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The Effects of Entry Regulation on Bank Competition: The Case of the Iranian Banking Industry

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THE EFFECTS OF ENTRY REGULATION ON BANK COMPETITION: THE CASE OF THE IRANIAN BANKING INDUSTRY

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We focus on a modified version of the markup test to investigate the impact of entry regulation on competitive conditions in the Iranian banking industry for the period 1996-2006. The time interval under examination corresponds to an era characterized by substantial relaxation of entry barriers and private bank penetration. To estimate Lerner indexes as a measure of bank competition, we set up a simultaneous equation model for unbalanced panel data by utilizing the stepwise maximum likelihood method. We find that concomitantly with the new bank entries a pro-competitive change in the banking industry took place.

I. Introduction

The prediction and measurement of market power in the banking industry has received increasing attention during recent years, mainly due to the processes of regulatory reform in the financial services industry. While significant reform took place among financial service providers, the process was particularly concentrated in the banking industry.

As in most transition economies, the priority of plan fulfillment determined all financial transactions in the Iranian banking industry. Credit allocation was dependent

on the central planner, and the banks had to support this allocation. The state-owned banks settled all payments, absorbed private savings, and channeled them either to the state budget or to state enterprises according to the central plan regardless of fund repayments.

The recent process of banking reform in the Iranian banking sector is conceptually similar to the liberalization process followed by NIS countries.[1] In the late 1990s the Central Bank of Iran changed the entry policy from one where entry was totally barred to one where the entry of non-bank credit institutions and private banks was allowed. The regulatory reform and new bank entries provide a natural setting to test differences in behavior before and after the change in the underlying institutional structure. Specifically, we wish to know whether or not the removal of the substantial entry barriers has made the highly concentrated banking sector more competitive.

The traditional Structure-Conduct-Performance (SCP) hypothesis, aiming to infer competition conditions from concentration measures (e.g., the Herfindahl index), views the degree of competition as an increasing function of the number of firms in a market and a decreasing function of the average market share. Although the SCP hypothesis of a positive relationship between concentration and profits can be derived from oligopoly theory under the assumption of Cournot behavior, it is not warranted under alternative models.[2] Also, as noted by Shaffer (2004), even if the SCP hypothesis is generally correct, there are reasons that limit the practicality of the SCP approach in banking industry.

In contrast to the structural approach, the non-structural approach, based on the so-called "New Empirical Industrial Organization literature", focuses on obtaining estimates of market power from the observed behavior of banks. One method, the H-statistic developed by Panzar and Rosse (1977), uses the sum of the elasticities of a firm's revenue with respect to the firm's input prices to identify the extent of competition in a market. Under perfect competition, the H-statistic should be equal to one, since any increase in input prices should lead to a one-to-one increase in total revenues.

An alternative non-structural measure of competition, the markup test of Bresnahan (1982) and Lau (1982), involves estimating demand and supply equations to capture the divergence of price from estimated marginal cost. This method allows the

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[1] The Newly Independent States (NIS) are the twelve former Soviet Union republics that achieved independence after the disintegration of the Soviet Union in December 1991.

[2] As noted by Shaffer (2004), alternative equilibrium concepts may predict different relation between market concentration and competition.

measurement of market power in terms of an index that ranges from 0 for perfect competition to 1 for pure monopoly pricing. Since this test measures the actual deviation from marginal-cost pricing, neither regulation nor possible disequilibrium would alter the interpretation of the results.[3] Where data are available, this technique is superior to the Panzar-Rosse approach in terms of econometric identification and ability of the estimated conduct parameter to map onto specific oligopoly solution concepts. Moreover, the Panzar-Rosse statistic is not reliable for samples that are not in long-run equilibrium (see Shaffer 2001).

The methodology we utilize is related to that developed by Bresnahan (1982) and Lau (1982) and has been applied to banking data by Spiller and Favaro (1984), Shaffer (1989, 1993, and 2001), Berg and Kim (1994), and Suominen (1994). Gruben and McComb (2003) estimate an index of market power with aggregate data and identify a change in competitive behavior due to privatization. Their results suggest bank behavior that is consistent with competitiveness before the privatization but with super-competitiveness after privatization in which banks run at levels of output where marginal costs exceed marginal revenues. Angelini and Cetorelli (2003) also applied the markup test with some variations to the Italian banking industry. They found that competitive conditions have improved substantially after the implementation of the Second Banking Coordination Directive, which allows banks from European Union countries to branch freely into other EU countries.

