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DOES MONOPOLISTIC COMPETITION EXIST IN THE MENA REGION? EVIDENCE FROM THE BANKING SECTOR

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ABSTRACT

The goal of this paper is to empirically assess the level of banking competition in selected Middle East and Northern African (MENA) countries. The analysis employs the estimation of a non-structural indicator (H-statistic) introduced by Panzar and Rosse and draws upon a panel dataset of eight MENA countries (Algeria, Egypt, Israel, Jordan, Morocco, Oman, Saudi Arabia, and United Arab Emirates) over the period 1997–2012. The empirical findings are robust towards three different panel data econometric techniques (Ordinary Least Squares, Pooled Generalized Least Squares with Fixed Effects, and Generalized Method of Moments) and consistent with other similar studies, providing sufficient evidence in favour of a banking monopolistic competition regime. Furthermore, the estimation of three other alternative measures of competition (Lerner index, adjusted Lerner index, and conduct parameter) provides similar results, revealing that the banking sector in the MENA region is characterized by a low level of Significant Market Power (SMP). Overall, the analysis shows that, despite similarities in the process of financial regulatory reforms undertaken in the eight MENA countries, the observed competition levels of banks vary substantially, with Algeria and Morocco consistently outperforming the rest of the region.

Keywords: Banking sector, MENA region, Monopolistic competition, Panel data, Panzar-Rosse index

JEL classification numbers: C23, G21, L10

I. INTRODUCTION

The banking sector is exposed to instability and risk in the banks' balance sheets, in terms of both assets and liabilities. Due to the high leverage levels and the lack of transparency of assets, banks are more prone than other corporate institutions to take excessive risk in their investments. Such risk may be further exacerbated when banks operate in a competitive environment as this may increase the probability of bailouts and the risk of contagion in the case that individual financial institutions fail.

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Over the last decades, two non-structural models of competitive behaviour have been developed within the emerging New Empirical Industrial Organization (NEIO) framework. These models, which measure competition and focus on the detailed competitive conduct of firms, without using explicit information about the structure of the market, are attributed to Bresnahan (1982), and Panzar and Rosse (1987). Both of these models measure competition by estimating deviations from competitive pricing and can be formally derived from profit maximizing equilibrium conditions, which is their main advantage compared against structural measures (Bikker *et al*., 2012). In addition, these measures of competition are classified as non-structural, as they are based on the assumption that factors other than market structure and concentration might affect the competitive behaviour of firms. The most widely used in the empirical banking literature Panzar–Rosse model builds a competition indicator, the so-called H-statistic, which provides a quantitative assessment of the competitive nature of a market. The H-statistic is calculated by means of reduced-form revenue equations and measures the elasticity of total revenues with respect to changes in factor input prices (Rosse and Panzar, 1977). Furthermore, Shaffer (1982) shows that H is negative for a conjectural variations' oligopolistic market or for a short-run competitive market; it is equal to 1 for a natural monopoly in a contestable market; or it is equal to zero for a firm that maximizes sales subject to a breakeven constraint. Owing to its relative simplicity, the Panzar and Rosse methodology has been extensively applied to the banking sector, in both regional and single-country studies (e.g., Molyneux *et al*., 1994; De Bandt and Davis, 2000; Bikker and Haaf, 2002; Claessens and Laeven, 2004).

However, the H-statistic does not provide a monotonic index of the degree of market power, and no reliable conclusion can be drawn from a ranking of H-values across countries or years (Shaffer, 2004a, 2004b; Bikker *et al*., 2012). More specifically, there are conditions under which smaller (or more negative) values of H correspond to stronger competition, not weaker competition. Shaffer (1983a) shows that the Lerner index is an increasing function of the Panzar–Rosse statistic when the number of firms is fixed, so higher values of H correspond to more severe market power (lower competition) as measured by the Lerner index. Similarly, Shaffer (1983b) shows that H is an increasing function of the Bresnahan conduct parameter when the number of firms is fixed, again indicating that higher H is associated with more severe market power (lower competition).

Based on the above considerations and in order to strengthen our empirical findings, we have employed three alternative measures of market power: the Lerner index, the adjusted Lerner index; and finally the conduct parameter (θ) evaluated in Genesove and Mullin (1998). These indicators provide more reliable conclusions addressing our research question regarding the degree of competition in the MENA region banking sector.

The contribution of this paper is twofold. First, it goes beyond the existing literature in that it uses the most recent dataset to assess the level of competition in the MENA banking sector, to which rather scant attention has been paid in the past. Second, in order to test the robustness of the empirical findings, it combines three different econometric techniques – Ordinary Least Squares (OLS), Generalized Least Squares with Fixed Effects (PGLS_FE), and Generalized Method of Moments (GMM) – to an unscaled price and revenue equation. Moreover, it combines these results with the estimations obtained by the use of the three other non-structural indicators.

The remainder of this paper is structured as follows. Section II reviews the literature, while Section III focuses on the description of the banking industry in the MENA region. Section IV presents the data and the methodologies applied and Section V illustrates and evaluates the results of the empirical analysis. Section VI presents three alternative measures of market power to test for the robustness of our model. Finally, Section VII concludes the paper together with some policy implications.

II. REVIEW OF THE LITERATURE

A number of empirical studies have investigated the competitive conditions in various banking systems by applying the Panzar–Rosse H-index (Table 1). The majority of these studies conclude that banks operate in a monopolistic competitive environment (Shaffer, 2002; Claessens and Laeven, 2004; Beck *et al*., 2006; Gutierrez, 2007; Polemis, 2014), while European banks seem to be less competitive than US banks, with larger banks being more competitive than smaller banks (Gutierrez, 2007).

Furthermore, a number of studies find differences in the level of competition among banks operating in different countries. De Bandt and Davis (2000) reveal a monopolistic behaviour of the small banks in France and Germany, while they find that monopolistic competition prevails both in the case of small banks in Italy and in the case if large banks in all three countries in their sample. This suggests that in these countries small banks have more market power, perhaps because they cater more to local markets.

Another important study is attributed to Claessens and Laeven (2004). The authors compute the H-statistic for 50 developed and developing countries in the period 1994–2001. According to their results, monopolistic competition describes best the markets under consideration. Subsequently, they draw attention on the factors underlying competition by means of regression of the estimated H-statistics on a number of country-specific characteristics; these refer to the presence of foreign banks, activity restrictions, market entry conditions, market structure, competition from non-banking sectors, general macroeconomic conditions, and the overall development level of the country. The researchers do not reveal any direct relationship between competition and concentration, but they find that fewer entry and activity constraints, that is, higher contestability, result in higher competition.

Staikouras and Koutsomanoli-Fillipaki (2006) carry out the first multi-country analysis for the EU, following the enlargement to 25 member countries, spanning the period 1998 to 2002. They find evidence of monopolistic competition, with larger banks behaving more competitively than smaller ones and with new members showing higher levels of competition than older ones.

Though there is an extensive literature using non-structural measures to assess competition in many developed and in some developing countries, there are limited studies that conduct this kind of analysis for the MENA region. Murjan and Ruza (2002) investigate the degree of competition during the period 1993–97 in nine MENA countries. They argue that MENA banking sectors operate under monopolistic competition and Gulf Cooperation Council (GCC) economies tend to be less competitive than non-oil producing countries. Al-Muharrami *et al*. (2006) and Turk-Ariss (2009) also conclude that the banking sectors in these economies operate under monopolistic competition.

