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Competition and Profitability of Banks: Empirical evidence from the Middle East & North African (MENA) Countries

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ARTICLE INFO

Article history

Received: 17 April 2020

Accepted: 23 April 2020

Published Online: 30 April 2020

Keywords:

Competition

Profitability

Credit Risk

Z-score

Lerner Index

Panel Regression

ABSTRACT

This paper uses generalized method of moments (GMM), Least Squares (LS) and Generalized Linear Model (GLM) to examine the impact of competition on profitability of banks and Stochastic Frontier approach (SFA) is used to estimate of cost efficiency. We have used an unbalanced panel dataset from a sample of emerging economic MENA countries over the period between 2011 and 2017. We find out that have a significant and negative impact of competition on profitability of banks. The empirical findings of this study suggest that (1) MENA banks should more improve the process of managing and monitoring the loan segment business ; the result which reducing in the level of credit risk which leads to higher profitability (2) MENA banks should shrink higher level of banking sector development. (3) MENA banks should make full conduct of available funds to engage in various natures of businesses; if there is an issue of insolvency, robust government support would give protection to MENA banks. Finally, it also provides some compulsory policy implications which will be very much beneficial for a wide range of stakeholders.

JEL: G10; G21

1. Introduction

Financial reforms required in the area Middle East and North Africa (MENA) in favor of International Monetary Fund (IMF) during the period 1980s and 1990s. These reform had affected significantly in banking systems and local stock market in MENA region^[31].

In the traditional structure conduct refers that in the banking industries have the effect of competition on the profitability. It represents that if the concentration is the higher, the competition will be the lower which forces to obtain higher profit^[37,38,40].

Else, the efficient structure hypothesis emphasizes to take efficiency which leads to higher profitability. To mea-

sure the efficiency cost to income ratio is used and different results were found^[3,12].

They used joint banking products (total deposit, gross loan and non-interest income) to examine the impact of competition on profitability Chinese commercial banks over the period 2003 to 2013^[38].

This study investigates the impact of the competition in different banking markets on profitability of different ownership structure (Islamic banks, Commercial Banks and Specialized Govt. Institution). The purpose of this study is to show the impact of competition on profitability of banks in MENA region. For that reason, this study contributes to the contemporaneous empirical analyses in some ways. 1st, on this field, several various nations like

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US banking industry, European banking industry, Greek banking industry and China banking industry has focused a lot of attention where lately MENA have focused to handle this sophisticated issue, but there have a few evidence of research on this area. Thus, this paper is to investigate MENA countries banks with a broader range of unbalance panel data that covers 256 banks and 19 countries over the period from 2011 to 2017. 2nd, some studies focused mostly on the impact of credit risk, liquidity risk, capital risk, and insolvency risk (Z-score), cost efficiency, banking sector development and stock market development and it has also found that these indicators has impact on banks profitability in MENA countries. Determination of profitability indicators are used return on assets (ROA), return on equity (ROE) and net –interest margin (NIM). Finally, this paper uses Lerner index and 3- banks concentration ratio (C3) to measurement market competition; we attain more sturdy results for the sake of the impact of cost- efficiency and competition on banks profitability. This study uses 3 method (Generalized method of moments, Least Squares and Generalized Linear Model) to justify this result. This study will help to financial authority for policy implementation of various forms of banks in MENA region.

The remaining part of this paper is structured as follows. Section 2 reviews of literature. Section 3 shows presentation of data and methodology. Section 4 explains the empirical results. Lastly, Section 5 Conclusions and Policy Making.

2. Review of Literature

There have a number of volumes of literature examining the profitability not only in the US banking but also the European banking industry. The outcomes refer that bank profitability has significantly influence by bank credit risk, liquidity risk, bank size, bank capitalization, bank efficiency, bank diversification, concentration, inflation as well as GGDP but some has significantly negatively impact such as credit risk, liquidity risk ad bank size. Table- 1 provides brief information about the empirical studies focusing on US and Europe.

Table 1. Review of literature on profitability

Data period	Areas of Investigation	Method and Methodology	Empirical outcomes	References
1985-2001	Greek Banking Industry	GMM	There has no proof in support of structure conduct performance paradigm in Greek-banking industry	[1]

1990-2002	Greek Banking Sectors	Fixed effect estimator	Not only higher capitalization but also lower cost ratio leads to greater profitability. GGDP and inflation also influence to bank profitability.	[45]
1992 to 1998	European Banking Industry	GMM and OLS	Capital asset ratio has a significantly & positively effect on bank profitability	[14]
1992-1998	European Banking Industry	Generalized Method of Moments	Bank diversification has a positive impact on bank profitability	[13]
1986-1989	European Banking Industry	Ordinary Least Square (OLS)	Liquidity risk has a is significant & negative concerned to bank profitability	[23]
1973-1978	US Banking Industry	Ordinary Least Square (OLS)	Size has significantly & negatively concerned to bank profitability	[34]
1994-1998	European Banking Industry	Fixed Effect Estimator	Credit risk has a negative impact on bank profitability	[22]
1994-2005	US Banking Industry	Generalized Method of Moments (GMM) and Ordinary Least Square (OLS)	Bank concentration contribute to increase profitability of bank	[42]
1980 -1989	US Banking Industry	OLS	Larger market share as well as various product contribute to higher profitability of banks	[3]

They investigated about Greek banking area over the period from 1985 to 2001. They said that there has no proof in support of structure conduct performance paradigm in Greek- banking sector. For this result, they used Generalized Method of Moments (GMM)^[11]. They studied about Greek banking industry over the period 1990 to 2002. They refer that not only higher capitalization but also lower cost ratio leads to greater profitability of banks. They also refer that GGDP and inflation also influence to bank higher profitability. For identify this result, they used fixed effect estimator (FEE)^[45]. They examined about European banking area over the period from1992 to1998. They found that Capital - asset ratio has a significant & positive effect on higher bank profitability. For detect this result, they used two methods Generalized Method of Moments (GMM) & Ordinary Least Squares (OLS)^[14].