Our paper contributes to the study of bank competition in three different ways. First, the study analyzes the impact of entry regulation on competitive conditions over a long period of time, 1996-2006. Second, there is an important and unattended issue common to all of published works in this area and to which we direct our attention in this paper. Namely, to the best of our knowledge, all the published papers related to the issue of bank competition utilize time-series, cross-section, or balanced panel estimation. Unbalanced panel estimation is more likely to appear in banking sectors where some banks have dropped out of the market while new entrants have emerged over the sample period. In this case, dropping observations to make the panel balanced is very restrictive and may cause a substantial loss of efficiency (see Baltagi and Chang 2000; Biørn 2004). Third, although there is an extensive literature using non-structural measures to assess competition in many developed and in some developing countries, there is a paucity of study on the Iranian banking industry, hence the current paper fills this gap in the literature.

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[3] Other advantages include a test statistic that can be interpreted easily and the possibility to use aggregate data; see, e.g., Shaffer (2004).

The remainder of this article is organized as follows. In the next section we provide an overview of relevant aspects of the Iranian banking sector and the financial reform. Section III describes the model and methodology adopted to estimate market power. Section IV introduces the data. The interpretation and discussion of the results appear in Section V. Section VI concludes.

II. The Iranian banking industry: an overview

The reform of the banking sector and its transformation from a closed, state-dominated, and poorly managed to a market-driven, open, and financially viable one constitutes a major challenge of transition in Iran's banking industry. The goal was to create a stable and efficient private financial sector to attract investments, mobilize savings, and allocate resources to their most productive use.

Following the Revolution of 1979, all banks were nationalized. Iran's laws required that the banking sector be run according to the Islamic law, prohibiting fixed interest payments on deposits. This left banks with limited degrees of freedom to differentiate in the market. Moreover, entry in the Iranian banking sector was barred, which effectively shielded the incumbents from competition. All banks, regardless of size, geographic location, or individual efficiency, promised and paid more or less the same mandated interest rates and no bank ever had to justify the difference in the rates paid to depositors for short, medium, and long-term deposits.

Since the Constitution permitted neither private nor foreign banks to participate in the market, a solution the Central Bank of Iran thought of was to allow private non-bank credit institutions to step in. These institutions were allowed to pay up to 4% higher interest rates than those paid by state-owned commercial banks and to engage in a broad range of banking activities.

To effectively restructure the Iranian banking system, as well as to increase competition and diversification in the banking industry, the Central Bank of Iran initiated a privatization program in 2000. Under this program, some of the non-bank institutions were permitted to perform as private commercial banks. Although so far only six licenses have been awarded, what is clear is that the new private banks have grown spectacularly: Table 1 shows that the high concentration of deposit and loan market shares by the state-owned banks declines over 2002-2006 and that the market share by private banks gradually increases.

In this regard, Figure 1 depicts the trajectory of the Herfindahl index over the period of our study. Recent reforms in the banking sector have reduced the concentration of the Iranian banking system. This is in agreement with the decreasing

share of public banks; as Table 1 shows, the share of assets in state-owned banks fell from 97% to 86% over the 2002-2006 period.

The private banks' huge success is attributed to paying higher interest rates on customer deposits, introducing innovative products and services, and efforts to improve customer satisfaction. In addition, private banks displayed a better financial performance. This improved performance is mainly due to the scrutiny of experienced loan officers as well as various supervisory checks and balances and monitoring systems. Although the contribution of private banks to the financial system is still significantly lower than their state-owned counterparts, these banks are poised to play an important role in forming the future banking environment in Iran.

Table 1. Banking sector, 2002-2006 period

A. Deposits	2002	2003	2004	2005	2006
State-owned	486226	600386	755140	938836	1234585
	(98.7)	(97.2)	(94.8)	(90.3)	(84)
Private	6781	17790	41756	100901	231321
	(1.3)	(2.8)	(5.2)	(9.7)	(16)
Total	493007	618176	796806	1039738	1465906
	(100)	(100)	(100)	(100)	(100)
B. Loans	2002	2003	2004	2005	2006
State-owned	389346	541372	758225	909585	1222787
	(99.4)	(97.8)	(95.5)	(91.6)	(88.3)
Private	2348	11794	35152	83389	157922
	(0.6)	(2.1)	(4.4)	(8.4)	(11.7)
Total	391694	553166	793377	992974	1380709
	(100)	(100)	(100)	(100)	(100)
C. Assets	2002	2003	2004	2005	2006
State-owned	858224	1197647	1459103	1835371	2280375
	(97.3)	(95.1)	(91.2)	(88)	(85.7)
Private	24009	62233	141923	244438	378402
	(2.7)	(4.9)	(8.8)	(12)	(14.3)
Total	882233	1259880	1601027	2079809	2658777
	(100)	(100)	(100)	(100)	(100)

Note: figures in billion Rial (percentage shares in parentheses).