In a more recent paper, Anzoategui *et al*. (2010) study the extent of bank competition in the Middle East and Northern Africa region during 1994–2008, using the H-statistic and the Lerner index. Both these measures suggest that banking sector competition in the region is lower relative to other regions and has not improved in recent years. Furthermore, they argue that indicators of market contestability and activity restrictions are important factors in determining the degree of competition across countries in the region.

Overall, the majority of the empirical studies seem to provide strong evidence supporting the hypothesis that monopolistic competition is the prevailing environment across the MENA region. In fact, monopolistic competition is quite a recurrent finding due to the wide range of values the H-statistic can take within this scenario (between zero and one). This context enhances the importance of certain methodological issues concerning the empirical implementation of the Panzar and Rosse (1987) approach, such as data, estimation techniques, and sample period under consideration.

TABLE 1
Main empirical studies

Author	*Time period*	*Model*	*Countries*	*Main findings*
Bikker and Groeneveld (2000)	1989–1996	Scaled revenue equations	5 EU countries	Monopolistic competition in all of the countries.
De Bandt and Davis (2000)	1992–1996	Scaled revenue equations	Germany, France, and Italy	Monopolistic competition for large banks in all of the countries. Monopolistic behaviour for small banks in France and Germany. Monopolistic competition for small banks in Italy.
Bikker and Haaf (2002)	1988–1998	Scaled price and revenue equations	23 countries	Perfect competition for the large banks. Monopolistic competition for the small and medium size banks.
Claessens and Laeven (2004)	1994–2001	Scaled price and revenue equations	50 countries	Monopolistic competition in all of the examined countries.
Weill (2004)	1994–1999	Scaled revenue equations	5 EU countries	Monopolistic competition in all of the examined countries.
Mamatzakis *et al*. (2005)	1998–2002	Scaled revenue equations	Bulgaria, Croatia, and FYROM	Monopolistic competition.
Staikouras and Koutsomanoli-Fillipaki (2006)	1998–2002	Scaled revenue equations	EU-15	Monopolistic competition in the EU-15 (H index = 0.54).
			EU-10 (enlargement countries)	Monopolistic competition in the EU-10 (H index = 0.78).

Continued

TABLE 1
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Author	*Time period*	*Model*	*Countries*	*Main findings*
Casu and Girardone (2006)	1997–2003	Scaled revenue equations	5 EU countries	Monopolistic competition in all of the examined countries.
Gutierrez (2007)	1986–2005	Scaled revenue equation	Spain	Monopolistic competition. More competitive environment among larger banks.
Sun (2011)	1995–2009	Scaled price equation	EMU, USA, and UK	Monopolistic competition in all of the examined countries and regions.
Bikker *et al*. (2012).	1986–2004	Scaled and unscaled price and revenue equations	67 countries	Monopolistic competition in 40 countries
Polemis (2014)	1996–2011	Unscaled price and revenue equations	EMU countries	Monopolistic competition in the EMU.

Source: Author's elaboration.

III. BANKING SECTOR IN THE MENA REGION

Banking sectors in the MENA region have many similarities, but are also quite different from each other. Specifically, within the region there are large differences among countries, in terms of population density per capita GDP, and financial development (Naceur *et al*., 2011). Table 2 depicts selected banking sector indicators for each country in the MENA region. It is evident that there is a wide cross-country variation, with Tunisia displaying values below the MENA region average and Jordan displaying values higher than those of OECD countries. However, differences between the MENA countries and high income OECD countries are substantial.

Specifically, overhead costs as a share of total assets are in the region of 2 percent, in line with OECD countries. Similarly, the net interest margin is on average 3 percent, thus indicating that the cost of financial intermediation is lower than that observed in OECD and other lower middle income countries. When it comes to the cost to income ratio, the averages for the MENA countries compare favourably, with an overall average of 49 percent. The Return on Assets (ROA) averages 1.3 percent for the MENA region. Substantial cross-country variations are found for the Return on Equity (ROE), with strong performance of banks in Qatar (18 percent) and negative ROE in State of Libya (–0.24 percent) in 2011. The concentration ratio of the three largest banks (CR-3) indicates relatively high concentration in Yemen (100 percent), State of Libya (98 percent), and Bahrain (89 percent).

Finally, the z-score computed as the ratio of return on assets plus capital-to-asset ratio to the standard deviation of the return on assets averages 25 percent for the MENA region – well above the OECD countries, indicating a stable banking system. Syria (9 percent) and Saudi Arabia (15 percent) display below average z-scores in 2011, while the values for Lebanon (50 percent), Jordan (45 percent), and Egypt (39 percent) are substantially higher than those in OECD countries, indicating a more stable banking system.

IV. DATA AND METHODOLOGY

IV.1 Sample selection

Our dataset is drawn from the Bankscope database. Primarily data are collected for a sample of 2.055 observations from a balanced panel of 137 banks operating in Algeria, Egypt, Jordan, Israel, Morocco, Oman, Saudi Arabia, and United Arab Emirates (UAE), over the period 1997 to 2012. The choice of countries is influenced by the availability of data on institutional factors and financial structure. Moreover, we limit our analysis to publicly traded commercial banks since the services they offer are reasonably homogeneous and comparable across countries, and they follow international accounting standards (Naceur *et al*., 2011). In addition, we use data from consolidated accounts, if available, and otherwise from unconsolidated accounts in order to avoid double-counting.

In a second stage, we delete countries with less than 50 bank-year observations since we need a reasonable number of bank-year observations for each country to estimate the H-statistics. Lastly, we delete countries with data for less than 20 banks since we need at least 20 observations per country to get reasonably accurate H-statistic estimates for each country.[1]

Summary statistics for the variables along with the cross-section dimension of the panel per country are provided in the Appendix (Table A1). From the relevant table, it is evident that the sample data are well behaved, showing limited variability in relation to the mean. On the other

[1] We therefore drop observations from Syrian Arab Republic and State of Libyan.

TABLE 2
Selected banking sector indicators (2011)

Countries	*Overhead costs/ total assets (%)*	*Net interest margin (%)*	*CR-3 (%)*	*ROA (%)*	*ROE (%)*	*Cost income ratio (%)*	*Z-score (%)*
Jordan	1.70	3.15	88.22	1.14	7.43	45.35	44.58
Israel	2.21	2.49	79.93	0.71	10.05	71.81	24.81
Syrian Arab Republic	1.44	2.53	75.45	0.45	3.87	45.17	8.54
Egypt	1.62	2.50	60.75	0.75	11.04	53.13	39.54
Lebanon	1.37	2.02	51.30	0.94	10.44	52.17	50.01
Algeria	1.18	2.24	75.50	1.63	16.26	37.76	21.49
Morocco	1.96	2.62	71.19	1.19	13.65	49.37	30.59
Saudi Arabia	1.38	2.84	55.33	1.99	14.55	37.33	14.68
United Arab Emirates	1.28	3.23	60.89	1.57	11.50	32.80	21.66
Oman	1.99	3.39	72.95	1.39	11.00	47.45	12.07
Tunisia	2.12	2.80	41.07	0.41	5.33	53.25	21.89
Libyan	0.16	0.03	98.24	−0.04	−0.24	110.10	31.09
Iraq	2.53	4.19	87.04	3.28	13.93	32.32	25.33
West Bank and Gaza	2.97	4.58		1.95	16.70	55.80	17.94
Yemen, Republic	2.06	4.20	100	1.34	11.62	40.86	30.01
Kuwait	1.16	3.07	88.95	1.48	10.17	30.65	19.10
Bahrain	1.10	2.14	89.06	1.16	9.86	37.56	17.57
Qatar	0.94	3.31	86.88	2.68	18.12	23.40	27.62
MENA region	*1.74*	*2.85*	*75.46*	*1.32*	*11.36*	*49.06*	*24.65*
High income OECD	4.03	4.97	71.56	1.48	14.96	56.44	15.47
Lower middle income economies	3.94	4.88	71.72	1.35	14.81	57.13	15.12

Source: World Bank Financial Structure Database.

hand, the variables are not normally distributed since the relative values of the skewness and kurtosis measures are not equal to zero and three, respectively.

