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WHAT DRIVES THE EFFICIENCY OF SELECTED MENA BANKS? A META-FRONTIER ANALYSIS

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Abstract

In the past two decades, both developed and developing countries have deregulated their banking and financial systems with the aim of improving the efficiency, productivity and profitability of the sectors and increasing international competitiveness. This study attempts to examine the effect of institutional and financial variables on the banking industry performance of selected Middle Eastern and North African (MENA) countries. Evaluating bank efficiency in a non-parametric setting (Data Envelopment Analysis, DEA), we then employ a second-stage Tobit regression to investigate the impact of regulatory variables on banks' efficiency. The first stage indicates that Morocco and Tunisia have more efficient banking systems compared to the other selected MENA countries, although banks in Jordan seem to catch up with best practice from 2003 onwards. The Tobit regressions show a robust association of some environmental measures with cost efficiency. In this context, our results reveal that higher bank efficiency in our sample is influenced by the quality of the legal system, well capitalized and liquid banks. We also find that banking sector development measured by credit to private sector by banks in low regulated environments—like the one in our sample countries—tends to reduce bank efficiency. However, the impact of stock market development is positive and significant in all specification confirming the complementary role of bank and capital market. Besides, a highly concentrated banking sector in our sample reduces significantly the efficiency of banks. Finally, efficiency is improving in our sample thanks to the financial reforms variables not accounted for in our control variables and Egyptian banks display the lowest efficiency in the region for the entire sample period.

ملخص

خلال العقدين الماضيين عمدت الدول، سواء منها المتقدمة منها أم النامية، إلى تحرير نظمها في مجال الصرافة والمال، بغية رفع مستوى الكفاءة والإنتاجية والربحية للقطاعات، وكذا زيادة التنافسية الدولية. وتسعى هذه الدراسة إلى دراسة آثار المتغيرات المؤسساتية والمالية على الأداء في مجموعة منتخبة من دول الشرق الأوسط وشمال أفريقيا في مجال الصرافة. فبعد تقييمنا لكفاءة البنوك في سياق غير بارامتري (التحليل التطويقي للبيانات) سنعمد إلى المرحلة الثانية بالاستعانة بنموذج انحدار توبت (نموذج انحدار مراقب) لبحث تأثير المتغيرات التنظيمية على كفاءة البنوك. وتشير المرحلة الأولى إلى أن المغرب وتونس تحظيان بنظم مصرفية أكثر كفاءة من مثيلاتها في غيرهما من الدول المنتخبة من دول الشرق الأوسط وشمال أفريقيا. وذلك على الرغم من أن البنوك في الأردن منذ 2003 فصاعدا قد شرعت تضاهي أجود الأمثلة في هذا المجال. وتبين انحدارات توبت ارتباطا قويا بين بعض الإجراءات البيئية وبين كفاءة التكلفة. وفي هذا السياق تكشف نتائجنا أن تحسن الكفاءة المصرفية في عينتنا إنما تتأثر بجودة النظام القانوني والبنوك ذات رأس المال والسيولة النقدية الجيدة. كما نجد أيضا أن نمو قطاع الصرافة يجنح إلى الحد من الكفاءة البنكية إذا قسنا ذلك النمو بما يحصل عليه القطاع الخاص من قروض مصرفية وسط بيئة تخضع لقدر محدود من التنظم. ومهما يكن من أمر فإننا نجد تأثيراً إيجابيا ذا بال من كافة الوجوه لتطوير البورصة، مما يؤكد الدور التكاملي لسوق الصرافة والمال. أضف إلى ذلك أن الكثافة الزائدة في عدد البنوك بالقطاع المصرفي في عينتنا تحدث هبوطا ذا بال في كفاءة تلك البنوك. ويمكننا القول في نهاية المطاف إن الكفاءة في طريقها إلى الزيادة في عينتنا نظراً لبعض التغيرات في مجال الإصلاحات المالية غير المبررة في متغيرات التنظيم لدينا، كما نجد أن البنوك المصرية قد اتسمت طوال فترة العينة بالهبوط في الكفاءة.

1. Introduction

Many economies, both in developed and developing countries, have deregulated their banking systems over the past two decades, with the primary objective being to improve productivity, efficiency and profitability of the banking systems and also to increase international competitiveness. Developing countries mostly following International Monetary Fund (IMF) and/or World Bank inspired programs to improve the performance and efficiency of their financial sectors, to improve in turn their overall economic performance. Indeed, a strong and stable banking system has been advocated as being the cornerstone in many liberalization programs (Saunders and Sommariva, 1993).

Such process of financial reform has also been undertaken in some Middle Eastern and North African (MENA) countries with the aim to establish a market-based financial sector—to boost competition within banks through improved mobilization of savings, to enhance market-based allocation of resources and to foster more efficient risk-management capabilities.

However, the conventional wisdom relating to the positive effect of reforms on financial sector performance is not always validated by empirical studies (Berger et al., 2000). Despite a vast literature on the effects of deregulation on the efficiency and productivity of banks, (see Berger and Mester, 2003; Mukherjee et al., 2001; Isik and Hasan, 2003 among others) deregulation seems to have had a positive effect in some countries but not in others. Indeed, the outcome of deregulation policies seems to reflect several country-specific demand and supply conditions of the banking industry prior to deregulation.

This study attempts to shed some light on these issues by examining the effect of institutional development, financial structure and bank-specific characteristics on the efficiency and performance of the banking sector in Egypt, Jordan, Morocco and Tunisia. These MENA countries share similarities in terms of economic structure —the order of implementation of structural adjustment programs, the liberalization of state-owned companies and attraction of direct foreign investments, and resource-scarcity in relation to population. Despite the substantial transformation of the countries' banking and financial sectors in recent years, and the fact that the regulatory requirements imposed by national regulators are now in line with international standards, there is still a lack of empirical studies investigating the impact of financial and institutional reforms on bank performance and efficiency. This paper contributes both to the international debate on the impact of deregulation on the banking system of developing countries and whether the reform process is translating into more efficient and sound banking systems. It also contributes to the understanding of the dynamics of economic development of the MENA region.

The rest of the paper is organized as follows. Section 2 discusses the existing literature on the effects of financial reforms on banks performance and efficiency competition. Section 3 describes the methodology, the data and the variables used. The empirical results are illustrated in Section 4 and Section 5 concludes.

