stabilizing effects on bank profits and improves bank stability.

Our results give incentives for regulators as regards the necessity to monitor MENA banks that engage in commissions, fees and other non-interest income-generating activities since these banking institutions might incur a growing insolvency risk. They raise a cautious flag concerning the need to closely monitor MENA banks that aggressively engage in non-traditional activities. Banks in emerging countries, such as the MENA region, may lack the managerial skills and expertise to engage in profitable non-risky activities. In order to boost their institutions' performance, managers aggressively engage in profit-boosting yet risky product expansion. Thus, strengthening regulatory restrictions and closely scrutinizing diversified banks is necessary to, not only to avoid reckless diversification decisions but also to preserve the soundness of the overall banking system. Policies should be designed to give banks more incentives to improve their portfolios' management and risk management techniques without increasing their inefficiencies.

It is worthy for managers to shift towards trading activities since they boost banks performance and increase bank stability. Following trading businesses is profitable and has a stabilizing effect on MENA banks. However, insiders have to be cautious regarding

the engagement in commission-based and other non-interest income-generating activities as they might increase the bank insolvency risk, which may worsen the benefit/cost product diversification trade-off. All in all, before entering new markets, managers need to invest in expertise and learn how to deal with non-traditional activities to avoid non-profitable (or risky) investment decisions.

Finally, an in-depth analysis of liquidity sources management is required to reach the best level of these assets, making them serve as a great cushion against liquidity shocks without negatively impacting the capacity of banks to generate additional revenues. Managers have to closely consider this trade-off.

In sum, the financial liberalization and deregulation, the technological innovations accompanied with a rising demand for new developed and diverse financial products and services and the increased competition have led MENA banks to search for new ways to diversify their activities. This empirical investigation shows that they shift towards new business lines, not to substitute losses from their mainstream activities but to strengthen their positions in the banking market, to extend the scope of their products and services, to keep their existing customers and attract new ones, to hold competitive advantages, to widen their profit margins, to prevent themselves from potential risks and to mimic their peers in developed banking industries.

Notes

1. Chiorazzo, Milani, and Salvini (2008) note that the majority of the US banks are small whereas the European banking institutions are relatively large compared to their US peers.
2. y_{it-1} in Equation (1) is used to check whether the profitability and insolvency risk of the MENA-based banks are persistent. The inertial effect informs us about the degree of environment competitiveness where these banking institutions operate.
3. It is the ratio of operating expenses (excluding interest expenses) to the sum of interest and non-interest incomes.
4. Operating costs include the administrative costs, staff salaries and property costs, excluding losses due to bad and non-performing loans.
5. Heritage Foundation (2016), Index of Economic Freedom, http://www.heritage.org/research/features/index/.
6. The pairwise correlations of the main variables used in this study are deemed satisfactory as judged by the criterion of the variance inflation factor. Due to limitations of space, we do not report the correlation matrix here, but it is available from the authors upon request.
7. In all Tables and for all the specifications, Hansen J-test reports the p-values for the null hypothesis of the validity of the over-identifying restrictions, and AR(1) and AR(2) are the p-values for first and second order autocorrelated disturbances in the first-differenced equation, respectively .
8. Other non-interest income includes revenues that cannot be properly included in commission/fee-based sources or trading income.
9. According to Baele, Jonghe, and Vennet (2007), the loan loss provision ratio is one of the few observable signals about loan quality.
10. According to Barth, Capiro, and Levine (2004), a higher freedom from government controls and lower monitoring incentives from regulators makes it possible for banking institutions to operate in different fields, prompting some conflicts of interests such as moral hazard (which encourages managers to undertake risky investment opportunities) and agency problems (related to the management of more complex and larger banks).

11. The positive sign of nim coefficient confirms the fact that the mainstream MENA banks' activities are generating profits.
12. In Tables 5–16, listed×w and foreign×w refer respectively to the interaction terms of listed dummy and foreign dummy with variable w, where w∈{div_rev, div_non, nii, cnii, tnii, onii}. Due space limitations, results concerning the control variables are not reported. They are available from authors upon request.

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