IV.2 Empirical model

There is a striking dichotomy between the reduced form of the price/revenue relationship as estimated in the empirical literature. Some researchers estimate a price or a revenue function that does not include total banking assets as a control variable (Bikker *et al*., 2006, 2012; Polemis, 2014). Others estimate a price/revenue function in which the dependent variable is either the gross interest revenue or the total banking revenue divided by total assets (Bikker and Haaf, 2002; Claessens and Laeven, 2004; Mamatzakis *et al*., 2005; Yildirim and Philippatos, 2007). However, as shown by Bikker *et al*. (2006, 2012), the use of total assets in the two reduced form price and revenue equations, either as a denominator in the two dependent variables (interest and total income) or as an independent explanatory variable in order to account for size effects, has lead to a biased estimate of the H-statistic. For this reason, we estimate the following unscaled reduced-form equations.

$$\begin{aligned}\ln(II_{it}) = a &+ \beta_1 \ln(\mathrm{X}_{1,it}) + \beta_2 \ln(\mathrm{X}_{2,it}) + \beta_3 \ln(\mathrm{X}_{3,it}) \\ &+ \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln(Y_{2,it}) + \gamma_3 \ln(Y_{3,it}) + \varepsilon_{it}\end{aligned} \tag{1}$$

$$\begin{aligned}\ln(TI_{it}) = a &+ \beta_1 \ln(\mathrm{X}_{1,it}) + \beta_2 \ln(\mathrm{X}_{2,it}) + \beta_3 \ln(\mathrm{X}_{3,it}) \\ &+ \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln\left(Y_{2,it}\right) + \gamma_3 \ln\left(Y_{3,it}\right) + \varepsilon_{it}\end{aligned} \tag{2}$$

where α and ε_{it} are the constant and the error term, respectively.

The interpretation of the variables is as follows. II_{it} is the interest income and TI_{it} is the total income expressed as the sum of gross interest revenues plus other operating non-interest revenues. $X_{1,it}$ is the ratio of interest expenses to total deposits and money market funding as a proxy for the average funding rate, $X_{2,it}$ is the ratio of total non-interest expenses (including the personnel expenses) to total assets as an approximation of the wage rate, and $X_{3,it}$ is the ratio of other operating and administrative expenses to fixed assets as a proxy for the price of physical capital.

Moreover, $Y_{1,it}$ is the ratio of equity to total assets accounting for the leverage reflecting differences in the risk preferences across banking institutions (Bikker *et al*., 2012), $Y_{2,it}$ is the ratio of net loans to total assets as an approximation of the credit risk, and $Y_{3,it}$ represents fixed to total banking assets reflecting certain characteristics of the assets' composition. The sum of the three elasticities ($\mathrm{H} = \beta_1+\beta_2+\beta_3$) yields the H-statistic in equations (1) and (2).

V. EMPIRICAL FINDINGS

The econometric methodology adopted in this paper uses three different set of estimators. First, we assess the level of market power by using panel OLS methodology. However, there is a potential endogeneity issue regarding the use of the factor input prices (X_1, X_2, and X_3). Because of this, an OLS estimator would tend to underestimate the effect of these control variables on price and bank revenues (coefficient biased towards zero). In order to overcome this problem, we include the GLS fixed effects estimator that allows among other things the unobserved country-specific factors to be filtered out. Lastly, in order to check for the robustness of our findings, we re-estimate price and revenue equations by employing a GMM estimator that controls for the endogeneity. The latter can be a problem because, if unobserved variables jointly affect both the dependent and control variables, then the coefficient estimates for the independent variables may be biased (Hausman and Ros, 2013). For this reason, we utilize a GMM estimator developed by Hansen (1982). This estimator takes into account the unobserved time-invariant bilateral

specific effects, while it can deal with the potential endogeneity arising from the inclusion of several control variables.

Table 3 presents the estimation results generated from the price equation (equation (1)). From the relevant table it is evident that the coefficients are statistically significant, the signs are the expected ones, and the fit is surprisingly high. The H-statistic is less than one, implying that monopolistic competition is the appropriate market structure in each of the MENA countries. The H-statistic varies generally between 0.328 (Morocco) and 0.971 (Oman).

In the next step, we test whether $H = 0$ using a Wald test. If the null hypothesis cannot be rejected, a decrease in input prices decreases marginal costs but would not also reduce revenues. In this case, the market is usually characterized by monopoly behaviour (Carbo *et al*., 2009). In addition, we test whether $H = 1$. If the null hypothesis cannot be rejected, a decrease in input prices will reduce marginal costs and revenues by the same amount as a cost reduction, providing sufficient evidence for the absence of market power. From the Wald tests, we conclude that the null hypothesis cannot be accepted, pointing out that the banking sector in the MENA region is not characterized by perfect competition ($H \neq 1$) or monopoly ($H \neq 0$). However, it is worth emphasizing that values of the H-statistic between zero and unity cannot be reliably interpreted as corresponding to monopolistic competition, because it has been shown that similar values can also result from short-run competition, or from long-run competition in the case of constant returns to scale (Bikker *et al*., 2012).

The three methodologies (OLS, PGLS_FE, and GMM) provide us with very little variation in similar results, revealing the robustness of our findings.[2] These results indicate that while the banking sector in the MENA region is traditionally highly concentrated, with the sum of the three largest banks' market share (CR-3) equal to 75.46 (see Table 2), each country performs in a monopolistically competitive environment. These findings indicate that the highly concentrated banking sectors of MENA countries do not seem to lead to anti-competitive behaviour as suggested by the traditional Structure-Conduct-Performance paradigm, since the Wald test rejects the existence of collusive behaviour.

Regarding the magnitude of the relevant point elasticities, we infer that the coefficient of the average funding rate (X_1) is positive and statistically significant for all of the MENA countries. This indicates that the higher the interest expenses, relative to deposits and money market funding, paid by banks, the more the allocation of revenues. Although the sign and the level of significance for the rest of the input prices (X_2 and X_3) vary over the sampled countries, in most cases they appear to have a positive and statistically significant impact on price (interest income). The ratio of equity to total assets (Y_1), which reflects the leverage differences in the risk preferences across banking institutions, is positive and in some countries statistically significant under the three different methodologies. However, the relevant elasticity is negative and statically significant in Saudi Arabia and Oman.