Figure 1. Herfindahl index for the Iranian banking industry
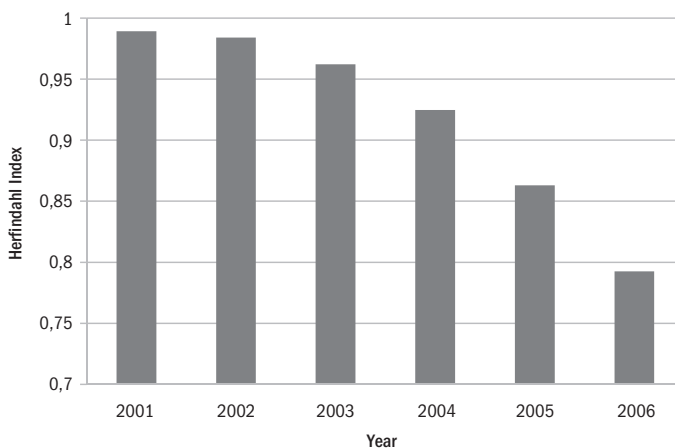
III. Model and estimation procedure

The basic model used in this paper is derived from that originally proposed by Bresnahan (1982) and Lau (1982) and applied to the banking industry by Spiller and Favaro (1984), Shaffer (1989, 1993, 2001), Berg and Kim (1994), Suominen (1994), Angellini and Cetorelli(2003), and Gruben and McComb (2003). Our model draws heavily on earlier work appearing in Angellini and Cetorelli (2003).

In principle the markup test involves estimating a structural model with separate demand and supply equations, which parameterize the markup of price over estimated marginal cost as a measure of market power. In equilibrium profit maximizing banks will choose prices and quantities such that marginal cost equals their perceived marginal revenue. These choices depend to a large extent on cost considerations and on the degree of competition in the market.

We consider a single-product case, a non-competitive industry in which incumbent firms produce output Q at price P. Let q_i be the quantity produced by bank i, $i = 1,2,\dots,m$, and $\sum_i q_i = Q$. Let the inverse demand function be $P = P(Q,z)$, where z is a vector of exogenous variables affecting demand, e.g., prices or quantities of other inputs and outputs used by the demanders of Q. Assuming banks are input price-takers,[4] the ith bank's profit maximization problem is given by:

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[4] Although this model assumes banks are input price takers, violations of this assumption do not damage the results in a serious way (see, e.g., Groben and McComb 2003). If banks have market power over

$$Max\Pi = P(Q,z)q_i - C(q_i, w_i),$$
$$q_i$$

(1)

where $C(q_i, w_i)$ is the cost function for bank i, and w_i is the vector of the prices of the factors of production employed by bank i.

The optimality condition corresponding to this profit maximization problem is given by:

$$P_i = C'(q_i, w_i) - q_i \frac{\partial P}{\partial Q} \frac{\partial Q}{\partial q_i},$$

(2)

where $q_i \dfrac{\partial P}{\partial Q} \dfrac{\partial Q}{\partial q_i}$ measures the departure from a perfectly competitive benchmark in which price would be set equal to marginal cost. This equilibrium condition can be rewritten as:

$$P_i = C'(q_i, w_i) - \frac{\theta_i}{\tilde{\varepsilon}},$$

(3)

where

$$\theta_i \equiv \frac{\partial Q}{\partial q_i} \cdot \frac{q_i}{Q}$$

(4)

is the conjectural elasticity of total industry output with respect to the output of the ith firm, and $\tilde{\varepsilon}$ is the market demand semi-elasticity to the price,

$$\tilde{\varepsilon} \equiv \frac{\partial Q / \partial P}{Q}, \quad \tilde{\varepsilon} < 0.$$

(5)

It is possible to estimate both the supply and demand equations simultaneously in order to identify θ_i and $\tilde{\varepsilon}$. However, as noted by Angelini and Cetorelli (2003), this approach increases the complexity of the estimated model. The alternative method is to estimate $\dfrac{\theta_i}{\tilde{\varepsilon}}$ as one parameter. In the latter case, dividing both sides of equation (3) by individual bank prices, we obtain a Lerner index,

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deposits, in violation of the assumption, it can be shown that our result overstates the overall degree of market power by misattributing any deposit power to the asset side.