They examined about European banking area over the period from1992 to1998. They said that there has a

positive effect of bank diversification on bank higher profitability. For detect this result, they used Generalized Method of Moments (GMM) [13].

They studied about European banking area over the period from 1986 to 1989. They said that liquidity risk has a significant and negative effect of concerned to bank profitability. For detect this result, they used Ordinary least square (OLS) estimator [23].

They examined about US banking sector over the period 1973 to 1978. They refer that there has a significant and negative impact concern to bank profitability. For identify this result, they used Ordinary least square estimator [1,34].

They observed about European banking industry over the period from 1994 to 1998. They refer that credit risk has a negative effect concern to bank profitability. For identify this result, they used fixed effect estimator (FEE) [22].

They examined about US banking area from the period 1994 to 2005. They refer that Bank concentration ratio contribute to increase bank profitability. For identify this result, they used two methods Generalized Method of Moments (GMM) and Ordinary Least Squares (OLS) [42].

They studied about US banking area over the period 1980 to 1989. They refer that larger bank market share as well as various product contribute to higher profitability of banks. For identify this result, they used Ordinary least square estimator [3].

3. Data and Methodology

This part includes six segments where segment 3.1 Presentation of data and time border; Segment 3.2 Define the variables and source of variables as well as estimated effects on bank profitability; including four classes namely (1) Profitability indicators, (2) Industry specific variables, (3) Bank specific variables and (4) macroeconomic control variables; Segment 3.3 Assessment of competition in the MENA banking industry (Lerner index); Segment 3.4 Drives efficiency of cost in the MENA banking industry: Stochastic Frontier approach (SFA); Segment 3.5 Determination of z-score (insolvency risk) in the MENA banking sector; finally, Segment 3.6 Emphasis on econometric model to determine bank profitability.

3.1 Presentation of Data and Time Border

This study is prepared on the basis of bank data on MENA countries. It covers over the period 2011 to 2017. At first we have gathered 21 countries, 392 banks, and total observation 2758; 1820 Commercial banks, 805 Islamic banks and 133 Specialized Govt. Institution data from the MENA countries. After dropping missing data, we had a

database of 19 countries, 256 banks and total observation 969, 634 Commercial banks, 298 Islamic banks and 37 Specialized Govt. Institution banks. As per the ownership structure, there are 3 ownership patterns in the MENA region. The bank-specific data as well as the industry-specific data are collected from the database of Bank scope. Macroeconomic variables are retrieved from database of the World Bank (data.worldbank.org). The data are not available information for all the year. For this reason, we use an unbalanced panel datasets so that we can keep persistence. We use 3 profitability indicators to measure profitability of bank which are ROA [1,12,37,38,40]; ROE [7,37,38,40]; and NIM [1,37,38,40]. The bank specific determinant of profitability includes insolvency risk (z-score), credit risk, capital risk, liquidity risk, bank size, bank- diversification and cost- efficiency. The industry-specific variables include competition (Lerner index, C3), banking sector- development and stock market- development. Two macroeconomic variables are includes GDP growth rate and annual inflation rate. Finally, this paper uses Lerner index and C3 to examine competition. We get more vigorous results with concern to the effect of cost- efficiency and competition on bank profitability. The study uses 3 method (Generalized method of moments, Least Squares and Generalized Linear Model) to find out this robust result.

3.2 Define the Variables and Source of Variables as well as Estimated Effects on Bank Profitability

Table 2. Define the variables and source of variables as well as estimated effects on bank profitability

Endogenous variables	Definition	Expected Effect	Source
(1) Profitability - indicators	$(x+a)^n$		
Return on assets (ROA)	$\frac{\text{net income}}{\text{total assets}}$		[27,37-39]
Return on equity (ROE)	$\frac{\text{net income}}{\text{shareholder's equity}}$		[37-39]
Net-interest margin(NIM)	$\frac{\text{net} - \text{interest income}}{\text{earning assets}}$		[37-39]
(2) Industry- specific variables			
Bank competition (Lerner index)	$(P_{TAU} - MC_{TAU}) / P_{TAU}$	+	[2,9,10,11,16,17,18,19,21,26,33,38,39,41].
Bank competition(C3)	$\frac{\text{total assets of the largest three banks}}{\text{total assets of the whole banking industry}}$	+	[38]

Banking-sector development	$\frac{\text{banking sector assets}}{\text{value of gross domestic product}}$	+	[38-40]
Stock-market development	$\frac{\text{market capitalization of listed companies}}{\text{value of gross domestic product}}$	+	[38-40]
(3)Bank-specific variables			
credit risk	$\frac{\text{impaired loans}}{\text{gross loans}}$	-	[26,38-40,43]
liquidity-risk	$\frac{\text{liquid assets}}{\text{total assets}}$?	[37,38]
Capital-risk	regulatory- capital ratio	?	[38,39,41,44]
Insolvency risk (Z-score)	$\frac{ROA + E / TA}{\sigma ROA}$	+	[2,5,24,29,30, 38,39,41,43,44]
Size	Natural logarithm of total assets	+	[26,38,39,41, 43]
Cost- efficiency	Stochastic frontier approach (SFA)	?	[25,38].
(4)Macroeconomic variables			
GGDP	Annual growth of gross domestic product rate	-	[28,43]; World bank
Inflation	Annual inflation rate	?	[43]; World bank
Here, notes: “+” denotes positive effect, “-” means negative effect, “?” represents no indication.			