The ratio of net loans to total assets (Y_2) capturing the level of credit risk is positive and statistically significant for most of the individual countries under the three different methodologies. It is noteworthy that it takes the highest values in Algeria and Jordan (0.242 and 0.238, respectively, on average), reflecting that a 10 percent increase (decrease) of the level of credit risk will have a nearly 2.4 percent increase (decrease) in the level of interest income. Moreover, the ratio of fixed to total assets (Y_3) is negative and only in selected cases is statistically significant (Israel, Jordan, Oman, and Saudi Arabia). Similar findings can be traced in previous empirical studies, confirming the existence of monopolistic competition in the MENA banking region (Murjan and Ruza, 2002; Al-Muharrami *et al*., 2006; Turk-Ariss, 2009; Anzoategui *et al*., 2010),

[2]It is noteworthy that according to the Hausman test, the null hypothesis (random effects) has been rejected in all countries, indicating that the fixed effects specification is the appropriate one. The estimations from the application of the random effects models are available from the author upon request.

TABLE 3
Empirical results for the MENA countries (price equation)

Control variables	*Algeria*	*Egypt*	*Israel*	*Jordan*	*Morocco*	*Oman*	*Saudi Arabia*	*UAE*
				OLS				
Intercept	-1.127^{***} (0.213)	-0.440^{***} (0.096)	-0.747^{***}(0.209)	-0.626^{***} (0.204)	-0.933^{***} (0.153)	0.625^{**} (0.255)	-1.701^{***} (0.170)	-0.047 (0.118)
X_1	0.317^{***} (0.028)	0.568^{***} (0.026)	0.394^{***} (0.020)	0.409^{***} (0.025)	0.275^{***} (0.039)	0.351^{***} (0.024)	0.349^{***} (0.013)	0.387^{***} (0.018)
X_2	0.004 (0.083)	0.125^{***} (0.032)	0.881^{***} (0.215)	0.377^{***} (0.125)	0.269^{***} (0.043)	0.778^{***} (0.108)	0.272^{***} (0.095)	0.236^{***} (0.040)
X_3	0.008 (0.075)	-0.044^{*} (0.026)	-0.614^{***} (0.185)	-0.163^{*} (0.097)	-0.105^{***} (0.030)	-0.158^{*} (0.085)	-0.126^{*} (0.080)	0.048^{*} (0.029)
Y_1	0.037 (0.035)	-0.008 (0.013)	0.214^{***} (0.046)	0.007 (0.035)	0.061^{**} (0.030)	0.007 (0.034)	-0.079^{**} (0.032)	0.163^{***} (0.031)
Y_2	0.355^{***} (0.050)	0.149^{***} (0.026)	0.129^{**} (0.062)	0.188^{***}(0.075)	-0.001 (0.032)	0.183 (0.131)	-0.125^{***} (0.045)	0.154^{***} (0.034)
Y_3	0.079 (0.083)	-0.003 (0.029)	-0.674^{***} (0.195)	-0.166^{*}(0.104)	-0.039 (0.039)	-0.186^{**} (0.088)	-0.182^{**} (0.080)	0.025 (0.030)
H-statistic	0.329 (0.062)	0.649 (0.084)	0.662 (0.140)	0.623 (0.082)	0.439 (0.037)	0.971 (0.072)	0.495 (0.062)	0.671 (0.087)
Observations	149	337	154	137	85	89	137	247
Adjusted R^2	0.66	0.80	0.82	0.77	0.82	0.83	0.88	0.75
Wald test $\{H_0 = 0\}$	47.58^{***}[0.00]	440.88^{***}[0.00]	107.76^{***}[0.00]	98.01^{***}[0.00]	38.27^{***}[0.00]	237.90^{***}[0.00]	136.98^{***}[0.00]	506.69^{***}[0.00]
Wald test $\{H_0 = 1\}$	197.56^{***}[0.00]	129.19^{***}[0.00]	129.19^{***}[0.00]	35.78^{***}[0.00]	62.47^{***}[0.00]	0.21[0.65]	142.52^{***}[0.00]	121.83^{***}[0.00]
				PGLS_FE				
Intercept	-0.938^{***} (0.529)	-0.538^{***} (0.125)	-1.430^{**} (0.780)	-1.165^{***} (0.144)	-0.620^{***} (0.197)	0.020 (0.264)	-0.435^{***} (0.081)	-0.108 (0.117)
X_1	0.383^{***} (0.063)	0.607^{***} (0.023)	0.422^{***} (0.039)	0.471^{***} (0.011)	0.288^{***} (0.043)	0.377^{***} (0.020)	0.345^{***} (0.010)	0.414^{***} (0.009)
X_2	0.146^{*} (0.097)	0.159^{***} (0.026)	0.575^{***} (0.183)	-0.063 (0.086)	0.359^{***} (0.084)	0.463^{***} (0.093)	0.543^{***} (0.055)	0.284^{*} (0.057)
X_3	-0.034 (0.089)	-0.106^{***} (0.018)	-0.464^{***} (0.165)	0.006 (0.062)	-0.225^{***} (0.052)	-0.034 (0.066)	-0.240^{***} (0.047)	-0.047^{*} (0.030)
Y_1	-0.002 (0.053)	0.021 (0.028)	-0.099 (0.088)	0.069^{***} (0.022)	0.027 (0.036)	-0.156^{***} (0.058)	0.086^{***} (0.018)	0.045^{***} (0.028)
Y_2	0.159^{**} (0.081)	0.100^{***} (0.017)	0.109 (0.103)	0.288^{***} (0.053)	0.061^{*} (0.037)	0.109 (0.132)	-0.065^{***} (0.023)	0.069^{**} (0.034)
Y_3	-0.014 (0.086)	-0.090^{***} (0.019)	-0.404^{**} (0.161)	-0.009 (0.064)	-0.034 (0.080)	-0.001 (0.072)	-0.227^{***} (0.046)	0.014 (0.029)
H-statistic	0.496 (0.083)	0.660 (0.067)	0.533 (0.129)	0.414 (0.158)	0.422 (0.060)	0.806 (0.060)	0.649 (0.038)	0.651 (0.096)
Observations	149	337	154	137	85	89	137	247
Adjusted R^2	0.80	0.99	0.93	0.93	0.93	0.91	0.97	0.93
Wald test $\{H_0 = 0\}$	30.36^{***}[0.00]	465.65^{***}[0.00]	10.17^{***}[0.00]	104.93^{***}[0.00]	27.98^{***}[0.00]	172.07^{***}[0.00]	966.99^{***}[0.00]	334.90^{***}[0.00]
Wald test $\{H_0 = 1\}$	31.45^{***}[0.00]	123.03^{***}[0.00]	7.80^{***}[0.00]	209.49^{***}[0.00]	52.55^{***}[0.00]	9.96^{***}[0.00]	283.98^{***}[0.00]	96.51^{***}[0.00]