$$L = (P_i - C'(q_i, w_i))/p_i = \lambda/p_i. \tag{6}$$

The Lerner index, measuring the mark-up of price over marginal cost, indicates the market power of a firm. Values of L between 0 and 1 describe varying degrees of imperfect competition or market power. Following this approach, we consider a translog cost function:

$$\begin{aligned}
\ln(C_{it}) &= s_0 + \gamma_0 \ln q_{it} + \frac{\gamma_1}{2}(\ln q_{it})^2 + \sum_{j=1}^{3} s_j \ln w_{jit} + \ln q_{it} \sum_{j=1}^{3} \gamma_{j+1} \ln w_{jit} \\
&+ s_4 \ln w_{1it} \ln w_{3it} + s_5 \ln w_{1it} \ln w_{2it} + s_6 \ln w_{2it} \ln w_{3it} + (1/2)\sum_{j=1}^{3} s_{j+6} (\ln w_{jit})^2
\end{aligned}, \tag{7}$$

where C_{it} represents the cost for the i-th firm in the t-th period; q_{it} represents the output of the i-th firm in the t-th period, and w_{jit} represents the j-th input prices of the i-th firm in the t-th period (taking j = 1; 2; 3).[5]

Differencing equation (7) with respect to q_{it} and substituting the result in equation (3) yields the supply equation,

$$P_{it} = \frac{C_{it}}{q_{it}}[\gamma_0 + \gamma_1 ln(q_{it}) + \sum_{j=1}^{3} \gamma_{j+1} ln(w_{j,it})] + \lambda_t , \tag{8}$$

where λ_t's are average values across different banks for a given year.

Generalizing the Angelini and Cetorelli (2003) approach for measuring banking market power, we assume that banks are arranged in groups according to the number of years the banks are observed. The banks are observed in at least 1 and at most P years. Let N_p denote the number of banks observed during p periods. Let ip index the $i'th$ bank observed during p years $(i = 1,...., N_p; p = 1,....., P)$, and let t index the observation number $(t = 1,....., p)$. The total number of banks in the panel is $N = \sum_{p=1}^{P} N_p$ and the total number of observations is $n = \sum_{p=1}^{P} N_p p$. Stacking the two equations (7) and (8) for observation it, we have

$$y_{it} = X_{it}\beta + \alpha_i + \lambda_t + \varepsilon_{it}, \tag{9}$$

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[5] Most empirical implementations have employed a translog functional form to estimate bank's cost function. Unlike linear or quadratic forms, the translog form has the advantage of being directly compatible with the theoretically required homogeneity conditions without employing additional parameters (Shaffer, 2004).

where y_{it} is a matrix of two variables whose derivatives are $\ln(C_{it})$ and $P_{it}q_{it}$, X_{it} is a matrix of fourteen variables for the cost equation and five variables for the revenue equation, and λ_t is the coefficient that measures market power (and only appears on the revenue equation). Our model, therefore, is formally a system of two ($G=2$) regression equations with a random individual effect in the first and a fixed time effect in the second equation.

If, following Biørn (2004), we stack the p realizations from bank i in $y_{i(p)} = (y'_{i1},...,y'_{ip})'$, $X_{i(p)} = (X'_{i1},...,X'_{ip})'$, $\varepsilon_{i(p)} = (\varepsilon'_{i1},...,\varepsilon'_{ip})'$, and let matrix $\Delta_{i(p)}$ indicate that the bank i is observed in p periods, we can define $\lambda = (\lambda'_1,...,\lambda'_T)'$ for the bank i, we can state that $\lambda_{i(p)} = \Delta_{i(p)}\lambda$ and then write (9) as:

$$y_{i(p)} = X_{i(p)}\beta + (e_p \otimes \alpha_i) + \lambda_{i(p)} + \varepsilon_{i(p)} = X_{i(p)}\beta + \lambda_{i(p)} + \varepsilon_{i(p)}, \tag{10}$$

$$E\left(\varepsilon_{i(p)}\varepsilon'_{i(p)}\right) = I_p \otimes \sum_e + E_p \otimes \sum_\alpha = K_p \otimes \sum_\varepsilon + J_p \otimes \sum_{(p)} = \Omega_{\varepsilon(p)}, \tag{11}$$

where $\sum_{(p)} = \sum_\varepsilon p\sum_\alpha$, e_p is the ($p{\times}1$) vector of ones, $E_p = e_p e'_p$, $J_p = (1/p)E_p$, I_p is the p dimensional identity matrix, and $K_p = I_p - J_p$.