3.3 Assessment of Competition in the MENA Banking- industry (Lerner Index & Concentration Ratio)

The Lerner index extent to market power which define as bank’s price minus marginal cost divided by the bank’s price. We used Lerner index as well as C3 to examine the market competition (market power) in the MENA countries following [2,5,9,10,11,16,17,18,19,21,32,33,38,39,41]. For calculating bank level data the Lerner index is used. The range is utilized $0 < \text{Lerner} < 1$ for level of competition. At the point when the estimation of Lerner list is zero (0), it shows market power is lower but highly competitive. On the other hand, if the value of Lerner index is one (1), it indicates that market power will be more but less competitive.

Lerner index calculate as following:

$$\text{Lerner}_{it} = (P_{TAit} - MC_{TAit}) / P_{TAit}$$

Here, P_{TAit} represents the price of total assets MC_{TAit} indicates the marginal cost of total assets of the bank i at time t . Price indicates total operating income which calculates interest income plus non-interest income divided by

total assets of banks i in time t , and Marginal cost (MC) determines by trans log cost function [5].

MC_{TAit} Translog cost function as follow:

$$\begin{aligned} \ln COST_{it} = & \beta_0 + \beta_1 \ln Q_{it} + \frac{\beta_2}{2} \ln Q_{it}^2 + \sum_{j=1}^3 \gamma_{ij} \ln W_{j,it} \\ & + \sum_{j=1}^3 \delta_j \ln Q_{it} \ln W_{j,it} + \sum_{j=1}^3 \sum_{k=1}^3 \ln W_{j,it} \ln W_{k,it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Ln indicates natural logarithm and cost indicates total cost, Q_{it} represents total assets (output) for a bank i at time t .

W_j and W_k indicate $W_1, W_2,$ and W_3 .

W_1 indicates input prices of labor (*personal expenses to total assets*)

W_2 indicates Input prices of funds (*interest expenses to total deposits*)

W_3 indicates Input prices of fixed capital (other operating and administrative expenses to total assets).

Then, Compute as marginal cost:

$$MC_{TAit} = \frac{COST_{it}}{Q_{it}} \left[\beta_1 + \beta_2 \ln Q_{it} + \sum_{j=1}^3 \gamma_{ij} \ln W_{j,it} \right] \quad (2)$$

3.4 Drives Efficiency of Cost in the MENA Banking Industry: Stochastic Frontier Approach (SFA)

Cost efficiency examines how a bank work well under the level environment condition concern to ‘best-practice bank’ which producing the equivalent output [4]. Cost efficiency measures for getting equal output, by reducing variance concern to benchmark bank with minimize cost. The cost efficiency level use generally from the cost function which express as translog function as follows [38]:

$$\begin{aligned} \ln Cost_{it} = & \beta_0 + \beta_1 \ln assets_{it} + \frac{1}{2} \beta_2 (\ln assets_{it})^2 + \sum_{j=1}^3 \alpha_{ij} \ln input_{ij} \\ & + \sum_{j=1}^3 \sum_{k=1}^3 \alpha_{ijk} \ln input_{ij} \ln input_{ik} + \sum_{j=1}^3 \gamma_{ij} \ln assets_{it} \ln input_{ij} + \nu_{it} + \mu_{it} \end{aligned}$$

Here, Ln defines the natural logarithm. i represents a particular bank, and t represent a definite year of bank. Cost indicates the total cost; this study has taken one output which is total assets, on the other hand, input has taken three input prices (1) price of labor (personal expense divided by total assets) (2) price of fund (interest expense divided by total deposit) (3) price of capital (other operating & administration expenses divided by total assets). ν denotes the effect of statistical noise. μ represents the non - negative random disturbance term which taking the effects of inefficiency. Descriptive statistics of Lerner index

shows in table 3.

Table 3. Descriptive statistics of Lerner index

Vari	N	Formula	Min	Maxi	M	Std.
Cost	969	Interest expenses plus non-interest expenses	-340 5.00	416320 7.00	6907 4.85	25520 5.40
Assets	969	Total assets	9.0000	19.0000	15.275	1.6754
input price of labor	969	(personal expenses to total assets)	0.0000	0.0000	0.000	0.0000
input price of fund	969	(interest expenses to total deposits)	0.0000	15.0000	.015480	.4818694
input price of fixed capital	969	(other operating and administrative expenses to total assets)	0.0000	1.0000	.002064	.0454076
MC	969	Estimated using equation (1) and (2)				

Note: N represents number of observation; Min represents minimum; Maxi represents maximum; M represents mean and Std. represents standard deviation. MC denotes marginal cost, vari denotes variables.

3.5 Determination of z-score (Insolvency Risk) in the MENA Banking Sector

Return on assets plus CAP (equity divided total assets) divided by standard deviation return on assets as define as Z-score. Z-score uses to examine the insolvency risk of the study. Z-score provide the information about bank which bank is stable or unstable or less stable as well as provide the information which bank has the capability to absorb the losses. So, the higher value of z-score denotes the greater stability and lower risk. To examine the financial stability of financial institution like as (banks, insurance company) broadly used by [2,5,20,29,30,37-41,43,44]. The calculation of Z-score can be expressed as follows:

$$Z\text{-score} = \frac{ROA + E / TA}{\sigma ROA}$$

Here, ROA denotes return on assets of banks; E indicates equity of banks; TA represents total assets of banks; σ ROA stand for standard deviation return on assets.