2. Literature Review

There is a vast literature on the use of frontier techniques to evaluate bank efficiency, using both parametric and non-parametric methodologies. While earlier studies focused on one methodological approach and on individual countries (for the US or EU countries see Berger and Humphrey, 1997 for a literature review), in recent years both the number of cross-country studies and the number of studies focusing on developing counties has increased, mainly due to the unprecedented economic reforms implemented in such countries (see, among others, Fries and Taci, 2005; Grigorian and Manole, 2006).

Most cross-country studies assume that banks in different countries can access the same banking production technology. In other words, they assume a common production frontier for all countries in order to be able to compare efficiency results across borders. The interpretation of the resulting efficiency scores relies significantly on the validity of this assumption. In some cases this is a major drawback, as the production technology is substantially different among countries, particularly if countries are a different levels of financial development. Bank efficiency estimates may be influenced by factors not generally included in the efficiency analysis, such as differences in bank type, ownership, and other bank specific conditions. In such cases, the assumption of a common frontier may be misleading. Further, such assumption can lead to biased efficiency results for banks from different countries as it ignores differences in regulatory, competitive and economic conditions that are beyond a bank's control (Dietsch and Lozano-Vivas, 2000; Chaffai et al., 2001)).

Bos and Kool (2006) indicates that if environmental factors are not appropriately controlled, efficiency estimates may be biased. Recent empirical studies have attempted to overcome this problem by integrating country-specific environmental variables into the efficiency estimation. There are various ways to incorporate environmental variables in the estimation of bank efficiency, the most commonly used are the one-step and the two-step approaches[1].

In the one-step approach, environmental variables are included directly in the estimation of efficiency whereas in the two-step approach efficiency scores obtained in the first stage of analysis are then regressed on a number of country-specific environmental variables. Both approaches are employed in the literature; the one-step approach seems to be the preferred choice if using a parametric approach to the efficiency evaluation[2], following the maximum likelihood procedure of Battese and Coelli (2005).

On the other hand, the two step approach seems to be the favored approach if efficiency is estimated by means of Data Envelopment Analysis (DEA). In a typical two-stage study, the relative efficiency of each institution is evaluated in the first stage and then regressed (as the dependent variable in an ordinary least squares or a Tobit regression) on various explanatory variables in the second stage to identify the factors whose impact on efficiency is statistically significant.

The influence of environmental variables on cross-country efficiency levels has been of interest for many researchers. Bikker (2002) investigates the differences in X-efficiency levels of European banks and concludes that X-efficiency estimates from single-country studies, as often found in the literature, can be very misleading. He documents significant differences in cost efficiency scores across countries and sizes of banks, bank specialization as well as institutional conditions (supervisory rules, government interference, customer preferences and level of development).

Bos et al. (2005) analyze the effects of accounting for heterogeneity on the German bank efficiency scores for the period 1993-2003. They find that banks of different sizes, geographic origins, and types (cooperative and savings) have significantly different cost-efficiency scores. Dietsch and Lozano-Vivas (2000) investigate the influence of the environmental conditions on the cost-efficiency of French and Spanish banking sector over the period 1992-1998. They show that the specific environmental conditions of each country

[1] For more details on the one-stage and two-stage approaches, see Coelli et al. (1999, 2005).

[2] Fries and Taci (2005) review the advantages of using a one-step estimation of the determinants of inefficiency over the alternative two step estimation. Specifically, performing a two-step analysis in a parametric setting violates the assumption made in the first step that the bank inefficiency components of the error terms from the cost efficiency frontier are independently and identically distributed. See also Kumbhakar and Lovell (2003) for a complete methodology review on incorporating exogenous influence on efficiency.

occupy an important role in the definition and specification of the common frontier of different countries. In fact, when environmental variables are incorporated in the model the differences between both banking industries are reduced substantially and the cost-efficiency scores improved. Chaffai et al.'s (2001) study on a sample of European countries over the period 1993–1997 reports similar findings. They conclude that controlling for environmental conditions reduces the differences in average operational inefficiency scores among countries. Grigorian and Manole (2006) use a DEA approach to estimate the efficiency levels of transition countries between 1993 and 1995 and use a two step approach to explain the differences in efficiency across countries. They find that foreign ownership and enterprise restructuring enhance commercial bank efficiency. Bos and Kool (2006), on the other hand, find that market-specific factors and regional macroeconomic factors are of limited importance in explaining operational efficiency of the Dutch cooperative banking sector. Battese et al. (2004) have recently proposed a so-called "meta-frontier" as a method to estimate country or regional-specific frontiers and end up with efficiency scores that can be compared in an absolute sense. The meta-frontier results from the envelopment of regional specific frontiers. Bos and Schmiedel (2003), apply the meta-frontier methodology to eight European banking markets for the period 1993–2000. The authors conclude that for most countries included in the study, profit efficiency in particular improves significantly when estimated using a meta-frontier instead of a common frontier arguing that this may be evidence of the importance of local market circumstances.

However, the meta-frontier approach provides us with little information on the determinants of the differences in the regional-efficient frontiers. In this paper we therefore use a two-stage approach to complement the efficiency scores derived from the meta-frontier estimation. First, we estimate a single efficient cost frontier respectively for all banks in our sample. Second, we attempt to measure the marginal impact of local (country specific) market and regulatory variables. This approach allows us to tests the significance of each of these variables as well as their combined impact of all these on cost efficiency.

3. Methodology and Data

3.1 Measuring Efficiency by means of DEA

Following the work of Debreu (1951), Koopmans (1951), Shephard (1953, 1970) and Farrell (1957) the efficiency of a firm can be defined and measured as the radial distance of its actual performance from a frontier. There is a very large and well-established literature on the measurement of efficiency frontiers which can be divided in two main streams: parametric techniques, such as the Stochastic Frontier Analysis (SFA) and non-parametric techniques such as DEA.