To estimate the overall parameters $(\beta,\lambda,\sum_u,\sum_\alpha)$, we have to apply a two-step procedure to the log-likelihood function (*LL*) of all y's conditional on all X's. This implies writing *LL* functions like these:

$$LL_{(p)} = -\frac{GN_p p}{2}\ln(2\pi) - \frac{N_p}{2}\ln\left|\Omega_{\varepsilon(p)}\right| - \frac{1}{2}Q_{(p)}(\beta,\lambda_{(p)},\Sigma_\alpha,\Sigma_u), \tag{12}$$

$$LL = \sum_{p=1}^P LL_{(p)} = -\frac{Gn}{2}\ln(2\pi) - \frac{1}{2}\sum_{p=1}^P N_p\ln\left|\Omega_{\varepsilon(p)}\right| - \frac{1}{2}Q(\beta,\lambda,\Sigma_\alpha,\Sigma_u), \tag{13}$$

where $Q_{(p)} = Q_{(p)}(\beta,\lambda_{(p)},\sum_u,\sum_\alpha) = \sum_{i \in I_p}[y_{i(p)} - X_{i(p)}\beta - \lambda_{i(p)}]'\Omega^{-1}_{\varepsilon(p)}[y_{i(p)} - X_{i(p)}\beta - \lambda_{i(p)}]$, $\left|\Omega_{\varepsilon(p)}\right| = \left|\sum_{(p)}\right|\left|\sum_u\right|^{p-1}$ and $Q = Q(\beta,\lambda,\sum_u,\sum_\alpha) = \sum_{p=1}^P Q_{(p)}(\beta,\lambda_p,\sum_u,\sum_\alpha)$, and choosing initial values for $\sum_u$ and $\sum_\alpha$. In the first step of the procedure, we maximize *LL* with respect to λ and β, and in the second step we use the solution of the first step to maximize *LL* with respect to $\sum_u$ and $\sum_\alpha$. The joint estimation parameters $(\beta,\lambda,\sum_u,\sum_\alpha)$ can therefore be obtained by iterating between the above two steps until convergence is achieved.[6]

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[6] For the complete derivation of the maximum likelihood procedure and its connection to GLS, see Wangen and Biørn (2001) and Biørn (2004).

IV. Data, input, and output definitions

The panel data for the period 1996-2006 was obtained from the Central Bank of Iran. For each year in the 11-year data period, 10 state-owned banks were observed over the whole period ($N_{11}=10$); 5 private banks, and 1 state-owned bank were observed over the 2001-2006 period ($N_6=6$).[7] Other non-bank credit institutions are excluded because of a lack of reliable data. However, due to small market share, excluding them would not pose a serious problem for our estimation.

The time interval under examination is of particular importance since it spans a number of years before and after new bank penetration, allowing us to test for possible shifts in competition occasioned by that change. This data provides us with enough identification power and degrees of freedom to pursue a thorough investigation of bank competition in Iran during an important transition period for the first time.

For the empirical specification, we need to define inputs and outputs according to some model of a banking firm. In order to define inputs and outputs, three main approaches can be identified: (1) the value-added model classifies deposits as outputs rather than inputs, assuming these products provide a valuable service for depositors in the dimensions of safe storage of value, record keeping, and a means of payment. (2) The user-cost model applies an empirical test to categorize inputs versus outputs. (3) The intermediation model that is used by most studies on banking market power (Klein 1971; Sealey and Lindley 1977). This model considers deposits as an input (see Shaffer 2004).

The definition of inputs and outputs is not without problem. For example, for deposits the financial costs and other liability costs are combined together. For loans, financial incomes associated with profits and losses, are not separated in financial accounts (see Fernandez de Guevara et al. 2005). Thus, in defining the inputs and outputs of banks, we follow the intermediation model of banking.[8] In this model, a bank's production function employs labor and physical capital to attract deposits, and then uses labor and deposits to generate assets. The measure of output (q_i) is thus the total assets, and the price of output (p_i) is the total interest earned on assets plus revenue from services as a ratio to total assets. The price of deposits is total interest paid on deposits divided by total deposits, wage rate is

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[7] Missing from the sample are two newly-established private banks, Pasargad and Sarmaieh, because their data was only available since 2005.

[8] This model has also been used in many empirical banking studies such as Shaffer (1993, 2001), Groben and McComb (2003), and Angelini and Cetorelli (2003).

Table 2. Descriptive statistics of the main variables used in the analysis

A. Operational definitions

Variable	Definition
C	The sum of interest expenses and personnel expenses
Q	Total assets
P	Total interest earned on assets plus revenue from services/total assets
w_1	Total interest paid on deposits/total deposits
w_2	Wage expenses/number of employees
w_3	Total expenses of fixed assets/value of fixed assets

B. Mean values

	C	Q	P	w_1	w_2	w_3
1996	426.0215	13860.1	0.057925	0.030905	0.011682	0.057768
	(357)	(12665)	(0.014353)	(0.015844)	(0.001958)	(0.01458)
1997	543.1125	15628.6	0.070275	0.031474	0.014157	0.072444
	(431)	(14008)	(0.014221)	(0.017618)	(0.002799)	(0.016)
1998	719.85	19467.4	0.074441	0.030839	0.017389	0.075567
	(481)	(17284)	(0.017686)	(0.015431)	(0.004154)	(0.032)
1999	774.05	0.021296	0.076999	0.034558	0.021296	0.078571
	(529.4)	(20623.7)	(0.016551)	(0.015)	(0.004)	(0.010798)
2000	1132.3	32730.8	0.081216	0.03413	0.035858	0.083163
	(732.3)	(27740.2)	(0.016872)	(0.015)	(0.013)	(0.012677)
2001	1353.64	42226.4	0.07693	0.030434	0.048227	0.100862
	(981)	(33195)	(0.011892)	(0.015937)	(0.013686)	(0.02)

