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A Study of the Competitiveness of Iran's Banking System

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In this article the Panzar and Rosse approach is employed to assess the level of competition in the Iranian banking system during 1997-2010. Panel data is used for all the 18 banks (private and public) that have been commercially active for at least the last four years. The results show that during the period of the study the banking system has been operating under a monopolistic competition system. It is also shown that allowing competition among private banks has improved the competitive environment. Finally, the results indicate that with private banks entering the market, competition in the entire banking system has risen.

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The formation of capital is vital for most economic activities. The role of banks differs somewhat by country, but they always are the key players channeling money for business investments. A sound and efficient banking system is a prerequisite and a major factor for economic growth. Liquidity management, reducing transaction and information costs, and shifting and lowering risk are some of the main benefits of banks in their pivotal role as financial intermediaries. An efficient and well performing banking system prevents people from going to non-professional and often risky financial agencies and middlemen with no regulations. Competition in the banking system is also important because it improves resource allocation and enhances growth. Understanding the level of competition among banks can indicate if the banking system is working efficiently.

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Yet bank competition has been a controversial issue historically. The Iranian government nationalized all banks in 1983 after the revolution; only public (or government owned and managed) banks were allowed to exist. Politicians, religious leaders and others had many excuses for not allowing the private sector to enter this market. This brought about many challenges for the banking sector and many shortcomings and inefficiencies developed. Economists and other observers have argued for many years that competition would increase interest rates paid on deposits, improve bank services, and force banks to be more responsive to consumer demands. The government decided to sell its ownership in some banks to the private sector in 1999 and to allow for private banks to be established. This paper studies the competitive effects of private sector entry into the banking sector in Iran. It is important to see whether allowing private banking has improved the competitive environment for Iran.

There are different ways to assess the level of competition in an industry but the method presented by Panzar and Rosse (1987) has advantages over other methods because it allows for the different roles that various firms play; whether they are large or small firms, domestic or foreign firms, or have other categorizations. This Panzar and Rosse method uses firm-level data and allows for firm-specific differences in the production function. Its special advantage is that it can be used in instances where data availability is limited (Claessens and Laeven, 2004 and Mensi, 2009). For these reasons we have used the Panzar and Rosse approach to study the level of competition in Iran's banking system during 1997-2010.

Literature Review

The literature on the measurement of competition can be divided into two major streams: structural and non-structural approaches. Structural methods are based on the Structure-Conduct-Performance paradigm (SCP) and the Efficiency Hypothesis which has its roots in the Empirical Industrial Organization (EIO) theory. The proponents of the SCP paradigm believe that a highly concentrated market leads to market power and collusion among large companies in the market. This in turn leads to a monopoly or oligopolistic outcome for the whole market. The proponents of the Efficiency Hypothesis believe that it is the efficiency and high productivity of larger firms that enhances their performance

and leads to monopolistic behavior of these firms. Firms are large because they have lower costs and they drive out higher cost firms. These structural approaches measure competitive conduct indirectly and rely on relationships between structure, conduct and performance of market for inferences about competition.

In both of these structural approaches the degree of market competition is ascertained indirectly through the study of the firm behavior. Concentration ratios play a key role in determining the competition level of the banking system. The significance of a structural approach is that it can explain the relationships among different sectors of a market. The application of the SCP to the banking market has been criticized by various authors such as Gilbert (1984), Reid (1987), Vesala (1995) and Bos (2002).

The New Empirical Industrial Organization (NEIO) literature argues that the level of competition cannot be measured solely by a market's structural indices. Simply because a market has a high concentration ratio does not mean that firms are able to charge higher prices. Mathews et al. (2007) showed that the use of profitability to assess competition in the banking industry leads to misleading conclusions. As a result, the literature, such as Lerner (1934), Iwata (1974), Bresnahan and Lau (1982) and Panzar and Rosse (1987), has moved to non-structural methods based on economic theories to assess the level of competition.