In this study, we follow the non-parametric DEA approach to measure inefficiency[3]. DEA is a mathematical linear programming technique developed by Charnes, Cooper and Rhodes in 1978 (CCR) which identifies the efficient frontier from the linear combination of those units/observations that (in a production space) use comparatively less inputs to produce comparatively more outputs. In particular, if N firms use a vector of inputs to produce a vector of outputs, the input-oriented CCR measure of efficiency of a particular firm is calculated as:

[3] For further details on DEA see, among others, Thanassoulis (2001); Coelli (2005)

$$\min_{\theta,\lambda} \theta_i$$

$$s.t. \quad \sum_{r=1}^{N} y^t{}_{mr} \lambda^t{}_r \geq y^t{}_{mi} \qquad (1)$$

$$\sum_{r=1}^{N} x^t{}_{kr} \lambda^t{}_r \leq \theta_i x^t{}_{ki}$$

$$\lambda^t{}_r \geq 0$$

Where $\theta_i \leq 1$ is the scalar efficiency score for the i-th unit. If $\theta_i = 1$ the i-th firm is efficient as it lies on the frontier, whereas if $\theta_i < 1$ the firm is inefficient and needs a $(1-\theta_i)$ reduction in the inputs levels to reach the frontier.

The CCR model assumes constant returns to scale (CRS), which is the optimal scale in the long-run. The additional convexity constraint $\sum \lambda_i = 1$ can be included in (1) to allow for variable returns to scale (VRS) (see Banker, Charnes and Cooper (1984) or BCC model). The BCC model therefore measures pure technical efficiency and scale efficiency, calculated as the difference between the CCR score and the BCC score. The BCC model is used in this paper since several factors such as imperfect competition and regulatory requirements may cause a unit not to operate at the optimal scale.[4]

Given that units in our sample are based in different countries, it is possible to identify a "regional frontier" using DEA on the data for units from a specific country. Following Battese et al. (2004), DEA is firstly used to construct K regional frontiers. The meta-frontier is then obtained by pooling all the observations for units from all the regions.

The choice of using a DEA approach for this study is based on several considerations: DEA works well even with a small sample size and it does not require any assumption about the functional form of the frontier or of the inefficiency component. We adopt an input-minimization orientation, based on the assumption that during periods of regulatory changes and increased competition market participants strategically focus on cutting costs; therefore we would expect changes in inputs use to be closely associated with the changes in market structure. The existing literature (see Goddard et al., 2001) has traditionally focused on the estimation of input or cost based efficiency, assuming that bank management has more control over costs rather than over outputs. The estimations are run on a common frontier for all the countries in the sample. We then focus on assessing the impact of contextual variables on bank efficiency using a two-step approach. Banker (2008) results indicate that a two-step DEA-based procedure with OLS, maximum likelihood or Tobit estimation in the second stage perform considerably better than one-stage parametric methods.

3.2 Input and Output Definition

There are two main approaches to the definition of inputs and outputs of financial institutions— the production approach and the intermediation approach (Frexias and Rochet, 1997). Both approaches are widely used in the literature and there is no consensus on the superiority of one to the other (Berger and Humphrey, 1997). In this study we follow the intermediation approach. This approach, accredited to Sealey and Lindley (1977), views financial institutions as mediators between the supply and the demand of funds. As a consequence, deposits are considered as inputs, and interest on deposits is a component of total costs, together with labor and capital. In the cross-country setting of the present study, the need for comparable data from different countries imposes strong restrictions on variables one is able to use, not least because of the various accounting criteria used in the four

[4] For an introduction to DEA methodology see, among others, Coelli et al. (1998); Thanassoulis (2001); see Lovell (1993) and Seiford (1996) for extensive reviews of this literature.

countries under investigation. To minimize possible bias arising from different accounting practices, the broad definition of variables as presented by Bankscope was chosen. Specifically, the input variable used in this study is Total Costs (Personnel Expenses + Other Administrative Expenses + Interest Paid + Non-Interest Expenses) whereas the output variables capture both the traditional lending activity of banks (total loans) and the growing non-lending activities (other earning assets).

3.3 Environmental Variables

In this section we introduce our contextual variables, particularly our proxies for the institutional and regulatory environment in the countries under study. Specifically, we utilize proxies for institutional development, financial structure and specific bank characteristics.

3.3.1 Institutional Development

According to the literature (Barth et al., 2003b) official government power hampers bank development in countries with a closed political system. To test this hypothesis we include various institutional indexes: Bureaucracy Quality (BC), Corruption (C), Democratic Accountability (DA), Government Stability (GS), Investment Profile (I), Law and Order (LO) and Socioeconomic Conditions (SC). These proxies reflect the political stability of the countries and allocate risk points to a preset group of factors, termed political risk components. The minimum number of points that can be assigned to each component is zero, while the maximum number of points depends on the fixed weight that component is given in the overall political risk assessment. The lower the risk point total, the higher the risk, and vice versa.

To ensure consistency, both between countries and over time, points are assigned by International Country Risk Guide (ICRG) on the basis of a series of preset questions for each risk component. For example, the institutional strength and quality of the bureaucracy (BC) is considered a shock absorber that tends to minimize revisions of policy when governments change. Therefore, high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. In low-risk countries, the bureaucracy tends to be somewhat autonomous from political pressure and to have an established mechanism for recruitment and training.

The corruption (C) within the political system distorts the economic and financial environment, reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability; and introduces an inherent instability into the political process. The most common form of corruption met directly by business is financial corruption in the form of demands for special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans. Such corruption can make it difficult to conduct business effectively, and in some cases my force the withdrawal or withholding of an investment. For instance, Barth et al. (2004a) argued that powerful supervision may lead to corruption or distortions and/or impede bank operations. Our study takes such index into account in order to control the risk to foreign business.

Democratic Accountability (DA) is a measure of how responsive the government is to its people, on the basis that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one. The points in this component are given on the basis of the type of governance enjoyed by the country in question.

Government Stability (GS) is an index of the government's ability to carry out its declared program(s), and its ability to stay in office. The risk rating assigned is the sum of government unity, legislative strength and popular support. A score of 4 points equates to

very low risk and a score of 0 points to very high risk. The threat to foreign investment can be assessed through the index of corruption.

Investment Profile (I) proxies the factors affecting the risk to investment that are not covered by other political, economic and financial risk components. The risk rating assigned is the sum of three subcomponents; contract viability/expropriation, profits repatriation and payment delays. Each element has a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to very low risk and a score of 0 points to very high risk.

Law and Order (LO) are assessed separately, with each sub-component comprising zero to three points. The Law element is a measure of the strength and impartiality of the legal system, while the Order element is an assessment of popular observance of the law. Thus, a country can enjoy a high rating in terms of its judicial system, but a low rating if it suffers from a very high crime rate or if the law is routinely ignored without effective sanction.