3.6 Emphasis on Econometric Model to Determine Bank Profitability

For determining bank profitability a number of indicators (ROA,ROE,NIM) are used by Tan [37-39]. We use three profitability indicators ROA, ROE and NIM to determine bank profitability. When we evaluate the bank profitability by ROA, ROE as well as NIM; we have faced a number of challenges. Firstly, higher profitable banks are able

to take more equity through retaining profits. Secondly, assume that perfect capital market will be increased in capital to improve projected earnings. Some issues are arisen, unobserved heterogeneity across banks in MENA as well as modifications in corporate governance. Finally, profitability would be very sturdy for MENA banks due to political interference. We try to follow the model [1,38]; by using a two-step Generalized Method of Moments (GMM) to estimate profitability in the MENA banking industry. Finally, we are driving a model and expands the specification proposed by Tan [38] and which would be expressed as follows:

$$P_{it} = \alpha_0 + \partial\pi_{i,t-1} + \sum_{j=1}^7 \beta_j X_{it}^j + \sum_{l=8}^{11} \beta_l X_{it}^l + \sum_{m=12}^{13} \beta_m X_{it}^m + \sum_{14}^{16} \gamma X_{it}^b + \varepsilon_{it}$$

Here, P denotes the profitability indicators ROA, ROE and NIM; i indicate the specific banks; t denotes the time for specific banks. α_0 denote the constant value. ($\partial\pi_{i,t-1}$) represent the lag variable which shows lag profitability of one period. X denotes the endogenous variables. X^j denotes the bank specific variables. X^l represents the industry specific variables. X^m denotes the macroeconomic variables. X^b denotes the bank (dummy) variables; 3 dummy variables are Islamic Banks (ISBs) and Commercial Banks (CBs), Specialized Govt. Institution (SGI) represented by ISBs, CBs and SGIs respectively. ∂ denotes the speed the adjustment which leads to equilibrium and its range value 0 to 1; higher value indicate less competitive market and also indicate slower adjustment; lower value denotes more competitive and also denotes higher speed adjustment. β_j , β_l and β_m are coefficients to be estimated. The error term is represented by ε .

4. Empirical Results

This segment consists of three section; section 4.1 Position of cost efficiency in the banking sectors; section 4.2 Situation of competitive conditions in the MENA banking industry; finally, section 4.3The influences of risk, cost efficiency and competition on bank profitability.

4.1 Position of Cost Efficiency in the Banking Sectors

This section (table 4) shows the result about cost efficiency concern to ownership structure over the period 2011 to 2017. Islamic banks shows the highest cost efficiency with regard to Commercial banks as well as Specialized Government Institution; whereas, Specialized Government Institution shows the lowest cost efficiency. The outcomes display 0.352743, 1.413965 and 1.571398 chronically Specialized Government Institution, commercial banks

and Islamic banks on examined time period. The result shows the different outcomes through equal inputs price. Specialized Government Institutions show the better cost efficiency among the banks. The results also inform about wastage 10.56%, 42.35% and 47.07% of their costs concern to the best price banks chronically Specialized Government Institution, commercial banks and Islamic banks. This result is contrast with the findings of Tan ^[38].

Table 4. Situation of Cost Efficiency in the MENA Banking sector (2011-2017)

v	2011	2012	2013	2014	2015	2016	2017	Ave	Per
ISB	0.4614	0.8811	0.6592	1.624	2.1701	3.2642	1.9385	1.5713	0.4707
CB	0.4771	1.8708	1.4965	1.3169	1.7026	1.6066	1.4269	1.4139	0.4235
SGI	0.0170	1.1438	0.0979	0.9011	0.1636	0.064	0.0808	0.3527	0.1056

Here, ISB= Islamic banks, CB= Commercial banks and SGI= Specialized Government Institutions; Ave= Average; Per =Percentage; V= banks.

4.2 Situation of Competitive Conditions in the MENA Banking Industry

This part (figure 1 and 2) shows the overall banking competitive condition in MENA region. Figure 1 explains the competition through Lerner index. The result shows that Specialized Govt. institutions and commercial banks take the highest market power over the period 2012 to 2016 but suddenly decline Specialized Govt. institutions 2016 to 2017 but Commercial banks keep their persistency; but both banks are slightly decline level from the period 2012 except 2015-2016 Specialized Govt. institutions. On the other hand, Islamic banks show the difference result from the others. The market power of its (Islamic banks) gradually increases from the beginning period till now. In figure 2 shows the overall assets of the largest three banks. The result shows that from the beginning to 2012 rapidly increase and 2012-2014 gradually increase but gradually decline from the 2014 to till now.