Continued

TABLE 3
Continued

Control variables	*Algeria*	*Egypt*	*Israel*	*Jordan*	*Morocco*	*Oman*	*Saudi Arabia*	*UAE*
				GMM				
Intercept	−0.986** (0.454)	−0.466*** (0.148)	−0.436 (0.404)	0.027 (0.289)	−1.178*** (0.318)	0.289 (0.268)	−2.287*** (0.242)	−0.026 (0.154)
X_1	0.369*** (0.054)	0.500*** (0.045)	0.470 (0.083)	0.400*** (0.035)	0.219*** (0.072)	0.318*** (0.027)	0.338*** (0.015)	0.357*** (0.025)
X_2	0.083 (0.102)	0.077 (0.056)	0.599 (0.598)	0.339* (0.198)	0.211** (0.092)	0.313* (0.197)	0.351*** (0.133)	0.078 (0.067)
X_3	0.007 (0.099)	0.020 (0.043)	−0.361 (0.520)	0.042 (0.168)	−0.103** (0.044)	0.214 (0.181)	−0.298** (0.123)	0.165*** (0.054)
Y_1	−0.012 (0.033)	0.066* (0.042)	0.154 (0.138)	0.051 (0.053)	0.064 (0.058)	−0.140** (0.076)	−0.069* (0.041)	0.205*** (0.039)
Y_2	0.211*** (0.048)	0.201*** (0.044)	0.081 (0.099)	0.096 (0.109)	0.015 (0.079)	0.223* (0.156)	−0.253*** (0.071)	0.287*** (0.046)
Y_3	0.044 (0.091)	0.031 (0.048)	−0.392 (0.545)	0.009 (0.173)	0.011 (0.071)	0.210 (0.176)	−0.339*** (0.118)	0.154*** (0.055)
H-statistic	0.459 (0.085)	0.597 (0.144)	0.709 (0.400)	0.780 (0.134)	0.328 (0.069)	0.844 (0.135)	0.390 (0.090)	0.600 (0.048)
Observations	149	337	118	113	57	69	117	200
Adjusted R^2	0.68	0.78	0.75	0.75	0.73	0.90	0.88	0.75
J-statistic	3.58 [0.65]	7.47 [0.28]	6.31 [0.39]	5.09 [0.53]	3.53 [0.74]	10.43 [0.11]	13.73 [0.32]	4.34 [0.63]
Wald test $\{H_0 = 0\}$	40.22***[0.00]	118.85***[0.00]	29.94***[0.00]	80.93***[0.00]	4.03**[0.05]	188.18***[0.00]	46.52***[0.00]	259.37***[0.00]
Wald test $\{H_0 = 1\}$	55.96***[0.00]	53.96***[0.00]	5.03**[0.03]	6.41***[0.01]	16.91***[0.00]	6.41***[0.01]	113.54***[0.01]	115.51***[0.00]

Notes: OLS = Ordinary Least Squares, PGLS_FE = Pooled Generalized Least Squares with Fixed Effects, GMM = Generalized Method of Moments. Asymptotic standard error in parentheses. Figures in square brackets denote p-values. J-statistic is a Sargan/Hansen test of the over-identifying restrictions for the GMM estimators. Significant at ***1%, **5%, and *10% levels, respectively.

It seems that there is no significant variation between the two specifications of the model (see equations (1) and (2)). More specifically, the H-statistic in the revenue model is less than one in all of the three different econometric techniques, while its magnitude ranges from 0.354 (Algeria) to 0.914 (Oman). From the Wald tests, we conclude that the alternative hypotheses ($H_1 \neq 0$ and $H_1 \neq 1$) cannot be rejected. It is worth mentioning that the coefficients are statistically significant in most of the cases while the signs are the expected ones (see Table 4).

Lastly, the two estimated equations appear to be well behaved to the diagnostic tests. In most cases the adjusted R^2 exceeds the value of 0.60, denoting that variation in the dependent variable is well captured by variations in the control variables. The null hypothesis of the F-statistic is rejected at the 1% level of significance, indicating that the control variables are valid. Regarding the GMM estimation, the instrument rank is greater than the number of estimated coefficients, while according to the reported J-statistic, the instrument list satisfies the orthogonality conditions.

VI. ROBUSTNESS CHECK[3]

In order to check for the robustness of our findings, and face many of the serious restrictions of the Panzar–Rosse methodology (lack of ordinality, absence of monotonic index of the degree of market power, etc.), we estimate other competitive indicators widely acknowledged from the theoretical and empirical standpoint (Fernandez de Guevara *et al*., 2007; Angelini and Cetorelli, 2003; Maudos and Fernandez de Guevara, 2004, 2007; Turk Ariss, 2009), such as the Lerner index (LI), the adjusted Lerner index (ALI), and the conduct parameter (θ) described in Genesove and Mullin (1998).

VI.1 Lerner index

One of the most traditional indicators of market power is the Lerner index. This index, which is defined as the difference between price (P_{it}) and marginal cost (MC_{it}), divided by the price, measures the capacity of a firm to set prices above marginal cost (Lerner, 1934). The Lerner index ranges between 0 and 1, with zero corresponding to perfect competition and larger values reflecting greater market power (less competition). The Lerner index (L) is calculated as follows:

$$\mathrm{L} = \frac{(P_{it} - MC_{it})}{P_{it}} \tag{3}$$

The rationale of this indicator is that the monopolist can raise the price above marginal cost (which equals the competitive price) and therefore the excess of price over marginal costs should be a good measure of market power. In the case of the banking sector, the product price P_{it} can be regarded as the ratio between total revenues and total assets for bank i at time t (e.g., Maudos and Fernandez de Guevara, 2004; Fernandez de Guevara *et al*., 2007; Goddard *et al*., 2007; Carbo *et al*., 2009). Total revenues are the sum between interest and non-interest income,

[3]We greatly thank an anonymous referee of this journal for his fruitful suggestion regarding the use of several alternative measures of competition (i.e., Lerner index and the conduct parameter θ) for the banking industry in the MENA region.

TABLE 4
Empirical results for the MENA countries (revenue equation)[a]