Socioeconomic Conditions (SC) assesses the socioeconomic pressures at work in society that could constrain government action or fuel social dissatisfaction. The risk rating assigned is the sum of three subcomponents; unemployment, consumer confidence and poverty. Each element can take a maximum score of four points (very low risk) and a minimum score of 0 points (very high risk).

3.3.2 Financial Structure

The recent literature links financial development to economics efficiency and productivity growth (Kasman and Yildirim, 2006). The following variables are used to proxy the countries' financial structure: capitalization, turnover, total shares traded and concentration.

The stock market is an economic foundation, which promotes efficiency in capital formation and allocation. It enables banks to raise long-term capital for financing new projects. The stock market development can be the index stock liquidity which is measured by the ratio of the value of total shares traded to average real market capitalization (TURNOVER) or the index of size which is calculated as the ratio of market capitalization of the stock exchange over GDP (MCAP). The higher the total shares traded, the more liquid the shares. Dey (2005) shows a positive relationship between high turnover stock portfolios and returns. We expect a positive link between TURNOVER and the efficiency levels. Besides, a positive impact of MCAP on bank efficiency is expected if the banking sector and capital market are complementary and a negative impact in case of competition between both financial sector compartments.

With respect to measuring the stock market, we use also the ratio of total shares traded on the stock market exchange to GDP (VTRADED). A rise in the trading value of shares on an exchange is indicative of interest in the security or the stock market. The trading volume and value reflects the level of liquidity, the efficiency of the infrastructural facilities of the stock market and the investment culture of the general investors. Liquidity can be measured with the facility with which a stock is converted into liquidity. A well developed stock market eases the access of banks to more sources of liquidity which can be translated into higher efficiency levels.

Concentration in the banking sector industry can provide a wide range and long-lasting implications for financial sector efficiency, bank stability, competitiveness and regulations. The results about concentration are diverse. On one hand, concentration increases market power and hence prevent competition and efficiency. On the other hand economies of scale drive bank mergers and acquisitions, so that increased concentration leads to efficiency improvements (Demirguc-Kunt and Levine, 2000). While policymakers are concerned about banking sector competitiveness and stability, it seems important to assess the impact of concentration on the efficiency of banks. We define the proxy of concentration as the

percentage of assets held by the three largest commercial banks relative to the total assets of all commercial banks.

3.3.3 Bank Characteristics

Finally, to control for differences bank characteristics we use the following proxies. EQTA is the equity to assets ratio and controls for capital strength. High level of equity alleviates the risk of insolvency and ultimately, the cost of borrowed funds. Banks with larger capitalization are less likely to become insolvent. Berger (1995) shows that for US banks there is a positive relationship between bank profitability and capitalization. He concludes that well-capitalized firms face lower expected bankruptcy costs for themselves and their customers, thereby reducing their cost of funding. We expect a positive relationship between efficiency and capitalization.

NETLOANS is defined as net loans to total assets. Banks with important volume of loans are more exposed to credit risk and have higher net interest margins. Banks are exposed to default risks on their loans due to the asymmetric information that reigns *ex ante*. Therefore, they have to be efficient in transforming deposits into loans without incurring excessive risks. We expect a negative relationship between efficiency and credit risk which can be explained by the bad assessment of managers of the implicit risk of borrowers, which would explain why bad management raises inefficiency.

Finally, LIQ is defined as the ratio of liquid assets to deposits and short-term funding. This ratio represents the risk of not having sufficient cash to satisfy unexpectedly high withdrawal of deposits or new loan requests, pushing up banks to borrow funds at excessive cost. Thus, as the fraction of liquid funds invested in cash and short term fund increases, the liquidity risk of the bank declines.

3.4 Data

We have constructed our bank datasets from the BankScope dataset of Bureau van Dijk. The database used includes 45 unconsolidated bank statements from Egypt, Jordan, Morocco and Tunisia over a 14-year period (1993 to 2006). We limit our analysis to publicly traded commercial banks for better homogeneous comparability among banks and countries. The institutional data was taken from the ICRG system which presents a comprehensive risk structure for the country with ratings for its overall political, financial, and economic risk and for the risk components that make up these risk categories. The financial structure data was drawn from the updated Thorsten Beck database (2007) which is published by the World Bank.

4. Empirical Results

This section presents the empirical results of the non-parametric technique, DEA of the banks in selected MENA countries and the two-stage procedure which uses the environmental variables as explanatory variables of the efficiency scores differences.

4.1 DEA Efficiency Results

DEA only computes efficiencies for any given bank against other firms in the sample. Efficiency measures are thus relative measures. The computed efficiency scores are based on an assessment of all banks within the year. An efficiency score of one indicates that the bank rests on the production frontier. An efficiency score of less than one indicates that the bank is inefficient, with the inefficiency measured as the distance between the observations' own score and the best practice. The lower the efficiency score, the less efficient is the bank relative to the best practice banks. Recall that the efficiency score for a given unit is relative to the meta-frontier identified using data from all the units in all regions.

Table 1 presents the results of the DEA estimations. The scores indicate the efficiency levels obtained by pooling all the observations for units from all the regions.

Table 1 shows that the average efficiency score for the four MENA countries is 77.8%, which indicates that banks, on average, are wasting 22.2% of their resources. Average efficiency results range from 70.61% in 1993 to 83.23% in 2003, decreasing to 74.6% in 2006. The annual average efficiency scores of Moroccan and Tunisian banks were the highest among the four MENA countries, while the lowest efficiency levels were displayed by Egyptian banks. Annual average trends are illustrated in Figure 1.

Egyptian banks reached their highest average efficiency in 1996 but then progressively deteriorate in the latest part of the sample period (2004, 2005 and 2006). The average bank efficiency in Egypt and Jordan could be improved by 38.5% and 22.9%, respectively. In other words, if the average bank was producing on the best practice frontier instead of its current level, only 61.5% of the inputs being used by banks in Egypt would be necessary to produce the same output levels. Morocco and Tunisia seem to have more efficient banking systems compared to Jordan and Egypt, although banks in Jordan seem to be catching up with best practice since 2003.

The results presented so far allow us to identify both the efficiency levels of the MENA countries banking systems and their evolution over time[5]. Results seem to highlight a general improvement in efficiency levels during the period 1994 to 1998 and then a decline, particularly remarkable in Egypt. Indeed, the gap between Egyptian banks and the region average is increasing over time. This trend is reversed by Jordan, whose banking sector efficiency outperforms the region average from 2002 onwards. These results, however, do not offer any insight into what might be driving the efficiency level differentials in the four MENA countries. In the next stage of the analysis we attempt to shed some light on this issue, by investigating the impact of the institutional, structural and regulatory environment.