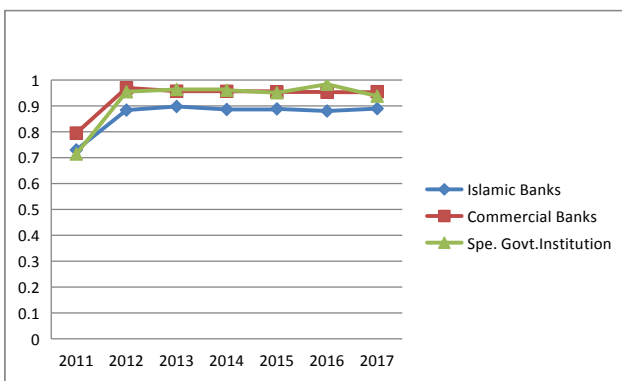


Figure 1. Competitive condition measured by Lerner index

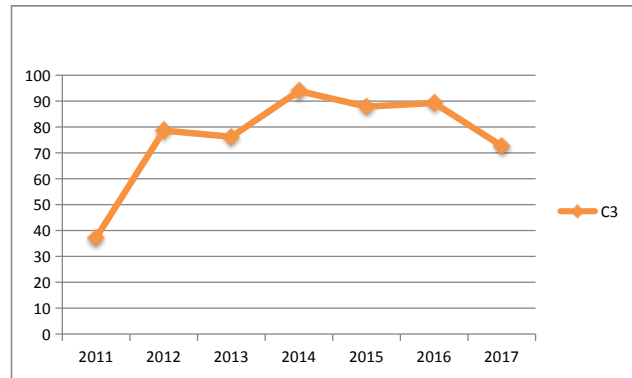


Figure 2. Competitive condition measured by C3

4.3 The Influences of Risk, Cost Efficiency and Competition on Bank Profitability

In table 5 represents the factors of bank profitability with an emphasis on the influences of Risk and Cost Efficiency. In table 6 focuses on the effects of risk and competition on bank profitability. Finally, in table 7 shows cost efficiency as well as C3 to test the effects of risk, cost efficiency and competition on bank profitability. Several profitability indicators are significant at the 1%, 5%, 10% level by The Hessian tests. This specifies the explanatory power of the model is high.

From the tables 5 and 6 results expression that credit-risk is insignificantly & positively concern to bank profitability whereas 2 profitability indicators ROA & ROE use ^[35-36], but credit-risk is positively and significantly concern to bank profitability when profitability indicator NIM is used. Our outcomes are difference with the findings of Tan ^[38]. We are used different econometric techniques in table 7 for this difference results. We further describe the insignificant positive effect of credit - risk on bank profitability when profitability indicators ROA & ROE are used but credit - risk is positively and significantly concern to bank profitability when profitability indicator NIM is used. This result suggests that larger volumes of credit- loan commit to higher bank profitability through large-scale of non-performing loans/impaired loans rises the banking cost & also precedes a decline in bank profitability. Actually, there has no impact between credit- risk & profitability whereas 2 profitability indicators ROA and ROE are used except NIM.

The results from in tables 5 and 6 display the liquidity- risk has insignificantly & negatively concern to bank profitability whereas 2 profitability indicators ROA and ROE are used but liquidity- risk is positively & significantly concern to bank profitability when profitability indicator NIM is used. The results are in contrast with Tan ^[38]. We are used different econometric techniques in table

7 for this difference results. We further describe the insignificant positive effect of liquidity- risk on bank profitability when profitability indicators ROA & ROE are used but liquidity- risk is positively & significantly concern to bank profitability when profitability indicator NIM is used. The result (NIM) clarifies that larger volumes of loans commit to increase bank income & also expand profitability of banks. However, higher liquidity- risk which leads to decline in ROA & ROE. The negative influence of liquidity- risk on bank, ROE results are similar to [8]. Unfortunately, actually there has no significant relation between liquidity- risk & profitability of banks in MENA countries.

With regard to in table 5 and Table 6, Capital- risk is revealed to be significantly & positively concern to bank profitability when profitability indicator ROA is used, and significant negative concern to bank profitability whereas profitability indicator ROE is used, and insignificant negative concern to bank profitability when profitability indicator NIM is used. Our results are dissimilarity with the outcomes of Tan [38]; When profitability indicator ROA, ROE and NIM are used. We are used different econometric techniques in table 7 for this difference results. We further describe the significant & positive concern to bank profitability when profitability indicator ROA is used; and significant negative concern to bank profitability whereas profitability indicator ROE is used, and insignificant negative concern to bank profitability whereas profitability indicator NIM is used. For The sake of ROE & NIM of MENA banks, the negative effect can be elucidated by the ways (1) for the larger levels of capital, the funding cost may be declined of the banks (2) higher capital level may be encourage for lending or engage in prudent lending which lead to higher profitability of banks, (3) for collecting higher volume capital, banks need emphasis on own capital & reduce external loans. As a result, the dropping the volume of borrowing increases the bank profitability. We also find out that have a significant and positive effect of capital - risk on ROA; that refers lower levels of capital- risk (higher levels of capital) which lead to a lower ROA. The result states that higher volume of capital reduce the risk on assets & lower the equilibrium expected return on assets required by stakeholders.

In table 5 and in table 6 display that insolvency- risk is insignificant and positive concern to bank profitability when profitability indicator ROA is used and insolvency risk significant & positive related to bank profitability when profitability indicators ROE & NIM are used. Our outcomes are in contrast with the outcomes of Tan [38]. We are used different econometric techniques in table 7 for this difference results. We further describe the insignificant positive effect of insolvency - risk on bank

profitability when profitability indicators ROA is used but insolvency risk is significant & negative concern to bank profitability when profitability indicator NIM is used. The result (ROA) shows that the effect of insolvency- risk on ROA is insignificant & positive, higher level of insolvency- risk lead to higher ROA and CAP (E/TA) which lead to higher banks profitability. Actually, there has no significant relationship between insolvency- risk & profitability when Profitability indicator ROA is used. On the contrary, the effect of insolvency- risk on ROE & NIM is significant but negative which indicate greater level of insolvency- risk which leads to a lower profitability of banks in MENA.