The Panzar and Rosse model is theoretically derived from the long run profit maximization conditions for firms. In order to reach the equilibrium output for the firm, the profit level should be maximized both at individual firm level and for the industry as a whole. This implies, first, that the ith firm equates it marginal revenue to its marginal cost:

$$R_i^{'}(x_i, n, z_i) - C_i^{'}(x_i, w_i, t_i) = 0$$

Where R_i is revenue, C_i is cost, X_i is the i^{th} firm's output, n is the number of firms, w_i is a vector of m input prices, Z_i is a vector of exogenous variables that make up a firm's revenue and t_i is a vector of exogenous variables that make up a firm's costs. In equilibrium we have the following condition implying zero profit:

$$R_i^*(x_i, n, z_i) - C_i^*(x_i, w_i, t_i) = 0$$

Variables with an asterisk are equilibrium values. Market power is measured by a change in equilibrium revenue (∂R_i^*) brought about by a change in input prices (). Panzar and Rosse introduce an H statistic as an index to measure the level (degree) of competition among firms. H is computed from the reduced-form revenue equation. The 'H statistic' is the sum of the elasticities of the reduced form revenues with respect to factor prices:

$$H = \sum_{k=1}^{m} \frac{\partial R_i^*}{\partial w_{k_i}} \cdot \frac{w_{k_i}}{R_i^*}$$

Where R_i* is the i^{th} firm's revenue in equilibrium, w is input prices (factor input prices), and m is the number of firm inputs.

Depending on the market structure H can take any value between -∞ and one. The industry is characterized by monopoly or perfect cartel for H ≤ 0. In this case an increase in input prices will increase marginal costs, reduce equilibrium output and consequently reduce total revenues. Imperfectly competitive firms reduce output in order to stay on the inelastic portion of the demand function.

In perfect competition any increase in input prices leads to increases in marginal and average costs for all firms, which shifts the market supply curve to the left. This increases output prices but forces some firms to leave the market. The remaining firms face higher input prices, but the firm's revenue increases to offset cost hikes. Thus, H equals one (H=1) for a perfectly competitive market.

In a monopolistically competitive market, where firms try to use advertising and improve their services by providing a differentiated good, Panzar and Rosse show that the H statistic is between one and zero (0<H<1). In such markets H is an increasing function of demand elasticity and H rises as market competition increases. Panzar and Rosse show that if their method is to yield plausible results, firms need to have operated in a long-term equilibrium (i.e., the number of firms needs to be endogenous to the model) while the performance of firms needs to be influenced by the actions of other market participants.

Bikker and Haaf (2000) show that four conditions should be met for the Panzar and Rosse results to hold: (1) banks operate in long-term equilibrium, (2) the performance of banks is influenced by actions of other market players, (3) costs in banking are homogeneous (similar) across banks, and (4) demand price elasticity is larger than 1.

Many empirical studies have used the Panzar and Rosse model to investigate the banking industry for various countries. It works well with the banking industry because banks provide multiple outputs with inputs that are not associated explicitly with individual outputs. Bandit and Davis (2000) used concentration indices and the Panzar-Rosse model with data for the period 1992-1996 to show that small banks in France and Germany have a monopoly structure whereas the large banks in these countries and small banks in Italy have a monopolistically competitive market structure. Hempell and Hannah (2002) showed that bank type (such as business, cooperative, and credit banks) has an impact on the degree of competition in the German banking system. They also used concentration indices and the Panzar-Rosse model with data from 1993-1998 in their analysis. Claessens et al. (2003) investigated the degree of banking system competition for 50 countries using the Panzar-Rosse model during 1994-2001. They found the banking system becomes more competitive with the removal of some banking restrictions and the entry of foreign banks into these countries.

Al-Muharrami et al. (2006), in a study of six Persian Gulf countries during 1993 -2002, have shown that the H statistic for Kuwait, Saudi Arabia and the United Arab Emirates indicates perfect competition in the banking system of these three countries. They find that Bahrain and Qatar have a monopolistic competition banking system and Oman has a monopolistic system.

Bikker et al. (2007) studied the banking market of 101 selected countries during 1986-2005 using the Panzar and Rosse model. They showed that dependent variable misspecification causes systematic skewness in the results, pushing the H statistic towards one. They demonstrated that the level of competition in the existing Panzar-Rosse literature is systematically overestimated and that the tests on both monopoly and perfect competition are distorted. This overestimate is due to the use of bank revenues divided by total assets as a dependent variable in the P-R model instead of unscaled bank revenues.

Abbasoglu et al. (2007) used the Panzar- Rosse H statistic to estimate the degree of competition among 27 Turkish banks during 2001-2005. They found that competition among these banks increased until 2004, then fell in 2005. The H statistic was always between zero and one, indicating a monopolistically competitive market structure in Turkey for the period under study.