4.2 Tobit Regression Results

DEA efficiency scores fall between 0 and 1, making the dependent variable a limited dependent variable. Therefore we use a Tobit regression model in the second stage of the analysis, where we test the impact of institutional and financial sector variables on bank efficiency and we control for macroeconomic and bank-specific variables as defined in sub-section 3.2.

We estimate several specifications of the Tobit model. For each specification, we examine the impact of each institutional related variable on the efficiency of banks in the selected MENA countries to preserve degrees of freedom and reduce the potential for multicollinearity. To account for the incidence of stock market development on bank efficiency, we also include different measures such as market capitalization over GDP, value traded over GDP and turnover that measures respectively capital market size, liquidity and efficiency.

The regression results obtained with different sets of institutional and control variables are presented in Tables 2 to 4. In each table, seven specifications are displayed for bank efficiency depending on the institutional variables used. The estimation sample includes, for all specification, 45 banks with 593 observations over a time span of 14 years.

All tables show that highly capitalized and liquidity banks tend to have better efficiency which is in line with previous studies (Berger and Meyer, 1997; Reda and Isik, 2007). However, bank risk measured by net loans over total assets has no significant impact on bank efficiency in our sample. Indeed, banks with sound capital positions face lower costs of going

[5] We have a balanced sample of 45 observations for the 14 years of analysis.

bankrupt, which reduces their cost of funding. They also have lower needs for external funding, which results in higher profitability. Alternatively, this positive relationship between efficiency and bank capitalization may be an indicator that owners with less capital at stake might have less incentive to make sure that the bank is well managed. Besides, with less control from owners, bank managers with lower capitalization have more incentives to consume perks. The positive impact of liquidity on bank efficiency is mainly explained by the fact that very liquid banks are less involved in financing risky loans that turn to be nonperforming and are therefore more efficient.

We now turn to the effect of concentration and financial structure on bank efficiency. The negative and significant impact of the credit to private sector by banks over GDP is consistent with the evidence that the relationship between banking sector development and economic growth in the MENA region is negative (see Ben Naceur and Ghazouani, 2007). This excessive availability of funds in the region and the lack of strong supervisory and governance structure contribute to overinvestment in low profitability projects that decrease banking efficiency.

Another important finding of this study is that all stock market development measures have positive and significant impacts on bank efficiency score in accordance with previous studies (Kasman and Yildirm, 2006; Pasiouras et al. 2007; and Pasiouras, 2007). This finding supports the view of Pasiouras et al. (2007) "as stock markets develop, improved information availability increases the potential pool of borrowers, makes it easier for banks to identify and monitor them, which can obviously have a positive impact on bank efficiency." Besides, this positive relationship between stock market development and bank efficiency confirms the complementary effect between equity and bank financing and justifies the move toward a more market base financial structure in our sample.

As expected, higher concentration results in lower cost efficiency. This result is in accordance with Berger (1995) and Athanasoglou et al. (2008) who claim that a more competitive banking sector contributes to improving the efficiency scores and performance of banks.

Turning now to the institutional explanatory variables, we find that the only institutional variable that has a positive and significant impact on bank efficiency is Law and Order. This variable measures the quality of the judicial system and a better legal system could provide to the banks efficient means to recollect their loans in case of defaults and restrain borrowers from investing in excessively risky and low returns activities. Therefore, improvement in bank efficiency is not linked to lower bureaucracy and corruption and democracy but rather to a well-functioning legal system with contract enforcement.

Finally, to account for market changes in efficiency across time and countries, we introduce years and country dummies in the models. All years are compared to the basis 1993 and all countries are compared to Egypt (least efficient baking system in the first stage analysis). The overall results from the Tobit regressions indicate that the mean efficiency scores are generally higher than those of the basis year meaning that efficiency improves during the period of study thanks to the strong reform program in the financial system undertaken during the same period. Also, the results confirm the univariate results that banks in Jordan, Tunisia and Jordan have better efficiency scores than those in Egypt.

5. Findings and Conclusion

This study attempts to examine the effect of deregulation policies on the performance of selected Middle Eastern and North African (MENA) countries banking industry over the period 1993–2006. Evaluating bank efficiency in a non-parametric setting (DEA), we then employ a second-stage Tobit regression to investigate the impact of institutional, financial

and bank characteristics variables on banks' efficiency. The first stage indicates that Morocco and Tunisia have more efficient banking systems compared to the other selected MENA countries, although banks in Jordan seem to catch up with best practice from 2003 onwards.

The empirical results show a robust association of some environmental measures with cost efficiency. In this context, our results reveal that bank efficiency in our sample is influenced by the quality of the legal system. Our results also indicate that well capitalized and liquid banks display higher efficiency scores. We also find that banking sector development measured by credit to private sector by banks in a low regulated environment tends to reduce bank efficiency. However, the impact of stock market development is positive and significant in all specifications confirming the complementary role of bank and capital markets. Furthermore, a highly concentrated banking sector reduces significantly the efficiency of banks. Finally, efficiency is improving in our sample thanks to the financial reforms variables not accounted for in our control variables and Egyptian banks display the lowest efficiency in the region for the entire sample period.

For the sake of reinforcing efficiency in Egypt, Jordan, Morocco and Tunisia, banks should reinforce their capitalization and liquidity. Local authorities should further improve the legal system and the regulatory and supervisory bodies to reduce inefficiency in allocating financial resources. Competition should be enhanced to enable banks to better control their costs. Last but not least, stock markets in the region need to be upgraded to help banks better identify and monitor borrowers.