From table 5, in table 6 and in the table 7 shows that bank size is positive & significant concern to the bank profitability when profitability indicator ROE and NIM are used. The positive effect of bank size on bank profitability may be expounded; larger banks can reduce costs through economies of scale. As a result the, reduce the cost which leads to increase bank profitability. It's also revealed that bank- size has significant & negative concern to ROA. It may be clarified by the results that larger banks have greater ability to emphasis on non-interest generating businesses. By deducing the volumes of interest-generating activities reduces ROA which lead to lower profitability of banks.

With respect to bank-specific determinants of bank profitability, both in table 5, in table 6 and in the table 7 display the bank diversification has significant & positive concern to the bank profitability when profitability indicator ROA Tan [38] and ROE are used and negative & significant concern to the bank profitability when profitability indicator NIM Tan [38] are used. This outcome can be elucidated by the fact that bank- diversification decreases banks costs through economies of scope. By reducing bank costs which leads to a progress in bank profitability. That's why; larger volume of funds is invested by banks in engaging in other non-traditional activities due to the negative effect of diversification on NIM. By reducing the volume of funds for traditional loan-deposit services decreases bank income & further declines bank profitability.

The results from in tables 5 and in table 6 show that cost - efficiency has positive and significantly concern to bank profitability whereas 2 profitability dimensions ROA & NIM are used but significant & negatively concern to bank profitability when profitability indicator ROE is used. Our outcomes are in dissimilarity the outcomes of Tan [38]. We are used different econometric techniques in table 7 for this difference results. We further describe the cost- efficiency has positive and significant concern to bank profitability whereas 2 profitability dimensions ROA

and NIM are used but significant & negative concern to bank profitability when profitability indicator ROE is used. The result (ROA, NIM) shows the effect of higher cost- efficiency which lead to higher ROA and NIM which leads to lower cost and ultimately lead to higher banks profitability in MENA countries. On the contrary, the effect of cost -efficiency on ROE is significant but negative which indicate greater level of cost- efficiency lead to a lower profitability of banks. However, in the table 6 Lerner index shows that Lerner index is significantly & negatively concern to bank profitability when profitability indicator ROA is used & significantly & positively concern to bank profitability when profitability indicator ROE is used and insignificant & positive concern to bank profitability when profitability indicator NIM is used. Our outcomes are difference with the outcomes of Tan^[38]. We are used different econometric techniques in table 7 for

this difference results. We describe the C3 has significant and negatively concern to bank profitability when profitability indicators ROA is used (same result in table 6) but positively and significantly concern to bank profitability when profitability indicator NIM is used. Unfortunately, insignificantly & positively concern to bank profitability whereas profitability indicator ROE is used. The result (Lerner, C3) based on ROA and NIM implies that MENA banks with higher levels of market power which indicate lower level of profitability. on the other hand, lower level of competition which lead to higher profitability. The result is in similar with Tan^[38].

Both in table 5 and in table 6 display that banking - sector development have negative & significant effect on bank profitability when profitability dimensions ROA & NIM are used and insignificant & negative concern to bank profitability when profitability indicator ROE is

Table 5. The effects of risk-taking behavior and competition on bank profitability (cost efficiency only)

Variable	ROA		ROE		NIM	
	Coefficient	z-Statistic	Coefficient	z-Statistic	Coefficient	z-Statistic
(t-1) of dependent variable	4.91E-14***	8.764079	-7.64E-16**	-2.10777	1.07E-15	1.053382
Bank characteristics						
CREDIT_RISK	0.000378	0.084543	0.099462	1.499877	0.037159**	2.139123
LIQUIDITY_RISK	-0.00191	-0.69549	-0.05267	-1.2969	0.0167	1.569894
CAPITAL_RISK	0.007019***	4.532239	-0.03924*	-1.70855	-0.00844	-1.40366
INSOLVENCY_RISK	1.31E-05	0.888613	-0.00069***	-3.15821	-0.00038***	-6.70286
BANK_SIZE	-0.00134***	-4.53389	0.020269***	4.613805	0.002938**	2.553124
BANK_DIVERSIFICATION	0.004122**	2.489947	0.139463***	5.680143	-0.02463***	-3.82915
COST_EFFICIENCY	0.030707***	4.086762	-0.25236**	-2.26483	0.078352***	2.684325
Industry characteristics						
BANKING_SECTOR_DEVELOPMENT	-5.40157***	-2.14615	-41.8072	-1.12011	-27.9607***	-2.85974
STOCK_MARKET_DEVELOPMENT	7.09E-07***	3.371414	-3.03E-06	-0.97172	-2.24E-06***	-2.73689
Macroeconomics						
GGDP	0.000159**	1.945267	-0.0005	-0.41742	0.000523**	1.825963
INFLATION	0.000123*	1.601829	0.005306***	4.710341	0.003987***	14.83581
ISLAMIC_BANK	-0.00057	-0.27006	0.031138	1.002291	-0.01583**	-1.94497
COMMERCIAL_BANK	-0.0001	-0.05093	0.024321	0.802952	-0.02589***	-3.26323
SIG	0.000384	0.183527	-0.03731	-1.21251	0.010984	1.496174
C	0.032447***	6.310499	-0.21581***	-2.83031	0.063094***	3.158779
Deviance statistic	0.000139		0.030633		0.002102	
LR statistic	122.8912		86.42212		132.0293	
Pearson SSR	0.133304		29.31617		2.011702	
Dispersion	0.000139		0.030633		0.002102	
Prob(LR statistic)	0		0		0	
Pearson statistic	0.000139		0.030633		0.002102	
Probability	.000		0.0235		0.0073	
No. of observations	969		969		969	