Table 2. (continued) Descriptive statistics of the main variables used in the analysis

B. Mean values

	C	Q	P	w_1	w_2	w_3
2002	2187.91	65733.9	0.072148	0.033813	0.062211	0.132922
	(1854)	(53449)	(0.029782)	(0.018342)	(0.016742)	(0.066)
2003	3073.64	85822.4	0.084845	0.046806	0.077796	0.10718
	(2488)	(69440)	(0.034135)	(0.024)	(0.025)	(0.051003)
2004	4808.8	119764.7	0.093609	0.04421	0.107558	0.044947
	(4236)	(91156)	(0.042311)	(0.023)	(0.04)	(0.024154)
2005	5811	145910.3	0.081192	0.042844	0.136448	0.074271
	(4159)	(105996)	(0.024941)	(0.017446)	(0.047925)	(0.09)
2006	7414.8	183537.1	0.104202	0.038308	0.135421	0.043009
	(5686.22)	(130006)	(0.113883)	(0.015263)	(0.01279)	(0.03)

Note: figures in billion Rial (standard errors in parentheses).

wage expenses divided by the number of employees, and the price of physical capital is the ratio of total expenses on fixed assets to the value of fixed assets. Table 2 gives an overview of definitions and some descriptive statistics for the variables.

V. Empirical results

The estimation of parameters is obtained by applying (12) and (13) to system of equations (10) described in Section III. Table 3 presents the Maximum Likelihood estimation results with three different definition on the individual effects (random, fixed and no effects). The model with error component effect is statistically more efficient compared to other models. Table 3 also gives a measure of overall model fit. The Schwartz Bayesian information criterion supports the random effect model. Therefore, in what follows, we will use the more efficient results of unbalanced panel estimation of the random effect model. Recalling that Lerner index is computed as $\frac{\lambda_t}{P_t}$, an assessment of whether the indexes are statistically significant can be obtained from the t-statistics on λ_t in equation (8). The price P_t is the average of individual bank prices for a given year.

The results of our estimation confirm that the competitive conditions had not improved before new bank entries, but they improved significantly after 2000 (Figure 2). According to our estimation, the Lerner index has fallen steadily from 0.68 in 2000 to 0.42 in 2005. This increase in competition is consistent with what we find using the Herfindahl Index (Figure 1). This is also consistent with the findings of previous studies in many developed and transition economies. Angelini and Cetorelli (2003) argue that Italian bank competition has improved substantially after the entry of banks from other European Union countries. Unite and Sullivan (2003) conclude that foreign entry and ownership structure, was effective in making Philippine banks more competitive and efficient. Mamatzakis et al. (2005) report similar results for the South Eastern European countries.

The importance of our finding may be seen more clearly if we compare the competitive conditions in the Iranian banking industry with other countries in the region. Comparisons over time indicate that competition did not improve and, in many cases, worsened over the period 2000-2006 within Middle East and North Africa (MENA) countries.[9] However, our findings show competition improved over the same period for the Iranian banking industry. This is in agreement with Anzoategui

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[9] See Anzoategui et al. (2010) for the Lerner index in MENA countries over 1994-2008 period.

Table 3. Estimates of system (10)

	Random effect model		Fixed effect model		Without individual effect	
	Coefficient	Std. error	Coefficient	Std. error	Coefficient	Std. error
s_0	21	3.9**	0.6	12	-3.4	1.7
s_1	1.1	0.36**	3.5	1.5**	1.5	0.69**
s_2	-.38	0.54	-1.0	0.75	-0.70	0.53
s_3	-3.8	0.7**	0.3	2.1	-0.90	1.2
s_4	-.031	0.02	0.06	0.07	0.2	0.08**
s_5	0.22	0.08**	0.34	0.23	0.04	0.028
s_6	0.15	0.07**	0.07	0.11	0.11	0.07*
s_7	-0.36	0.03**	-0.19	0.22	-0.38	0.15**
s_8	-0.22	0.08**	-0.24	0.15*	-0.25	0.086**
s_9	-.54	0.11**	0.03	0.24	-0.26	0.14*
γ_0	3.5	0.56**	0.53	1.8	0.65	1.1
γ_1	-0.14	0.04**	0.03	0.14	0.05	0.08
γ_2	-0.07	0.021**	-0.2	0.06**	-0.07	0.03**
γ_3	0.02	0.043	0.038	0.066	0.018	0.04
γ_4	0.26	0.048**	0.035	0.14	0.04	0.07
λ_{1996}	0.031	0.014**	0.047	0.06	0.04	0.02*
λ_{1997}	0.051	0.014**	0.061	0.05	0.05	0.02**
λ_{1998}	0.052	0.013**	0.067	0.048	0.055	0.03*
λ_{1999}	0.05	0.013**	0.068	0.041*	0.057	0.034**
λ_{2000}	0.049	0.013**	0.073	0.04*	0.052	0.03
λ_{2001}	0.05	0.014**	0.065	0.05	0.053	0.03*
λ_{2002}	0.045	0.011**	0.06	0.021**	0.049	0.02**
λ_{2003}	0.044	0.01**	0.07	0.02**	0.048	0.02**
λ_{2004}	0.05	0.011**	0.073	0.024**	0.05	0.02**
λ_{2005}	0.035	0.012**	0.058	0.025**	0.04	0.02*
λ_{2006}	0.056	0.011**	0.79	0.017**	0.059	0.03**
No. of estimated parameters	26		42		26	
Log likelihood	186.4		214.2		179.6	
Schwartz's Criterionn	-114.5		-107.1		-105	

Note: ** P < 0.05, * P < 0.1.

Figure 2. Lerner index
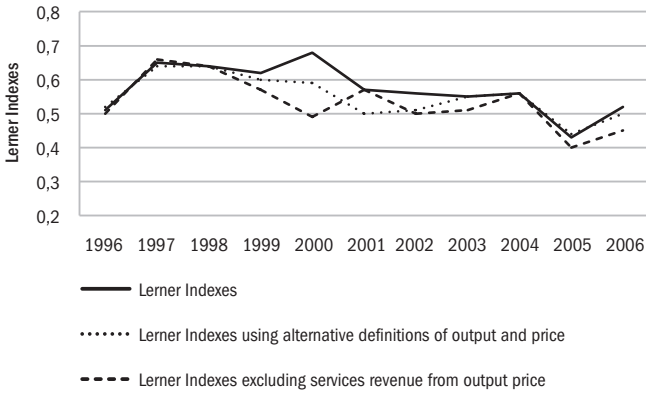
et al. (2010) who find that easing entry regulations help explain differences in bank competition across countries.

Comparing our results with other transitional and developed countries indicate that, despite a significant reduction in the Lerner index over the 2000-2006 period, the market power in the Iranian banking industry is still high. The Lerner index for developed European Union countries is considerably lower than 0.3 (see Fernandez de Guevara et al. 2005). However, the Lerner index for the Iranian banking sector is constantly above 0.4 (Figure 1). This is also considerably higher than the Lerner index for other countries in the MENA region (see Anzoategui et al. 2010).

The decline in the Lerner index in recent years implies that competition in the industry might have increased after new bank entries. In this regard, bank spreads (the difference between lending and deposit rates) have often been used as indicators of bank competition. Higher spreads and margins are often interpreted to signal greater inefficiencies and lack of competition in the banking sector. Concomitantly with the decline in the Lerner Index, the spread between loan and deposit rates dropped (Figure 3). The finding of improved competitive conditions after new entries is confirmed by the inspection of price-deposit margins as a conventional indicator of the ability of banks to price over marginal cost (Figure 4). Consistent with the estimated Lerner indexes, the margin increased until 2000, the year prior to the entry of new banks, and falls considerably thereafter.

We also evaluated the marginal cost for the Iranian banking industry using the regression coefficients reported in Table 3, which shows a declining trend after new entries (Figure 5). The decline in the marginal cost is consistent with findings of
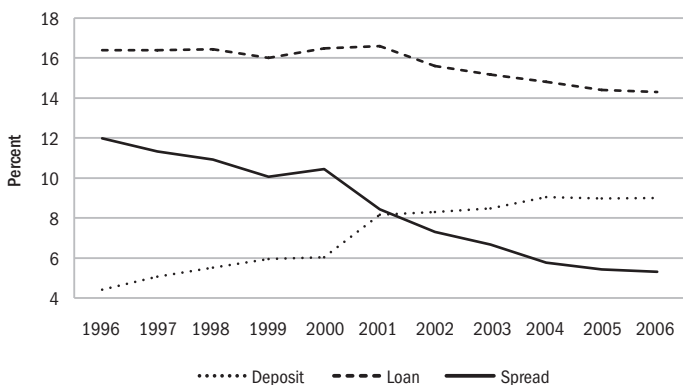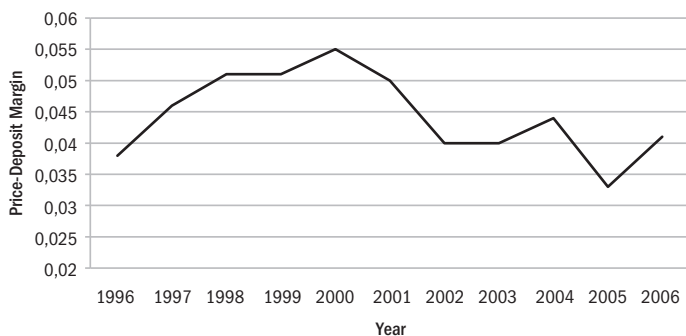
Figure 3. Bank spread

Figure 4. Price-deposit margin for the Iranian banking industry

Claessens et al. (2001), which suggest that allowing new bank entry may result in greater efficiency. Holding other factors constant, this should increase bank margins and as a result reinforces our conjecture regarding improved competitive conditions after 2000.

A number of other factors may have had an effect on banks' markups. As described in Section III, the Lerner index is inversely related to the elasticity of the market demand. Therefore, different demand conditions will lead to different market power measures, even if the degree of competition remains unchanged. The elasticity of demand for banking products may have changed over time as a result of the macroeconomic environment and the emergence of non-bank suppliers of financial services. In this regard, the finding of improved competitive conditions after 2000

Figure 5. Marginal cost for the Iranian banking industry
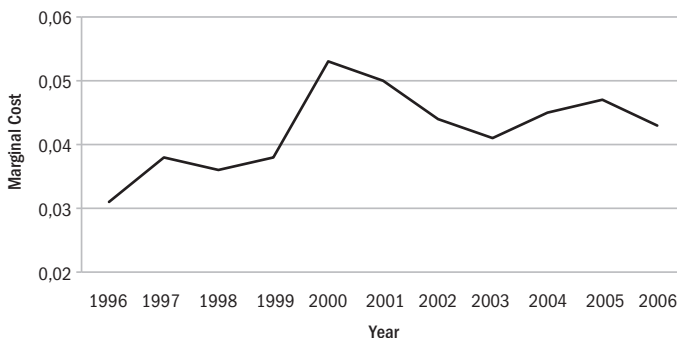
is reinforced by the results of Khiabani (2006), who estimated loan demand for the Iranian banking industry and detected no evidence of coefficient instability for the period 1995-2004.[10]

A check of the robustness of our core results relates to the definition of variables in the model. The estimated competitive indexes are about the same whether output is defined as total assets or whether instead it is defined as interest-yielding assets. The general result is also robust when we account for revenues from services and we treat deposits as part of banks output, thereby allowing for the possibility that deposits are a relevant source of market power for banks (Figure 2).

VI. Conclusions

This paper investigates the impact of new entries on the competitive conditions in the Iranian banking industry based on a modified version of the markup test. We use unbalanced panel data on all state-owned and private banks over the period 1996-2006. In order to analyze the evolution of competitive conditions, we set up a simultaneous equations model to estimate Lerner indexes as a measure of bank competition, utilizing the stepwise maximum likelihood procedure introduced by Biørn (2004).

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[10] Angelini and Cetorelli (2003) also note that, the concentration of the banking market may affect pricing behavior and can thus account for the observed pattern of the Lerner indexes. In addition, the economic cycles are likely to have an impact on banks pricing decisions.

Unfortunately, as our observation period is rather short, we cannot test whether this pattern could be the result of a short-term cyclical effect or decreasing market concentration rather than a more fundamental change due to the new environment.

The overall picture emerging from the Lerner indexes confirms that average mark-ups in the supply of banking products remained roughly unchanged before new entries and declined significantly after that. Although there is a large literature about the effect of foreign entry on domestic banking markets, our results are important in the sense that they show that entry of a new private sector to make domestic banks more competitive, may be as effective as a foreign entry policy. This result is also robust to alternative definitions of bank output and price.

This article provides significant evidence that bank competition in Iran is lower than other transition economies. Comparing our results with the estimated Lerner index of other transitional and developed countries indicate that, despite a significant reduction in the Lerner index over the 2000-2006 period, the market power in the Iranian banking industry is still high.

Our evaluation of banking sector competition suggests that, although in many cases competition declined over the period 2000-2006 within MENA countries, the competitive conditions have improved significantly in Iran since 2000. Nevertheless, we cannot rule out that some events not explicitly accounted for in the analysis during our sample period may have had a role in shaping the banking environment and the observed pattern of our indicators of competitive conditions. External shocks, the complex relationships between banking and other reforms, and the short time period that has passed make the impact of regulatory reform on competition hard to measure.

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