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Figure 1: DEA Efficiency Scores

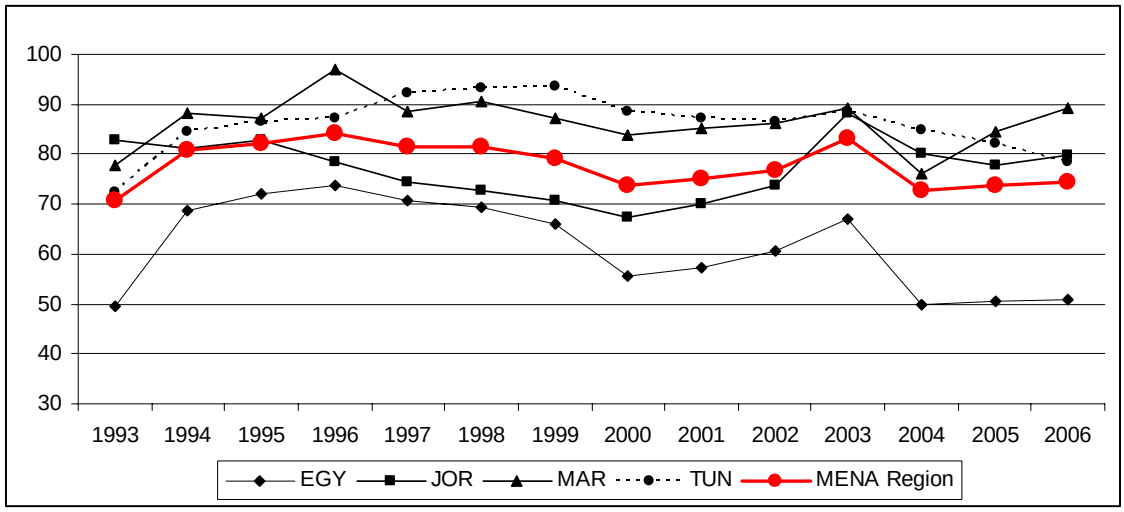

Table 1: DEA Efficiency Scores

	EGY	JOR	MAR	TUN	Average MENA Region
1993	49.56	82.84	77.80	72.24	70.61
1994	68.75	81.03	88.17	84.66	80.65
1995	71.99	82.92	87.29	86.38	82.15
1996	73.73	78.59	96.90	87.25	84.12
1997	70.85	74.30	88.57	92.12	81.46
1998	69.30	72.65	90.57	93.18	81.43
1999	65.88	70.59	87.07	93.48	79.26
2000	55.53	67.50	83.81	88.63	73.87
2001	57.36	70.03	85.15	87.22	74.94
2002	60.59	73.84	86.37	86.64	76.86
2003	66.89	88.20	89.14	88.71	83.23
2004	50.01	80.15	76.04	84.69	72.72
2005	50.48	77.78	84.43	82.25	73.73
2006	50.89	79.84	89.30	78.34	74.59
Average	61.56	77.16	86.47	86.13	77.83

Table 2: The Impact of Institutional, Financial Structure and Specific Variables on Bank Efficiency in Egypt, Jordan, Morocco and Tunisia (controlling for market capitalization as a measure for stock market development) – Tobit Regression Results

	(1) EFF	(2)	(3)	(4)	(5)	(6)	(7)
EQTA	0.416	0.419	0.409	0.380	0.364	0.434	0.415
	(3.21)***	(3.02)***	(3.05)***	(2.93)***	(2.67)***	(3.11)***	(2.89)***
LIQ	0.230	0.196	0.195	0.200	0.168	0.146	0.208
	(3.91)***	(3.15)***	(3.13)***	(3.25)***	(2.89)***	(2.53)**	(3.42)***
NETLOANS	-0.031	-0.033	-0.031	-0.026	-0.049	-0.023	-0.017
	(0.63)	(0.65)	(0.63)	(0.51)	(0.98)	(0.47)	(0.34)
CREDITPR	-0.481	-0.508	-0.496	-0.503	-0.446	-0.487	-0.486
	(3.83)***	(4.08)***	(4.28)***	(3.33)***	(3.77)***	(4.27)***	(4.03)***
CONC	-0.473	-0.475	-0.456	-0.468	-0.524	-0.177	-0.432
	(2.44)**	(2.43)**	(2.40)**	(2.29)**	(2.67)***	(0.82)	(1.90)*
MARKETCAP	0.064	0.066	0.066	0.066	0.057	0.094	0.066
	(1.90)*	(2.10)**	(2.11)**	(2.04)**	(1.76)*	(2.86)***	(2.11)**
BC	-0.012						
	(0.30)						
C		-0.006					
		(0.41)					
DA			0.003				
			(0.55)				
GS				-0.002			
				(0.09)			
I					0.009		
					(1.28)		
L&O						0.059	
						(2.77)***	
SC							-0.004
							(0.23)
JOR	0.436	0.442	0.426	0.422	0.437	0.312	0.414
	(5.51)***	(4.83)***	(5.18)***	(4.57)***	(5.44)***	(3.02)***	(4.21)***
MAR	0.326	0.329	0.266	0.317	0.225	0.217	0.316
	(4.89)***	(4.55)***	(6.69)***	(4.78)***	(5.17)***	(2.58)***	(4.34)***
TUN	0.366	0.344	0.347	0.332	0.291	0.321	0.245
	(7.98)***	(6.81)***	(7.02)***	(7.67)***	(5.78)***	(6.39)***	(5.13)***
Y1994	0.134	0.135	0.134	0.134	0.135	0.101	0.134
	(5.37)***	(5.40)***	(5.40)***	(5.41)***	(5.47)***	(3.65)***	(5.35)***
Y1995	0.156	0.158	0.158	0.158	0.159	0.110	0.156
	(6.07)***	(6.15)***	(6.18)***	(6.06)***	(6.27)***	(3.55)***	(6.07)***
Y1996	0.168	0.165	0.173	0.171	0.172	0.124	0.168
	(6.11)***	(5.62)***	(6.21)***	(5.66)***	(6.36)***	(3.84)***	(6.12)***
Y1997	0.147	0.146	0.154	0.153	0.138	0.117	0.147
	(4.90)***	(4.58)***	(5.02)***	(3.95)***	(4.32)***	(3.58)***	(4.85)***
Y1998	0.146	0.148	0.158	0.156	0.125	0.119	0.148
	(4.45)***	(4.44)***	(4.72)***	(3.13)***	(3.11)***	(3.47)***	(4.48)***
Y1999	0.125	0.127	0.137	0.136	0.100	0.100	0.127
	(3.50)***	(3.57)***	(3.83)***	(2.15)**	(2.26)**	(2.74)***	(3.58)***
Y2000	0.060	0.063	0.072	0.073	0.032	0.032	0.062
	(1.63)	(1.73)*	(1.97)**	(1.03)	(0.70)	(0.85)	(1.68)*
Y2001	0.097	0.100	0.109	0.111	0.077	0.064	0.098
	(2.56)**	(2.72)***	(2.91)***	(1.40)	(1.78)*	(1.65)*	(2.46)**
Y2002	0.138	0.138	0.149	0.151	0.126	0.104	0.138
	(3.54)***	(3.53)***	(3.89)***	(1.77)*	(3.17)***	(2.61)***	(3.35)***
Y2003	0.222	0.221	0.221	0.235	0.211	0.190	0.222
	(6.00)***	(5.84)***	(6.06)***	(2.59)***	(5.59)***	(5.01)***	(5.48)***
Y2004	0.065	0.063	0.073	0.079	0.051	0.030	0.064
	(1.83)*	(1.70)*	(2.07)**	(0.73)	(1.39)	(0.81)	(1.61)
Y2005	0.066	0.063	0.073	0.079	0.055	0.020	0.065
	(1.87)*	(1.70)*	(2.05)**	(0.70)	(1.51)	(0.50)	(1.61)
Y2006	0.132	0.132	0.138	0.148	0.124	0.042	0.127
	(2.65)***	(2.64)***	(2.75)***	(1.04)	(2.47)**	(0.71)	(2.16)**
Constant	0.855	0.875	0.829	0.873	0.857	0.488	0.838
	(5.60)***	(5.71)***	(6.49)***	(3.33)***	(6.64)***	(2.69)***	(6.52)***
Wald chi2 (23)	328.06***	280.95***	294.61***	310.76***	284.37***	369.69***	275.12***
Log Likelihood	238.23	238.14	238.62	238.26	241.10	242.26	236.65
Observations	593	593	593	593	593	593	593
Number of banks	45	45	45	45	45	45	45