Note: Table shows the GLM estimation results. Where return on assets (EOA), return on equity (ROE) and non-interest margin (NIM) are the endogenous variables for bank i and year t. The ROA(-1), ROE(-1) and NIM(-1) are lagged dependent variables. Bank specific variables are credit risk, liquidity risk, capital risk, insolvency risk (the return on assets (ROA) plus equity divided total assets (E/TA) divided by the standard deviation of return on assets ratio σ (ROA) defined as Z-score, bank size, bank diversification and cost efficiency are main endogenous variables. Industry specific variables are banking sector development, stock market development also endogenous variables. Macro-economic variables are growth of gross domestic product (GGDP) and inflation. Dummy variables are Islamic banks. Commercial banks and Specialized government institutions. *Significance at 10 percent; ** 5 percent; and *** 1 percent level.

used. Our results are dissimilarity with the results of Tan^[38]. We are used different econometric techniques in table 7 for this difference results. We further describe the banking -sector development have negative & significant effect on bank profitability whereas profitability indicators ROA & NIM are used and insignificant & negative concern to bank profitability whereas profitability indicator ROE is used. The effect of banking - sector development on ROA and NIM are negative but significant which indicate greater level of banking - sector development which increase the cost lead to a lower profitability of banks in MENA countries. The outcome is similar with^[6]. In table 5, 6 and 7 show that stock -market development has a significant and positive effect on ROA Tan^[38] of MENA banks which signposts the volume of non-interest business, increase significantly in a highly development stock market & that the income from these non-interest creating businesses contributes more than interest income to the overall in-

come of MENA banks. On the other hand, stock -market development is a insignificantly and positively effect on ROE but significant negatively effect on NIM of MENA banks which lead to higher stock- market development increase the cost which lead to lower profitability of banks in MENA region.

In table 5, 6 and 7 results indicate that in highly inflation environment MENA banks take the higher profitability. The finding explains that inflation work well in this place and can to adjust in interest rate which increases the revenue & further increase bank profitability. During the time of economic boom in MENA resign, those banks can to achieve higher profitability (ROA*, ROE***, NIM***). We can also explain that the credit condition of banks is better during periods of economic boom. By reducing the volume of non-performing loans, banks can increase profitability. Howsoever, the result states that MENA banks take lower ROA during periods of economic boom. GDP

Table 6. The effects of risk-taking behavior and competition on bank profitability (Lerner index only)

Variable	ROA		ROE		NIM	
	Coefficient	z-Statistic	Coefficient	z-Statistic	Coefficient	z-Statistic
(t-1) of dependent variable	5.65E-14***	10.49831	-1.02E-15***	-2.975579	1.85E-15**	1.901358
Bank characteristics						
CREDIT_RISK	-0.00034	-0.07507	0.114205*	1.717316	0.036894**	2.108439
LIQUIDITY_RISK	-0.00337	-1.23264	-0.04306	-1.07184	0.01255	1.187277
CAPITAL_RISK	0.006858***	4.39662	-0.0397*	-1.72975	-0.00917	-1.51846
INSOLVENCY_RISK	8.47E-06	0.570571	-0.00064***	-2.94466	-0.00039***	-6.86434
BANK_SIZE	-0.00149***	-5.04837	0.020765***	4.77178	0.002426**	2.118292
BANK_DIVERSIFICATION	0.005909***	3.703671	0.131512***	5.601664	-0.01888***	-3.05576
Industry characteristics						
LERNER	-0.00613*	-1.73703	0.132363**	2.550796	-0.00112	-0.08172
BANKING_SECTOR_DEVELOPME	-4.97287**	-1.96327	-42.2993	-1.1349	-26.3304***	-2.68482
STOCK_MARKET_DEVELOPMENT	7.26E-07***	3.426835	-3.32E-06	-1.06329	-2.22E-06***	-2.70361
Macroeconomics						
GGDP	0.000153*	1.860968	-0.00033	-0.27645	0.000526*	1.826763
INFLATION	0.000136*	1.761424	0.005157***	4.579877	0.004011***	14.88552
ISLAMIC_BANK	-0.00215	-1.02175	0.050381*	1.623999	-0.01879**	-2.3014
COMMERCIAL_BANK	-0.0016	-0.78706	0.037903	1.269613	-0.02947***	-3.75142
SGI	0.001911	0.907283	-0.05662*	-1.84102	0.013548*	1.840607
C	0.042451***	7.215811	-0.36844***	-4.25611	0.076161***	3.343625
Deviance statistic	0.000141		0.03059		0.002118	
LR statistic	107.7145		87.9156		123.8985	
Pearson SSR	0.135204		29.27427		2.026835	
Dispersion	0.000141		0.03059		0.002118	
Prob(LR statistic)	0		0		0	
Pearson statistic	0.000141		0.03059		0.002118	
probability	0.0824		0.0107		0.9349	
No. of observations	969		969		969	

Note: Table shows the GLM estimation results. Where return on assets (EOA), return on equity (ROE) and non –interest margin (NIM) are the endogenous variables for bank i and year t. The ROA (- 1), ROE (-1) and NIM (-1) are lagged dependent variables. Bank specific variable are credit- risk, liquidity- risk, capital- risk, insolvency- risk (the return on assets (ROA) plus equity divided total assets(E/TA) divided by the standard deviation of return on assets ratio σ (ROA) defined as Z-score), bank size, bank diversification and are main endogenous variables. Industry specific variables are Lerner index, banking sector development, stock market development also endogenous variables. Macro-economic variables are growth of gross domestic product (GGDP) and inflation. Dummy variables are Islamic banks. Commercial banks and Specialized government institutions. *Significance at 10 percent; ** 5 percent; and *** 1 percent level.

has positive growth on NIM which focuses on traditional interest -generating activities, which explains the non-interest generating business contributes more to the overall profitability of MENA banks. On the other hand, the time of economic boom, MENA banks emphasis on more effort & allocate extra resources to engage in traditional interest generating activities. However, ROA reduce, when the reduce volume of non-interest generating businesses. Whereas competition is examined by the Lerner index & C3 ratio, the result shows in one case (ROA) is same on banks profitability. This result suggests that the Lerner (ROA) and C3 (ROA) ratio are negative & significantly which representing lower competition leads to higher banks profitability. Unfortunately, We are found other two profitability indicators one case significant (ROE**; NIM***) and one case insignificant (ROE, NIM).