Control variables	*Algeria*	*Egypt*	*Israel*	*Jordan*	*Morocco*	*Oman*	*Saudi Arabia*	*UAE*
				OLS				
Intercept	−0.813*** (0.202)	−0.260*** (0.096)	−0.585*** (0.170)	−0.325 (0.228)	−1.294*** (0.137)	0.507** (0.234)	−0.156 (0.219)	0.105 (0.123)
X_1	0.195*** (0.026)	0.459*** (0.027)	0.313*** (0.017)	0.345*** (0.029)	0.086** (0.035)	0.265*** (0.022)	0.302*** (0.016)	0.317*** (0.019)
X_2	0.057 (0.081)	0.040 (0.032)	0.800*** (0.175)	0.499*** (0.138)	0.308*** (0.039)	0.742*** (0.099)	0.527*** (0.122)	0.378*** (0.041)
X_3	0.101 (0.074)	0.099*** (0.026)	−0.492*** (0.151)	−0.196*** (0.107)	−0.004 (0.026)	−0.092 (0.078)	−0.175* (0.102)	−0.033 (0.030)
Y_1	0.171*** (0.032)	0.028** (0.013)	0.197*** (0.037)	0.041 (0.039)	0.050* (0.027)	−0.052* (0.032)	0.166*** (0.041)	0.215*** (0.032)
Y_2	0.371*** (0.047)	0.142*** (0.026)	0.054 (0.050)	0.170** (0.080)	−0.022 (0.029)	0.096 (0.120)	0.094* (0.057)	0.067*** (0.035)
Y_3	0.039 (0.078)	0.123*** (0.029)	−0.548*** (0.159)	−0.216* (0.115)	−0.035 (0.035)	−0.125* (0.081)	−0.236** (0.103)	−0.076*** (0.032)
H−statistic	0.354 (0.061)	0.597 (0.085)	0.620 (0.114)	0.648 (0.091)	0.390 (0.033)	0.914 (0.066)	0.654 (0.080)	0.663 (0.091)
Observations	136	337	154	127	85	89	137	247
Adjusted R^2	0.62	0.77	0.82	0.68	0.83	0.81	0.76	0.70
Wald test $\{H_0 = 0\}$	60.97*** [0.00]	371.20*** [0.00]	142.97*** [0.00]	87.07*** [0.00]	37.68*** [0.00]	250.08*** [0.00]	145.09*** [0.00]	452.12*** [0.00]
Wald test $\{H_0 = 1\}$	203.62*** [0.00]	169.07*** [0.00]	53.55*** [0.00]	25.61*** [0.00]	92.24*** [0.00]	2.21 [0.14]	40.58*** [0.00]	116.95*** [0.00]
				PGLS_FE				
Intercept	−1.080*** (0.264)	−0.247* (0.136)	−0.686 (0.686)	−0.849*** (0.168)	−1.261*** (0.179)	−0.032 (0.215)	0.121 (0.257)	−0.178 (0.122)
X_1	0.270*** (0.026)	0.545*** (0.025)	0.317*** (0.033)	0.409*** (0.024)	0.154*** (0.039)	0.306*** (0.016)	0.299*** (0.020)	0.311 (0.008)
X_2	0.017 (0.081)	0.107*** (0.031)	0.573*** (0.185)	0.290*** (0.075)	0.348*** (0.076)	0.369*** (0.075)	0.678*** (0.091)	0.324 (0.032)
X_3	0.103 (0.072)	0.009 (0.020)	−0.271* (0.175)	−0.128** (0.050)	−0.120** (0.048)	0.048 (0.054)	−0.269*** (0.058)	−0.058 (0.016)
Y_1	0.030 (0.044)	0.072*** (0.025)	−0.048 (0.063)	0.085* (0.045)	0.007 (0.033)	−0.107** (0.047)	0.181*** (0.059)	0.133 (0.047)
Y_2	0.337*** (0.060)	0.070*** (0.017)	0.137 (0.115)	0.193*** (0.051)	−0.036 (0.034)	0.047 (0.107)	0.152*** (0.043)	0.008 (0.040)
Y_3	0.020 (0.081)	−0.004 (0.021)	−0.250* (0.164)	−0.235*** (0.045)	−0.084 (0.073)	0.062 (0.059)	−0.318*** (0.060)	−0.040 (0.028)
H-statistic	0.390 (0.059)	0.660 (0.076)	0.619 (0.131)	0.571 (0.050)	0.382 (0.054)	0.723 (0.048)	0.708 (0.056)	0.577 (0.057)
Observations	136	337	154	167	85	89	137	247
Adjusted R^2	0.76	0.85	0.90	0.90	0.93	0.92	0.91	0.86
Wald test $\{H_0 = 0\}$	52.87*** [0.00]	292.89 *** [0.00]	20.52*** [0.00]	183.15*** [0.00]	27.64*** [0.00]	209.82*** [0.00]	219.79*** [0.00]	496.78*** [0.00]
Wald test $\{H_0 = 1\}$	129.20*** [0.00]	77.52*** [0.00]	7.77*** [0.00]	103.35*** [0.00]	72.66*** [0.00]	30.67*** [0.00]	37.47** [0.00]	267.92*** [0.00]

Continued

TABLE 4
Continued

Control variables	*Algeria*	*Egypt*	*Israel*	*Jordan*	*Morocco*	*Oman*	*Saudi Arabia*	*UAE*
				GMM				
Intercept	−0.746*** (0.197)	−0.230 (0.152)	−0.210 (0.350)	0.286 (0.289)	−0.237 (0.429)	0.092 (0.279)	−0.231 (0.330)	−0.026 (0.161)
X_1	0.242*** (0.023)	0.440*** (0.047)	0.406*** (0.072)	0.332*** (0.035)	0.152*** (0.053)	0.256 (0.031)***	0.305 (0.021)	0.260*** (0.026)
X_2	0.070 (0.071)	0.011 (0.057)	0.522 (0.517)	0.580*** (0.198)	0.293** (0.144)	0.353 (0.218)*	0.519 (0.181)	0.324*** (0.070)
X_3	0.083 (0.063)	0.119*** (0.044)	−0.198 (0.450)	−0.066 (0.169)	−0.002 (0.025)	0.182 (0.199)	−0.223 (0.168)	0.015*** (0.056)
Y_1	0.129*** (0.033)	0.125*** (0.044)	0.101 (0.119)	0.072 (0.053)	0.070** (0.034)	−0.131 (0.066)**	0.153 (0.055)	0.212*** (0.041)
Y_2	0.351*** (0.048)	0.202*** (0.045)	−0.007 (0.086)	0.091 (0.109)	0.060 (0.067)	−0.082 (0.155)	0.138 (0.096)	0.192*** (0.048)
Y_3	0.019 (0.069)	0.107** (0.050)	−0.244 (0.471)	−0.147 (0.173)	0.167*** (0.054)	0.159 (0.195)	−0.245 (0.160)	−0.028*** (0.057)
H-statistic	0.390 (0.005)	0.569 (0.049)	0.730 (0.346)	0.845 (0.134)	0.443 (0.074)	0.790 (0.149)	0.601 (0.123)	0.701 (0.051)
Observations	136	266	118	113	45	69	117	200
Adjusted R^2	0.60	0.71	0.71	0.71	0.70	0.81	0.75	0.70
J-statistic	–	4.75 [0.58]	2.95 [0.81]	4.67 [0.59]	9.65 [0.65]	12.49 [0.51]	45.97 [2.99]	5.64 [0.46]
Wald test $\{H_0 = 0\}$	79.51*** [0.00]	101.64 *** [0.00]	118.85*** [0.00]	94.85*** [0.00]	11.26*** [0.00]	123.30*** [0.00]	59.36*** [0.00]	236.47*** [0.00]
Wald test $\{H_0 = 1\}$	187.56*** [0.00]	58.26*** [0.00]	53.96*** [0.00]	3.19* [0.08]	17.80*** [0.00]	8.71*** [0.00]	26.18*** [0.00]	105.79*** [0.00]

[a]See notes to Table 3.

while MC_{it} is the total marginal cost obtained by the estimation (allowing for fixed effects) of the following translog cost function:

$$\ln C_{it} = a_0 + a_1 \ln(Q_{it}) + \frac{1}{2} a_2 \ln(Q_{it})^2 + \sum_{k=1}^{3} \beta_{kt} \ln X_{k,it} + \sum_{k=1}^{3} \gamma_{kt} \ln Q_{it} \ln X_{k,it} + \sum_{k=1}^{3} \sum_{j=1}^{3} \ln X_{k,it} \ln X_{j,it} + \varepsilon_{it} \tag{4}$$

where C_{it} are the bank's total costs (financial plus operating cost) at time t, Q_{it} is the total assets, and X_{it} is the price of the three input factors of production (X_1, X_2, and X_3) as mentioned above (funding rate, wage rate, and physical capital). From equation (4), the marginal cost (MC) is merely obtained by taking the first derivative and multiplying by the average cost ($\frac{C_{it}}{Q_{it}}$)

$$MC_{it} = \frac{\partial C_{it}}{\partial Q_{it}} = \left(a_1 + a_2 \ln Q_{it} + \sum_{k=1}^{3} \gamma_{kt} \ln X_{k,it} \right) \frac{C_{it}}{Q_{it}} \tag{5}$$

The estimation of the above equation is done under the restrictions of symmetry and homogeneity (prices and inputs).