Table (3): The Impact of Institutional, Financial Structure and Specific Variables on Bank Efficiency in Egypt, Jordan, Morocco and Tunisia (controlling for valued traded as a measure for stock market development) – Tobit Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EQTA	0.388	0.421	0.405	0.400	0.384	0.416	0.435
	(2.99)***	(3.02)***	(2.95)***	(2.96)***	(2.96)***	(3.09)***	(3.09)***
LIQ	0.199	0.206	0.197	0.199	0.209	0.193	0.158
	(3.20)***	(3.37)***	(3.18)***	(3.41)***	(3.41)***	(3.11)***	(2.58)***
NETLOANS	-0.036	-0.036	-0.034	-0.036	-0.038	-0.037	-0.026
	(0.71)	(0.70)	(0.67)	(0.70)	(0.78)	(0.74)	(0.52)
CREDITPR	-0.420	-0.444	-0.437	-0.475	-0.402	-0.420	-0.403
	(3.67)***	(3.76)***	(4.01)***	(3.17)***	(3.64)***	(3.69)***	(3.74)***
CONC	-0.513	-0.519	-0.506	-0.528	-0.562	-0.487	-0.266
	(2.83)***	(2.81)***	(2.81)***	(2.84)***	(3.00)***	(2.25)**	(1.33)
VTRADED	0.060	0.062	0.062	0.061	0.050	0.062	0.084
	(1.97)**	(2.17)**	(2.18)**	(2.15)**	(1.63)	(2.17)**	(2.83)***
BC	-0.010						
	(0.27)						
C		-0.005					
		(0.36)					
DA			0.003				
			(0.51)				
GS				-0.010			
				(0.46)			
I					0.008		
					(1.04)		
SC						-0.002	
						(0.13)	
L&O							0.056
							(2.66)***
JOR	0.464	0.468	0.450	0.482	0.470	0.443	0.358
	(6.17)***	(5.28)***	(5.88)***	(5.76)***	(5.87)***	(4.73)***	(3.60)***
MAR	0.339	0.334	0.327	0.298	0.339	0.275	0.229
	(4.88)***	(4.54)***	(4.59)***	(6.60)***	(4.59)***	(5.82)***	(2.74)***
TUN	0.332	0.337	0.326	0.334	0.332	0.325	0.303
	(7.38)***	(7.26)***	(6.92)***	(7.82)***	(7.27)***	(6.83)***	(6.00)***
Y1994	0.135	0.135	0.135	0.135	0.134	0.135	0.102
	(5.43)***	(5.41)***	(5.41)***	(5.45)***	(5.39)***	(5.41)***	(3.70)***
Y1995	0.158	0.157	0.158	0.159	0.155	0.157	0.111
	(6.14)***	(6.13)***	(6.16)***	(6.13)***	(6.10)***	(6.14)***	(3.58)***
Y1996	0.171	0.165	0.172	0.175	0.167	0.170	0.125
	(6.22)***	(5.62)***	(6.20)***	(5.80)***	(6.16)***	(6.21)***	(3.87)***
Y1997	0.148	0.143	0.152	0.160	0.134	0.148	0.114
	(4.99)***	(4.54)***	(4.99)***	(4.13)***	(4.16)***	(4.91)***	(3.50)***
Y1998	0.148	0.145	0.155	0.167	0.121	0.149	0.115
	(4.58)***	(4.39)***	(4.68)***	(3.37)***	(2.96)***	(4.55)***	(3.37)***
Y1999	0.125	0.122	0.132	0.151	0.095	0.126	0.093
	(3.59)***	(3.47)***	(3.75)***	(2.40)**	(2.11)**	(3.59)***	(2.57)**
Y2000	0.058	0.055	0.065	0.088	0.026	0.058	0.023
	(1.63)	(1.55)	(1.81)*	(1.25)	(0.56)	(1.61)	(0.61)
Y2001	0.094	0.092	0.101	0.128	0.069	0.093	0.054
	(2.57)**	(2.55)**	(2.77)***	(1.64)	(1.60)	(2.39)**	(1.40)
Y2002	0.133	0.130	0.141	0.170	0.118	0.133	0.094
	(3.56)***	(3.41)***	(3.78)***	(2.02)**	(3.02)***	(3.28)***	(2.38)**
Y2003	0.219	0.215	0.217	0.258	0.206	0.218	0.183
	(6.07)***	(5.78)***	(6.01)***	(2.91)***	(5.50)***	(5.45)***	(4.86)***
Y2004	0.066	0.062	0.072	0.113	0.052	0.065	0.031
	(1.88)*	(1.69)*	(2.06)**	(1.08)	(1.38)	(1.64)	(0.83)
Y2005	0.065	0.060	0.070	0.112	0.054	0.063	0.019
	(1.83)*	(1.61)	(1.96)*	(1.04)	(1.49)	(1.56)	(0.47)
Y2006	0.142	0.139	0.146	0.198	0.131	0.138	0.060
	(2.94)***	(2.87)***	(3.01)***	(1.50)	(2.69)***	(2.40)**	(1.05)