5. Conclusion and Policy Making

This study examines the elements of bank profitability in MENA with a focus on the effects of risk, cost-efficiency, & competition (Lerner, C3) on bank profitability. We use a sample of MENA (634 Commercial banks, 298 Islamic banks and 37 specialized govt. Institution) over the period 2011 to 2017. This paper try to keep contributes to the empirical literature by the follows: (1) it observes in the different kinds of risk, (2) usages more accurate measures of efficiency (Stochastic Frontier approach- SFA) and competition (Lerner index & C3). However, it affords more sturdy results with respect to the effects of cost efficiency & competition on bank profitability compared to Tan^[38]. We find out that MENA banks have greater profitability in a lower competitive environment and various

Table 7. The effects of risk-taking behavior and competition on bank profitability (Cost efficiency & C3)

Variable (t-1) of dependent variable	ROA		ROE		NIM	
	Coefficient	z-Statistic	Coefficient	z-Statistic	Coefficient	z-Statistic
	2.58E-14***	10.25515	-6.53E-16***	-2.259967	-1.39E-15***	-3.195399
Bank characteristics						
CREDIT_RISK	0.000459	0.103105	0.09917	1.495042	0.036906**	2.129436
LIQUIDITY_RISK	-0.00089	-0.32244	-0.05633	-1.37558	0.013528	1.264322
CAPITAL_RISK	0.006562***	4.23201	-0.03759*	-1.62808	-0.00702	-1.16374
INSOLVENCY_RISK	1.24E-05	0.841322	-0.00069***	-3.14465	-0.00038***	-6.67683
BANK_SIZE	-0.00147***	-4.93096	0.02073***	4.666057	0.003337***	2.874778
BANK_DIVERSIFICATION	0.004174**	2.530553	0.139278***	5.67082	-0.02479***	-3.86266
COST_EFFICIENCY	0.029565***	3.944739	-0.24825**	-2.22428	0.081911***	2.808898
Industry characteristics						
C3	-0.01204***	-2.91252	0.043382	0.704555	0.037532***	2.332918
BANKING_SECTOR_DEVELOPME	-5.79976**	-2.30992	-40.3728	-1.07979	-26.7197***	-2.73509
STOCK_MARKET_DEVELOPMENT	6.97E-07***	3.327717	-2.99E-06	-0.95768	-2.20E-06***	-2.69769
Macroeconomics						
GGDP	0.000167**	2.046753	-0.00053	-0.44252	0.000498*	1.743355
INFLATION	0.000119	1.565039	0.005319***	4.720509	0.003998***	14.92531
ISLAMIC_BANK	-0.00026	-0.12616	0.03005	0.965806	-0.01677**	-2.06292
COMMERCIAL_BANK	-0.00035	-0.17037	0.025196	0.830921	-0.02514***	-3.17251
SGI	7.95E-05	0.038126	-0.0361	-1.17162	0.011978*	1.635163
C	0.041023***	6.943778	-0.24671***	-2.80419	0.036363	1.581888
Deviance statistic	0.000138		0.03065		0.002092	
LR statistic	132.3349		86.87304		138.0847	
Pearson SSR	0.132131		29.30096		2.000315	
Dispersion	0.000138		0.03065		0.002092	
Prob(LR statistic)	0		0		0	
Pearson statistic	0.000138		0.03065		0.002092	
Probability	0.0001 0.0036		0.0261 0.4811		0.005 0.0197	
No. of observations	969		969		969	

Note: Table shows the GLM estimation results. Where return on assets (EOA), return on equity (ROE) and non –interest margin (NIM) are the endogenous variables for bank i and year t. The ROA(- 1),ROE (-1) and NIM (-1) are lagged dependent variables. Bank specific variable are credit risk, liquidity risk, capital risk, insolvency risk (the return on assets (ROA) plus equity divided total assets(E/TA) divided by the standard deviation of return on assets ratio σ (ROA) defined as Z-score, bank size, bank diversification and cost efficiency are main endogenous variables. Industry specific variables are C3, banking sector development, stock market development also endogenous variables. Macro-economic variables are growth of gross domestic product (GGDP) and inflation. Dummy variables are Islamic banks. Commercial banks and Specialized government institutions. *Significance at 10 percent; ** 5 percent; and *** 1 percent level.

natures of risk like as credit- risk, liquidity- risk, capital-risk, & insolvency- risk are related significant to bank profitability in MENA countries. This paper offers several policy implications not only the MENA government but also the banking- regulatory authorities: (1) MENA banks would also improve the process of managing and monitoring the loan business through reducing the level of credit risk which leads to higher profitability (2) MENA banks should decrease higher level of banking sector development. (3) MENA banks should commit to full use of available funds to engage in various types of businesses; if there is an issue of insolvency, strong governmental support will give protection to MENA banks.

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