Table 5 presents the empirical results from the translog function for each of the MENA sample countries. More specifically, the majority of the estimated coefficients are statistically significant and plausibly signed. The estimated equations appear to be well behaved to the diagnostic tests. The adjusted R-square is significantly high (0.99), denoting that variation in the dependent variable is well captured by variations in the explanatory variables, whereas the values of the Durbin–Watson statistic (D-W) indicate absence of autocorrelation. Moreover, the standard error (SE) of regression is close to zero and the F-statistic of the joint significance of all the explanatory variables is rejected at the 1% level in all of the eight models, indicating the validity of the specified control variables (covariates). Lastly, in all eight specifications according to the Hausman test, the hypothesis of zero random effects cannot be rejected at a very high significance level ($p<1\%$), thus indicating the validity of the fixed effects estimator.[4]

The Lerner index shows some variation between the sample countries. However, its values do not exceed unity and range from 0.021 (UAE) to 0.634 (Egypt). The mean value of the estimated indices from the MENA region is equal to 0.324. This means that the banking sector in MENA countries does not show a significant level of market power. Comparing this finding with the relatively high number of banks operating in these countries offering differentiated products, we argue that monopolistic competition may better describe the competitive conditions. Our results coincide with other similar studies (e.g., Anzoategui *et al*., 2010) except for some MENA countries such as UAE and Jordan, where their estimations are on average 0.385 and 0.228, respectively.

VI.2 Adjusted Lerner index

As argued in Koetter *et al*. (2012) the conventional approach of computing the Lerner index assumes both profit (optimal choice of prices) and cost efficiency (optimal choice of inputs by firms). As a result, the estimated price–cost margins do not correctly measure the true extent of

[4]The results are available upon request.

TABLE 5

Empirical results of the translog function and the Lerner indices in MENA countries

Control variables	*Algeria*	*Egypt*	*Israel*	*Jordan*	*Morocco*	*Oman*	*Saudi Arabia*	*UAE*
Intercept	−0.686	−21.319	1.474	3.451*	−2.218	−2.999*	5.146*	−1.989*
	(2.006)	(18.791)	(2.115)	(1.826)	(3.789)	(1.614)	(3.250)	(1.142)
Q	0.904***	3.713*	1.286***	0.747***	1.383***	1.365***	0.005	0.964***
	(0.240)	(2.638)	(0.399)	(0.121)	(0.246)	(0.123)	(0.416)	(0.097)
½*Q^2	−0.013	−0.150	−0.060**	−0.016*	−0.026***	−0.052***	0.063**	−0.005
	(0.017)	(0.176)	(0.026)	(0.009)	(0.007)	(0.011)	(0.030)	(0.007)
X_1	−1.037***	−0.299	0.142	−0.218	1.726***	−0.719*	0.091	−0.645***
	(0.178)	(1.132)	(0.677)	(0.279)	(0.364)	(0.471)	(0.231)	(0.161)
X_2	1.203***	1.122	1.841***	1.596***	−0.693	1.011***	−0.941*	−0.110
	(0.393)	(1.125)	(0.669)	(0.398)	(0.712)	(0.383)	(0.518)	(0.234)
X_3	0.387*	−1.148*	−0.102	−0.444**	0.125	−0.675***	0.657**	−0.085
	(0.257)	(0.964)	(0.553)	(0.191)	(0.351)	(0.173)	(0.266)	(0.127)
Q*X_1	0.020*	0.097	−0.021	0.004	−0.078***	−0.006	−0.044***	0.007
	(0.014)	(0.104)	(0.021)	(0.017)	(0.016)	(0.022)	(0.009)	(0.014)
Q*X_2	−0.109***	−0.024	−0.113*	−0.118***	0.095***	−0.100***	0.045*	−0.019
	(0.025)	(0.070)	(0.047)	(0.025)	(0.035)	(0.022)	(0.029)	(0.016)
Q*X_3	0.006	0.073*	−0.006	−0.004	−0.039**	0.035**	−0.047***	−0.012
	(0.016)	(0.062)	(0.030)	(0.017)	(0.016)	(0.018)	(0.019)	(0.009)
W_1*W_2	−0.246***	0.122	−0.115	−0.139*	0.097**	−0.308***	−0.235***	−0.231***
	(0.033)	(0.226)	(0.168)	(0.089)	(0.050)	(0.086)	(0.040)	(0.021)
W_1*W_3	0.017	0.062	−0.004	−0.004	−0.172***	0.070***	−0.067***	0.005
	(0.026)	(0.094)	(0.052)	(0.044)	(0.016)	(0.023)	(0.025)	(0.012)
W_2*W_3	0.088**	−0.051	−0.038	−0.130	0.051*	−0.088	0.045***	−0.061**
	(0.038)	(0.086)	(0.120)	(0.024)	(0.032)	(0.077)	(0.015)	(0.024)
Lerner index	0.474	0.634	0.446	0.085	0.218	0.389	0.325	0.021
Adjusted Lerner index	0.386	0.441	0.245	0.125	0.158	0.317	0.251	0.068
Observations	84	53	154	141	57	88	73	114
Adjusted R^2	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
SE of regression	0.07	0.03	0.11	0.05	0.03	0.04	0.03	0.04
F-statistic	1326.16***	1262.54***	1417.31***	5763.01***	7503.08***	1789.40***	2775.14***	5250.17***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
D-W	1.70	2.82	2.00	1.45	1.97	1.28	1.77	1.34

Notes: Asymptotic standard error in parentheses. Figures in square brackets denote p-values. Significant at ***1%, **5%, and *10% levels, respectively.

market power. As a consequence, the authors propose a correction in the form of the efficiency adjusted Lerner index (ALI):

$$\text{ALI} = \frac{(\Pi_{it} + TC_{it}) - (MC_{it} * Q_{it})}{\Pi_{it} + TC_{it}} \tag{6}$$

where $i = 1, \ldots n$ is the number of banks in each of the MENA countries, Π is the total profit before taxes, *TC* is the total cost (operating plus financial cost), *MC* is the marginal cost calculated by the translog function given in equation (4), and Q is the total output proxied by the total earning assets (Clerides *et al*., 2013). Like the standard Lerner index, the adjusted Lerner ranges from 0 to 1, with larger values indicating greater market power.

The results in Table 5 indicate that the degree of competitiveness does not seem to perform significant variation between the MENA countries. Specifically, the adjusted Lerner index is significantly less than 1 in all of the sample countries, while its magnitude ranges from 0.068 (UAE) to 0.441 (Egypt), with the mean value equal to 0.249. The aforementioned results indicate that the banking sector in the MENA region is characterized by small market power. This could be attributed to the existence of the global financial crisis that hit all of the MENA countries. The recent crisis has impacted the banking sector in the MENA region in two ways. On the one hand, it is highly likely that it reduced efficiency due to capital losses and non-performing loans suffered by many banks, while on the other hand, the rising informational asymmetry costs faced by banks during the crisis period (adverse selection and moral hazard) have increased the cost of lending (Clerides *et al*., 2013).