Jeon et al. (2010) used the Panzar-Rosse model and concentration indices to study the impact of foreign banks on competition of the Asian and South American banking systems during 1998-2008. Their results show that when foreign banks enter these countries the level of competition among domestic banks in the host country goes up. This impact is stronger when a new foreign bank is established in the host country rather than a foreign bank simply purchasing the assets of a domestic bank.

Empirical Model and Data

Bikker and Haaf (2002) developed the following reduced-form revenue equation for a typical bank:

$$LnII = \alpha + (\beta LnAFR + \gamma LnPPE + \delta LnPCE) + \xi LnBSF + \eta LnOI + e \quad (1)$$

Where II represents interest income relative to the bank's total assets (or total funds), AFR is the ratio of annual interest expenses to total funds (the annual funding rate), PPE is the price of personnel expenses relative to total funds, PCE is the price of physical capital expenditure relative to total funds, BSF is bank specific exogenous factors, and OI is the ratio of other income to total assets. AFR, PPE and PCE are considered the inputs for the bank. A subscript to identify each bank is omitted for ease of exposition.

A later study, Bikker et al. (2007), augmented equation (1) to account for more special bank circumstances (especially revenue sources):

$$\begin{aligned} LnII = \alpha + \beta LnAFR + \gamma LnPPE + \delta LnPCE + \eta_1 Ln\,{LNS}/{TA} + \\ \eta_2 Ln\,{ONEA}/{TA} + \eta_3 Ln\,{DPS}/{F} + \eta_4 Ln\,{EQ}/{TA} + \eta_5 Ln\,{OI}/{II} + error \end{aligned} \quad (2)$$

Equation (2) has the following added variables: LNS/TA which is a ratio of customer loans to total assets, which measures loan risks; ONEA/TA is the percentage of assets that generate no income; DPS/F is the ratio of customers' deposits to total customers' deposits and short term credit security funds (which indicates where the bank obtains its deposits); and EQ/TA which is stockholder equity as a percentage of total assets (or the bank's capitalization); and since today's banks are more than simply financial middlemen, OI/II is the ratio of other income to interest income of banks.

The data set includes all Iranian banks which have been established for at least four years. There are ten government banks and eight private banks in the data set. Total assets in the banking system were 3,330 trillion rials ($320 billion US)[1]. The average government bank had assets of 271 trillion rials ($26 billion US) in 2010, while the average private bank had assets of 78 trillion rials ($8 billion US). The total loans in the Iranian banking system were 2,241 trillion rials ($215 billion US). The average government bank had outstanding loans of 181 trillion rials ($17 billion US), while the average private bank had outstanding loans of 54 trillion rials ($5 billion US).

The period studied is during 1997-2010, though the data for some of the private banks are not available for the whole period. If a bank has data for less than four years it is excluded from the study. We use the Bankscope site for most data (www.bankscope.com); the rest are obtained from Iran's Central Bank. Physical capital expenditures are not observable so we use the ratio of other non-interest expenses to fixed assets to measure PCE (Bikker and Groenveld, 2000).

Panel Data Regression Model

A panel data approach using observations of individual banks over time to estimate the model has the advantage of making up for possible weaknesses in either time series or cross-section data (Baltagi, 2001).

[1] The rial is the currency of Iran. The exchange rate used to convert values to dollars is the average rate during July for the year of analysis. The exchange rate came from the International Monetary Fund (http://www.imf.org/external/np/fin/data/param_rms_mth.aspx). All data are from Bankscope (www.bankscope.com) or directly from bank reports.

Before estimating the model we tested that the variables of the model are stationary using a Unit Root Test. Table 2 provides the results from three different tests, Levin et al., Im et al. and the PP – Fisher. All variables are stationary at the 5% level of significance, so no transformation is necessary.

The Limer F-Test

The first question to consider with panel data is whether to use a fixed or random effects model. We answer this question with the Limer F-test:

$$H_0 : \alpha_i = \alpha \,,\ \beta_i = \beta \text{ (pooled data)}$$
$$H_1 : \text{Not } H_0 \text{ (panel data)}$$

The test statistic is:

$$F_{(n-1,\ nt-n-k)} = \frac{(RSS_R - RSS_{UR}) / (n-1)}{(RSS_{UR}) / (nt-n-k)} \qquad (3)$$

RSS_{UR} is the unrestricted residuals sum of squares, RSS_R is the restricted residuals sum of squares, n is the number of sections (banks), t is the time period and k is the number of parameters. Since $F_{(17,\ 208)} = 10.35$ is larger than the critical F value of 1.62 the H_0 hypothesis is rejected. