

Competition and Efficiency of National Banks in the United Arab Emirates

Lawrence S. Tai
Zayed University

This paper examined the degree of competition and efficiency of publicly listed national banks in the United Arab Emirates (UAE) between 2003 and 2011. We calculated the Lerner Index to measure the degree of monopoly power for each bank in the loan market. In addition, we used a translog cost function to evaluate the efficiency of the UAE banking sector. Finally, we tested the causality between competition and efficiency and determined the direction of causality.

INTRODUCTION

This paper examines the degree of competition and efficiency of publicly listed national banks in the United Arab Emirates (UAE) between 2003 and 2011.

The banking sector is crucial to the development of any economy; it is also one of the major driving forces of economic growth in developing countries. Banks are special financial intermediaries whose operations are unique in financial markets and impact strongly on an economy. Hence, research on competition and efficiency of the banking sector has important policy implications. A higher degree of competition and efficiency in banking markets is expected to provide welfare gains by reducing the prices of financial services and thereby accelerating investment and growth.

The objective of this paper is to study the competition and efficiency of national banks in the UAE. As commercial banks play a vital role in the financing of an economy, banking competition and efficiency exert an important impact on a country's economic development. Bank performance has been a key issue particularly in developing countries as commercial banks are the dominant financial institutions in these countries and they represent the major source of financial intermediation. Evaluating their competition and efficiency is crucial to depositors, owners, potential investors, managers, and regulators

Table 1 shows the list of UAE publicly listed national banks and their branches from 2005 to 2011. While the number of national banks remained the same at 23 in 2011, the number of their branches increased to 768 in 2011 from 732 in 2010. The number of Gulf Cooperation Council (GCC) banks remained at six at the end of 2011. The number of foreign banks and their branches remained unchanged at 22 and 82, respectively at the end of 2011. The number of Automated Teller Machines (ATMs) reached 4,172 at the end of 2011.

TABLE 1
BANKS OPERATING IN THE UAE, 2005-2011

	2005	2006	2007	2008	2009	2010	2011
National banks							
Head offices	21	21	22	24	24	23	23
Branches	391	431	508	614	674	732	768
Electronic/customer service units	9	9	11	19	26	26	26
Cash offices	49	55	56	60	71	86	87
GCC banks							
Main branches	-	-	5	6	6	6	6
Additional branches	-	-	-	1	1	1	1
Foreign banks							
Main branches	25	25	22	22	22	22	22
Additional branches	83	81	81	82	81	82	82
Electronic/customer service units	6	15	30	35	42	50	50
Cash offices	1	1	1	1	1	1	1
Number of ATMs	N/A	N/A	2,057	2,420	3,599	3,758	4,172

Source: UAE Central Bank Annual Reports, 2005-2011.

Table 2 presents the UAE publicly listed national banks and their branches between 2005 and 2011. In terms of the number of branches, Emirates NBD is the largest bank, with 115 branches in 2011 due to the merger of National Bank of Dubai and Emirates Bank. The smallest bank is the Bank of Sharjah with only four branches at the end of 2011.

TABLE 2
UAE PUBLICLY LISTED NATIONAL BANKS AND BRANCHES, 2005-2011

	2005	2006	2007	2008	2009	2010	2011
National Bank of Abu Dhabi	54	55	57	68	74	80	86
Abu Dhabi Commercial Bank	39	39	39	41	42	46	45
Union National Bank	30	37	35	39	46	52	54
Emirates NBD	33	34	42	45	45	111	115
Commercial Bank of Dubai	20	20	20	23	23	24	25
Dubai Islamic Bank	24	32	43	48	53	61	68
Emirates Islamic Bank	12	17	23	30	32	32	33
Mashreq Bank	49	49	45	60	63	66	66
Sharjah Islamic Bank	9	16	18	22	24	24	26
Bank of Sharjah	3	3	4	4	4	3	4
United Arab Bank	9	9	9	9	10	12	13
InvestBank	7	11	12	12	12	12	12
National Bank of Ras Al Khaimah	18	19	20	25	27	28	30
Commercial Bank International	7	7	8	12	15	17	17
National Bank of Fujairah	6	9	12	14	14	14	15
National Bank of Umm Al Qaiwain	10	12	15	17	17	17	17
First Gulf Bank	9	11	15	17	17	18	18
Abu Dhabi Islamic Bank	23	31	43	45	54	64	66

Source: UAE Central Bank Annual Reports, 2005-2011.

Table 3 displays the banking indicators from 2005 to 2011. Total assets of banks operating in the UAE rose from AED 638.0 billion at the end of 2005 to AED 1,662.1 billion at the end of 2011. Total deposits climbed from AED 409.7 billion at the end of 2005 to AED 1,069.7 at the end of 2011. Loans, advances, and overdrafts increased from AED 327.0 billion at the end of 2005 to AED 1,071.0 billion at the end of 2011. Total personal loans recorded an increase from AED 148.4 billion at the end of 2007 to AED 252.1 billion at the end of 2011. Capital and reserves of banks operating in the UAE grew from AED 78.1 billion at the end of 2005 to AED 258.4 billion at the end of 2011.

TABLE 3
BANKING INDICATORS, 2005-2011
(End of period, in billions of AED)

	2005	2006	2007	2008	2009	2010	2011
Total assets	638.0	859.6	1,202.3	1,447.9	1,519.0	1,605.6	1,662.1
Total deposits	409.7	518.8	716.0	912.2	982.6	1,049.6	1,069.7
Loans, advances, and overdrafts	327.0	433.6	554.5	993.7	1,017.7	1,031.3	1,071.0
Total personal loans	N/A	N/A	148.4	227.1	237.9	247.1	252.1
Capital and reserves	78.1	104.1	130.9	165.6	231.4	256.0	258.4

Source: UAE Central Bank Annual Reports, 2005-2011.

LITERATURE REVIEW

A large number of studies have been conducted on measuring competition and efficiency in the banking industry. Two methods that have been applied to estimate the degree of competition for commercial banks are the Lerner index and Panzar and Rosse's H-statistic. The Lerner index measures the markup of price over marginal cost, indicating the market power of a bank. Studies that have used the Lerner index include Kubo (2006) to examine the level of competition of the Thai banking industry and Pruteanu-Podpiera, Weill, and Schobert (2008) to investigate the degree of competition of the Czech banking industry. The H-statistic is defined as the sum of the factor price elasticities of interest income with respect to borrowed funds, labor, and physical capital. Studies that have used the H-statistic include Abbasoglu, Aysan, and Gunes (2007) to study the level of competition of the Turkish banking sector. Since the H-statistic is a measure of competition for the banking industry as a whole, the Lerner index is used in this study as the research requires individual measures of competition for each bank in the sample through the 2003-2011 period instead of aggregate measures for the full sample.

In the literature, two major approaches have been taken to measure efficiency in the banking industry: parametric and nonparametric. Nonparametric approaches like data envelopment analysis (DEA) consider the whole distance from the frontier as inefficiency. These methods are therefore deterministic as they do not include the possibility of measurement errors in the estimation of the frontier and hence they may overestimate the inefficiencies. DEA approach has been used by Ozkan-Gunay and Tektas (2006) to study the efficiency of the Turkish banking sector, by Chang and Chiu (2006) to examine the efficiency of Taiwan's banking industry, and by Fitzpatrick and McQuinn (2005) to investigate the efficiency of UK and Irish credit institutions, just to name a few.

Parametric approaches such as the stochastic frontier approach (SFA) and the distribution-free approach (DFA) do not suffer from the above-mentioned drawback. SFA makes some distributional assumptions to disaggregate the residual from the frontier into an inefficiency term and a random disturbance, which are arbitrary. SFA has been used by Inui, Park, and Shin (2008) to study the comparative efficiency of Japanese and Korean banking and by Fitzpatrick and McQuinn (2005) to investigate the efficiency of UK and Irish credit institutions. DFA has been proposed to resolve the major criticism of the SFA, namely its distributional assumptions, by adopting more intuitive assumptions to separate inefficiency from random disturbance. DFA has been used by Matousek and Taci (2004) and by Pruteanu-Podpiera, Weill, and Schobert (2008) to examine the efficiency of the Czech banking industry.

This paper is the first attempt to investigate the degree of competition and efficiency of national banks in the UAE. The Lerner index is used to measure competition and DFA is applied to measure efficiency.

METHODOLOGY

This paper has three objectives. The first objective is to provide evidence on the level of banking competition in the UAE between 2003 and 2011. Using data on output prices and applying the Lerner index to measure competition, this study measures the degree of monopoly power for each bank in the loan market. The second objective is to evaluate the efficiency of the UAE banking sector during the 2003-2011 period. A translog cost function is estimated for all the banks in the sample. Each bank's efficiency is then computed as the deviation from the most efficient bank's intercept term. The final objective is to test the causality between competition and efficiency and determine the direction of causality.

Measurement of Competition: The Lerner Index

The Lerner index is calculated to provide evidence on the degree of banking competition in the UAE. The index is defined as the difference between the price and the marginal cost, divided by the price. The Lerner index ranges between 0 and 1. The index is an inverse measure of competition. A greater index means lower competition. In this study, the focus is on the loan market because loans represent the largest share of assets for UAE national banks. Accordingly, the price of loans is used and the marginal cost is calculated by using loans as the output.

The price of loans is calculated as interest income divided by net loans. Net loans are total loans minus non-performing loans. The marginal cost function is estimated on the basis of a translog cost function with one output (loans, y) and three input prices (labor, physical capital, and borrowed funds). The price of labor is measured by the ratio of personnel expenses to total assets (w_1). The price of physical capital is defined as the expenses for physical capital to fixed assets (w_2). The price of borrowed funds is defined as the ratio of interest expense to borrowed funds (w_3). See Figure 1.

FIGURE 1
TRANSLOG COST FUNCTION, MARGINAL COST, AND LERNER INDEX

$$\ln TC = \alpha_0 + \alpha_1 \ln y + \frac{1}{2} \alpha_2 (\ln y)^2 + \sum_{j=1}^3 \beta_j \ln w_j + \sum_{j=1}^3 \sum_{k=1}^3 \beta_{jk} \ln w_j \ln w_k + \sum_{j=1}^3 \gamma_j \ln y \ln w_j + \varepsilon$$

$$MC = \frac{TC}{y} \left(\alpha_1 + \alpha_2 \ln y + \sum_{j=1}^3 \gamma_j \ln w_j \right)$$

$$L = \frac{P - MC}{P}$$

Measurement of Efficiency: The Distribution-Free Approach

The distribution-free approach (DFA) is used to provide evidence on the level of banking efficiency in the UAE. Using a fixed-effects model, inefficiency is estimated from the value of a bank-specific dummy variable. A translog cost function is estimated for all the banks in the sample.

The DFA approach is applied and it is assumed that the difference in the actual and predicted cost for a given cross-sectional period is a combination of persistent inefficiency component and a random component (Berger, 1993). It is possible to obtain the persistent inefficiency component by averaging out these differences over time. Following Hunter and Timme (1995), the error term bank i in time t can be expressed as shown in Figure 2.

**FIGURE 2
ERROR TERM**

$$\varepsilon_{i,t} = \ln(v_{i,t}) + \ln(u_i)$$

where $\ln(v_{i,t})$ is a random error component that varies with time and is distributed with a zero mean over time, and $\ln(u_i)$ is the core efficiency or average efficiency for each bank which is time-independent while random error tends to average out over time. In order to be consistent with this error term specification, the cost function can then be expressed with a residual in the multiplicative form as shown in Figure 3.

**FIGURE 3
COST FUNCTION**

$$\text{Cost}_{i,t} = C_t(Q_{i,t}, P_{i,t})v_{i,t}u_i,$$

where C_t is a cost function and $Q_{i,t}$ and $P_{i,t}$ are output and input prices, respectively. This cost function in logarithm is shown in Figure 4.

**FIGURE 4
LOGARITHM COST FUNCTION**

$$\ln\text{Cost}_{i,t} = \ln C_t(Q_{i,t}, P_{i,t}) + \ln(v_{i,t}) + \ln(u_i).$$

The term $\ln(u_i)$ is assumed to be orthogonal to the regressors in the cost function. The error term $\varepsilon_{i,t}$ can be estimated for each bank for each year. In this way the parameters in the cost function and the random error term $\ln(v_{i,t})$ are allowed to change for each year while $\ln(u_i)$ remains constant over time.

The next step is to average the estimated cost function, error term $\varepsilon_{i,t}$ for each bank over n years in order to obtain an estimate of $\ln(u_i)$, that is $\ln(u_i) = \sum_t \varepsilon_{i,t}/n$. For each bank then the percentage efficiency measure can be expressed as shown in Figure 5.

**FIGURE 5
EFFICIENCY MEASURE**

$$\text{EFF}_i = \exp[\ln(u_{\min}) - \ln(u_i)]$$

$$\ln(u_i) = \sum_{t=1}^n \frac{\varepsilon_{i,t}}{n}$$

where $\ln(u_{\min})$ is the minimum value of $\ln(u_i)$. From this formulation an efficiency value of 1 corresponds to the most efficient bank while all other banks have values between 1 and 0.

In order to test the causality between competition and efficiency, and determine its direction in the short and long run, this study uses Granger's causality test.

Causality Between Competition and Efficiency: Granger Causality Test

The causality between competition (COMP) and efficiency (EFF) is tested by estimating the two equations as shown in Figure 6.

FIGURE 6
GRANGER CAUSALITY

$$\text{COMP}_t = \alpha_0 + \sum_{i=1}^m \alpha_i \text{COMP}_{t-i} + \sum_{j=1}^n \alpha_j \text{EFF}_{t-j} + u_t$$

$$\text{EFF}_t = \beta_0 + \sum_{i=1}^m \beta_i \text{EFF}_{t-i} + \sum_{j=1}^n \beta_j \text{COMP}_{t-j} + v_t$$

The Granger causality test is applied by following these three steps: (1) test whether the series are stationary or not; (2) examine the long-term relationship; (3) examine the direction of relationship.

The Augmented Dickey Fuller Test (ADF) is used for testing stationarity of each data series. The ADF is a regress test using each series' own lagged terms with significant differences. If the ADF test statistic is greater than McKinnon's critical values, and the series are stationary at that level, then the data is stationary.

DATA

The sample consists of all UAE national banks listed in the Dubai Financial Market and the Abu Dhabi Securities Exchange during the 2003-2011 period. All the required data are extracted from the annual reports of the national banks.

Table 4 shows the total loans and total deposits of the UAE publicly listed national banks at the end of 2011. In terms of total loans and total deposits, Emirates NBD is the largest bank while National Bank of Umm Al Qaiwain is the smallest.

TABLE 4
TOTAL LOANS AND DEPOSITS, 2011

	Total Loans (AED Million)	Total Deposits (AED Million)
National Bank of Abu Dhabi	159,522	151,817
First Gulf Bank	104,720	103,474
Dubai Islamic Bank	51,586	64,771
Union National Bank	57,581	60,315
Abu Dhabi Islamic Bank	48,831	55,172
Abu Dhabi Commercial Bank	124,755	109,887
Commercial Bank of Dubai	26,815	28,423
Emirates Islamic Bank	12,969	17,125
Bank of Sharjah	12,039	14,940
Sharjah Islamic Bank	10,427	10,399
National Bank of Umm Al Qaiwain	6,750	7,090
Commercial Bank International	7,865	8,435
InvestBank	7,849	7,539
Mashreq Bank	32,666	45,417
Emirates NBD	176,815	193,314
National Bank of Ras Al Kaimah	18,368	18,290
United Arab Bank	7,844	7,823
National Bank of Fujairah	10,505	10,339

Source: Bank annual reports, 2011.

EMPIRICAL FINDINGS

Table 5 displays some descriptive statistics for the sampled banks for 2011. The size of banks in the sample varied widely; the average bank had loans (total assets) of AED48,773 million (AED77,238 million) with a standard deviation of AED55,131 million (AED86,890 million). The average price of loans was 6.83% while the average price of borrowed funds was 1.95%, yielding an interest margin of 4.88%.

TABLE 5
DESCRIPTIVE STATISTICS, 2011

	Mean	Standard Deviation
<i>Output</i>		
Loans (AED millions)	48,773	55,131
<i>Input prices</i>		
Price of labor (AED millions)	619	603
Price of physical capital (%)	12.80	6.26
Price of borrowed funds (%)	1.95	0.70
<i>Other characteristics</i>		
Total assets (AED millions)	77,238	86,890
Total costs (AED millions)	1,741	1,705
Price of loans (%)	6.83	1.99

Table 6 shows the median and standard deviation of the Lerner Index for the sampled banks from 2003 to 2011. As indicated in the table, the competition of UAE national banks decreased between 2003 and 2006, increased in 2007, decreased again between 2008 and 2009, and then increased again between 2010 and 2011. Compared to 2003, competition decreased in 2011.

TABLE 6
LERNER INDEX FOR ALL BANKS, 2003-2011

Year	Median	Standard Deviation
2003	0.8763	0.0362
2004	0.8907	0.0267
2005	0.9125	0.0547
2006	0.9214	0.0286
2007	0.9093	0.0245
2008	0.9117	0.0162
2009	0.9250	0.0240
2010	0.9174	0.0236
2011	0.9099	0.0311

Table 7 displays the efficiency scores of all the banks in the sample. The market power of all banks in the sample increased except National Bank of Abu Dhabi, Sharjah Islamic Bank, and Mashreq Bank.

TABLE 7
LERNER INDEX FOR INDIVIDUAL BANKS, 2003-2011

Bank	2003	2011	Comment
National Bank of Abu Dhabi	0.8700	0.8204	Less market power
First Gulf Bank	0.8334	0.9375	Greater market power
Dubai Islamic Bank	0.8551	0.8777	Greater market power
Union National Bank	0.9025*	0.9211	Greater market power
Abu Dhabi Islamic Bank	0.7822	0.9101	Greater market power
Abu Dhabi Commercial Bank	0.8827	0.9222	Greater market power
Commercial Bank of Dubai	0.8678	0.9098	Greater market power
Emirates Islamic Bank	0.7001**	0.8742	Greater market power
Bank of Sharjah	0.9092	0.9271	Greater market power
Sharjah Islamic Bank	0.9117**	0.8890	Less market power
National Bank of Umm Al Qaiwain	0.9145	0.9348	Greater market power
Commercial Bank International	0.8994*	0.9273	Greater market power
InvestBank	0.9235	0.9453	Greater market power
Mashreq Bank	0.8845	0.8730	Less market power
Emirates NBD	0.8949	0.8958	Greater market power
National Bank of Ras Al Kaimah	0.8975	0.9371	Greater market power
United Arab Bank	0.8848	0.9002	Greater market power
National Bank of Fujairah	0.8547	0.9056	Greater market power

*2004 **2005

To explore the efficiency of the national banks, the panel data for all national banks that operated throughout the whole study period is used. The DFA approach is employed to calculate the efficiency scores of the banks. As shown in Table 8, InvestBank had the highest efficiency score while Mashreq Bank had the lowest efficiency score during the study period.

TABLE 8
BANKING EFFICIENCY, 2003-2011

Bank	Efficiency score
InvestBank	1.0000
National Bank of Umm Al Qaiwain	0.9827
United Arab Bank	0.9334
Bank of Sharjah	0.8810
National Bank of Ras Al Khaimah	0.8704
Commercial Bank International	0.8355
National Bank of Fujairah	0.8042
Abu Dhabi Commercial Bank	0.7968
First Gulf Bank	0.7859
Sharjah Islamic Bank	0.7680
Union National Bank	0.7457
Commercial Bank of Dubai	0.7340
National Bank of Abu Dhabi	0.6872
Abu Dhabi Islamic Bank	0.6568
Emirates Islamic Bank	0.6446
Emirates NBD	0.6324
Dubai Islamic Bank	0.5987
Mashreq Bank	0.4898

Table 9 presents the Lerner Index and efficiency score for all banks in the sample between 2003 and 2011. A negative relationship between competition and efficiency appears to exist. According to Demsetz's (1973) 'efficient structure hypothesis', the best managed firms have the lowest costs and consequently the largest market shares, which leads to a higher level of concentration. The negative link between banking competition and efficiency suggests that policies favoring banking competition should consider possible effects on financial stability.

TABLE 9
AVERAGE LERNER INDEX AND EFFICIENCY SCORE, 2003-2011

Year	Lerner Index	Efficiency Score
2003	0.8697	0.7441
2004	0.8858	0.6965
2005	0.8970	0.6551
2006	0.9149	0.5568
2007	0.9040	0.8064
2008	0.9093	0.8020
2009	0.9227	0.8099
2010	0.9138	0.7214
2011	0.9060	0.7099

Table 10 shows the pairwise Granger causality test results. Based on the p-values, the hypothesis that efficiency does not Granger cause competition and the hypothesis that competition does not Granger cause efficiency cannot be rejected.

TABLE 10
PAIRWISE GRANGER CAUSALITY TEST RESULTS, 2003-2011

Null Hypothesis	F-Statistic	p-Value
Efficiency does not Granger cause competition	0.8974	0.4442
Competition does not Granger cause efficiency	1.2933	0.2790

Table 11 presents the rankings based on efficiency score and bank size. Spearman rank correlation was calculated between bank size (proxied by total loans) and efficiency score. The correlation coefficient was negative and significant at 10% level. Smaller banks tend to be more efficient than larger banks.

TABLE 11
SPEARMAN RANK CORRELATION BETWEEN EFFICIENCY AND SIZE

Bank	Efficiency Rank	Loan Rank, 2011
InvestBank	1	16
National Bank of Umm Al Qaiwain	2	18
United Arab Bank	3	17
Bank of Sharjah	4	12
National Bank of Ras Al Khaimah	5	10
Commercial Bank International	6	15
National Bank of Fujairah	7	13
Abu Dhabi Commercial Bank	8	3
First Gulf Bank	9	4
Sharjah Islamic Bank	10	14
Union National Bank	11	5
Commercial Bank of Dubai	12	9
National Bank of Abu Dhabi	13	2
Abu Dhabi Islamic Bank	14	7
Emirates Islamic Bank	15	11
Emirates NBD	16	1
Dubai Islamic Bank	17	6
Mashreq Bank	18	8

CONCLUSION

In this study, we used a sample of 18 publicly listed UAE national banks to explore the competition and efficiency of the UAE banking sector between 2003 and 2011. The results indicate that there was increased competition among UAE national banks during the study period. All banks in the sample (except National Bank of Abu Dhabi, Sharjah Islamic Bank, and Mashreq Bank) increased their market power during this period. InvestBank was the most efficient bank while National Bank of Ras Al Kaimah was the least efficient bank. More efficient banks would benefit from lower costs and therefore have higher market shares. Competition increases cost efficiency. Bank managers respond to competitive pressure by keeping costs under control.

Granger Causality test results reveal that competition and efficiency does not Granger cause each other. Regarding the relationship between bank size and efficiency, it was found that smaller banks tend to be more efficient than larger banks.

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REFERENCES

Abbasoglu, O.F., Aysan, A.F., & Gunes, A. (2007). Concentration, Competition, Efficiency and Profitability of the Turkish Banking Sector in the Post-Crises Period. *Bank and Bank Systems*, 2, (3), 106-115.

- Chang, T.C. & Chiu, Y.H. (2006). Affecting Factors on Risk-adjusted Efficiency in Taiwan's Banking Industry. *Contemporary Economic Policy*, 24, (4), 634-648.
- Fitzpatrick, T. & McQuinn, K. (2005). Cost Efficiency in UK and Irish Credit Institutions. *The Economic and Social Review*, 36, (1), 45-66.
- Hunter W.C. & Timme, S.G. (1995). Core Deposits and Physical Capital: A Reexamination of Bank Scale Economies and Efficiency with Quasi-Fixed Input. *Journal of Money, Credit, and Banking*, 27, (1), 165-185.
- Inui, T., Park, J., Shin, H.H., Shin, D.J. & Wee, J.B. (2008). International Comparison of Japanese and Korean Banking Efficiency. *Seoul Journal of Economics*, 21, (1), 195-227.
- Kubo, K. (2006). The Degree of Competition in the Thai Banking Industry Before and After the East Asian Crisis. *ASEAN Economic Bulletin*, 23, (3), 325-340.
- Matousek, P. & Taci, A. (2004). Efficiency in Banking: Empirical Evidence from the Czech Republic. *Economics of Planning*, 37, (3), 225-244.
- Ozkan-Gunay, E.N. & Tektas, A. (2006). Efficiency Analysis of the Turkish Banking Sector in Precrisis and Crisis Period: A DEA Approach. *Contemporary Economic Policy*, 24, (3), 418-431.
- Pruteanu-Podpiera, A., Weill, L. & Schobert, F. (2008). Banking Competition and Efficiency: A Micro-data Analysis on the Czech Banking Industry. *Comparative Economic Studies*, 50, (2), 253-273.