VI.3 Conduct Parameter Method

Studies in the NEIO literature have identified firm conduct by parameterizing the firm's static first-order condition (MR = MC) to allow for price-taking, Cournot competition, and monopoly pricing. This methodology is called the Conduct Parameter Method (CPM). The CPM uses econometric techniques to estimate a structural model (supply relation and demand function) to recover the conduct parameter θ (Bresnahan, 1982, 1989; Lau, 1982).[5] This parameter takes the value from zero to unity, if the market is characterized by perfect competition or monopoly, respectively.

In this paper, we follow the methodology applied by Genesove and Mullin (1998), who argue that the sugar industry in the USA over the period 1890–1914 was characterized by a low level of market power since the estimated conduct parameter θ was close to zero (0.038).[6] According to this methodology, we first estimate the following inverse demand function:

$$P_{it} = a - \frac{1}{\beta} Q_{it} + \varepsilon_{it} \tag{7}$$

where P_{it} = is the ratio between the total revenue over total banking assets of bank i at time t, Q_{it} denotes the quantity proxied by the total banking assets, and u_{it} is the error term. Equation (6) is estimated with OLS and the relevant results are reported in Table 6 (see Panel A). In the next stage, we employ the following model in order to estimate the conduct parameter θ:

$$P_{it} = c_0 + c_1 W_{1,it} + c_2 W_{2,it} + c_3 W_{3,it} + \theta \left(\frac{Q_{it}}{\hat{\beta}} \right) + \varepsilon_{it} \tag{8}$$

[5]To the best of our knowledge, this is the first banking study that uses the method proposed by Genesove and Mullin (1998). For an extensive application of the CPM, see Delis *et al*. (2008).

[6]However, this method has been subject to extensive criticism (see, e.g., Corts, 1999; Delipalla and O'Donnell, 2001).

TABLE 6
Empirical results of the conduct parameter in MENA countries

Coefficients	*Algeria*	*Egypt*	*Israel*	*Jordan*	*Morocco*	*Oman*	*Saudi Arabia*	*UAE*
Panel A: $P_{it} = \alpha + (1/\beta)Q_{it} + u$								
Intercept	0.126***	0.162***	0.189***	0.156***	0.040***	0.128***	0.153***	0.137
	(0.015)	(0.011)	(0.017)	(0.010)	(0.014)	(0.023)	(0.025)	(0.011)
$1/\beta$	−0.005***	−0.005***	−0.007***	−0.006***	0.001*	−0.004**	−0.006***	−0.005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Diagnostics								
Observations	141	338	180	142	90	90	137	249
Adjusted R^2	0.12	0.11	0.19	0.35	0.01	0.05	0.08	0.13
SE of regression	0.02	0.02	0.03	0.01	0.01	0.01	0.02	0.02
F-statistic	19.24***	42.76***	43.84***	77.36***	2.06*	5.73**	12.96***	38.22***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.11]	[0.00]	[0.00]	[0.00]
D-W	0.68	0.58	0.95	0.92	0.40	0.37	0.95	0.83

Continued

TABLE 6
Continued

Coefficients	*Algeria*	*Egypt*	*Israel*	*Jordan*	*Morocco*	*Oman*	*Saudi Arabia*	*UAE*
Panel B: $P_{it} = c_0 + c_1 W_{1it} + c_2 W_{2it} + c_3 W_{3it} + \theta(Q_{it}/\beta) + u$								
Intercept	0.197***	0.259***	0.277***	0.218***	0.103***	0.293***	0.194***	0.255***
	(0.016)	(0.019)	(0.020)	(0.010)	(0.009)	(0.014)	(0.025)	(0.010)
C1	0.008***	0.033***	0.026***	0.019***	0.005***	0.020***	0.016***	0.019***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
C2	0.015***	0.011***	0.014***	0.011***	0.012***	0.045***	0.021***	0.021***
	(0.003)	(0.002)	(0.005)	(0.003)	(0.001)	(0.004)	(0.004)	(0.002)
C3	0.001	0.002*	−0.003	0.002	0.003**	0.000	0.002	0.001
	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
θ	0.594**	0.445*	0.567***	0.470***	0.001***	0.430**	0.194***	0.418***
	(0.234)	(0.252)	(0.156)	(0.098)	(0.000)	(0.207)	(0.026)	(0.120)
Diagnostics								
Observations	136	338	154	142	86	89	127	247
Adjusted R^2	0.40	0.72	0.61	0.70	0.72	0.84	0.51	0.63
SE of regression	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01
F-statistic	23.44***	26.20***	60.65***	82.91***	54.81***	115.07***	34.45***	106.23***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
D-W	0.71	1.21	0.96	1.25	0.66	0.51	1.21	1.32

Notes: Asymptotic standard error in parentheses. Figures in square brackets denote p-values. Significant at ***1%, **5%, and *10% levels, respectively.

where the new control variables W_1, W_2, and W_3 denote the three input factors described above and β is the estimated value of the inverse demand function derived from equation (7). Equation (8) is estimated with OLS and the relevant results are depicted in Table 6 (see Panel B). Specifically, the estimated conduct parameter θ varies across the MENA countries but its magnitude is lower than unity in all of the specifications. It is worth emphasizing that it takes the highest value ($\theta = 0.594$) in Algeria while is nearly equal to zero (0.001) in Morocco. The low value of the estimated conduct parameter is in alignment with the previous indicators of market power. In other words, banking competition in the eight sample MENA countries is rather intense.

VII. CONCLUSIONS

In this study we have attempted to assess the level of competition in eight MENA countries by estimating the H-statistic as proposed by Panzar and Rosse. For this reason we built a model covering 137 banks for the eight countries (Algeria, Egypt, Israel, Jordan, Morocco, Oman, Saudi Arabia, and United Arab Emirates) over the period 1997–2012 and apply panel data econometric techniques. We find that the banking sector in the MENA region is not characterized by perfect competition or contestability. Our results provide sufficient evidence in favour of a banking monopolistic competition regime. These findings indicate that the highly concentrated banking sectors of the MENA region do not seem to lead to anti-competitive behaviour, since the Wald tests reject the existence of collusive behaviour.

In order to overcome some of the main shortcomings of the H-statistic and assess the robustness of our findings, we perform a sensitivity analysis by employing three alternative non-structural indicators that have been widely used within the NEIO framework. From the estimated values of these measurements, we argue that banking sector among the eight MENA countries is characterized by the absence of SMP, providing sufficient evidence that monopolistic competition better describes the structure of the industry.

Despite similarities in the process of financial regulatory reforms undertaken in the eight MENA countries, the observed competition levels of banks vary substantially. The relatively high level of the H-statistic in Oman and UAE could be potentially explained by the elimination of certain regulatory restrictions, towards the creation of an integrated market for banking services in the region. Moreover, the low level of the H-statistic regarding Algeria and Morocco could be explained by the increasing level of banking consolidations, as a result of the financial crisis.

Following the results of other similar studies, we suggest that going beyond mere monitoring the bank concentration and by using non-structural measures of competition such as the H-statistic, we obtain a more informative diagnosis of competition in the banking sector. From a policy perspective, the results of this study support the need for a turn in the attention of policy makers and government officials towards a deeper revision of competition policies in the banking sector. In this way, the policy makers will foster competition policies in order to keep the markets open, strengthen integration, and lift the artificial barriers of entry, thus contributing to the stability of the banking system. Competition policy may act as a catalyst in order to support financial stability and create the appropriate conditions for stable financial markets in both the short and the longer term. In addition, it can help control potential distortions introduced by rescue packages.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web site:

Table A1: Descriptive statistics for the model variables.