Table 3: Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.875	0.885	0.854	0.946	0.825	0.863	0.536
	(5.98)***	(5.90)***	(6.87)***	(3.89)***	(6.63)***	(6.95)***	(3.08)***
Wald chi2 (23)	291.07***	300.24***	283.76***	347.75***	316.70***	297.02***	293.10***
Log Likelihood	238.64	238.42	238.375	238.688	239.82	238.56	241.88
Observations	593	593	593	593	593	593	593
Number of banks	45	45	45	45	45	45	45

Table (4): The Impact of Institutional, Financial Structure and Specific Variables on Bank Efficiency in Egypt, Jordan, Morocco and Tunisia (controlling for turnover as a measure for stock market development) – Tobit Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EQTA	0.433	0.397	0.417	0.433	0.429	0.450	0.425
	(3.15)***	(3.07)***	(3.01)***	(3.22)***	(3.12)***	(3.25)***	(3.05)***
LIQ	0.197	0.199	0.216	0.204	0.225	0.107	0.214
	(3.17)***	(3.24)***	(3.79)***	(3.33)***	(4.45)***	(2.12)**	(3.40)***
NETLOANS	-0.045	-0.040	-0.026	-0.034	-0.034	-0.031	-0.042
	(0.88)	(0.80)	(0.52)	(0.66)	(0.70)	(0.63)	(0.82)
CREDITPR	-0.411	-0.370	-0.437	-0.471	-0.388	-0.373	-0.378
	(3.65)***	(3.14)***	(4.05)***	(3.15)***	(3.59)***	(3.50)***	(3.34)***
CONC	-0.611	-0.578	-0.615	-0.637	-0.646	-0.450	-0.501
	(3.69)***	(3.37)***	(3.73)***	(3.74)***	(3.88)***	(2.54)**	(2.41)**
TURNOVER	0.151	0.165	0.161	0.148	0.133	0.165	0.160
	(2.89)***	(3.16)***	(3.24)***	(3.03)***	(2.68)***	(3.39)***	(3.20)***
BC	0.003						
	(0.07)						
C		0.011					
		(0.79)					
DA			0.008				
			(1.32)				
GS				-0.014			
				(0.60)			
I					0.009		
					(1.19)		
L&O						0.047	
						(2.35)**	
SC							-0.014
							(0.87)
JOR	0.489	0.465	0.488	0.517	0.484	0.465	0.447
	(6.70)***	(5.53)***	(6.84)***	(6.18)***	(6.88)***	(5.96)***	(4.36)***
MAR	0.342	0.343	0.337	0.355	0.281	0.284	0.353
	(4.87)***	(4.90)***	(4.82)***	(4.87)***	(6.17)***	(3.10)***	(7.36)***
TUN	0.323	0.328	0.241	0.340	0.224	0.300	0.348
	(6.93)***	(7.40)***	(5.57)***	(7.57)***	(5.40)***	(5.95)***	(7.16)***
Y1994	0.122	0.121	0.120	0.123	0.121	0.094	0.123
	(4.86)***	(4.87)***	(4.83)***	(4.94)***	(4.91)***	(3.40)***	(4.97)***
Y1995	0.144	0.143	0.143	0.147	0.142	0.106	0.146
	(5.57)***	(5.64)***	(5.64)***	(5.67)***	(5.62)***	(3.43)***	(5.73)***
Y1996	0.159	0.168	0.163	0.166	0.156	0.122	0.158
	(5.85)***	(5.79)***	(5.99)***	(5.54)***	(5.86)***	(3.81)***	(5.92)***
Y1997	0.125	0.133	0.132	0.139	0.111	0.095	0.118
	(4.31)***	(4.35)***	(4.44)***	(3.61)***	(3.69)***	(2.94)***	(4.00)***
Y1998	0.134	0.141	0.143	0.155	0.102	0.105	0.124
	(4.31)***	(4.40)***	(4.44)***	(3.14)***	(2.74)***	(3.10)***	(3.91)***
Y1999	0.100	0.107	0.109	0.130	0.066	0.072	0.089
	(3.00)***	(3.14)***	(3.19)***	(2.07)**	(1.63)	(1.99)**	(2.58)***
Y2000	0.031	0.036	0.039	0.065	-0.004	-0.002	0.018
	(0.89)	(1.04)	(1.11)	(0.93)	(0.10)	(0.05)	(0.49)
Y2001	0.083	0.090	0.094	0.123	0.054	0.048	0.067
	(2.36)**	(2.55)**	(2.62)***	(1.58)	(1.34)	(1.26)	(1.74)*
Y2002	0.126	0.137	0.137	0.170	0.107	0.089	0.109
	(3.48)***	(3.63)***	(3.76)***	(2.02)**	(2.89)***	(2.28)**	(2.74)***
Y2003	0.211	0.223	0.197	0.259	0.195	0.177	0.193
	(6.02)***	(6.00)***	(5.59)***	(2.92)***	(5.45)***	(4.73)***	(4.87)***
Y2004	0.054	0.065	0.064	0.112	0.038	0.020	0.035
	(1.57)	(1.79)*	(1.85)*	(1.08)	(1.05)	(0.55)	(0.89)
Y2005	0.038	0.046	0.046	0.098	0.027	-0.001	0.017
	(1.04)	(1.22)	(1.25)	(0.91)	(0.73)	(0.03)	(0.40)
Y2006	0.142	0.144	0.148	0.213	0.125	0.083	0.111
	(3.01)***	(3.11)***	(3.17)***	(1.64)	(2.59)***	(1.55)	(1.91)*
Wald chi2 (23)	287.93***	298.26***	280.88***	313.32***	303.63***	291.84***	325.65***
Log Likelihood	240.51	241.18	240.15	241.36	240.16	243.18	241.27
Observations	593	593	593	593	593	593	593
Number of banks	45	45	45	45	45	45	45

Notes: For table 2 to 4. *** Statistically significant at the 1% level, ** Statistically significant at the 5% level * Statistically significant at the 10% level; t-statistics in parentheses.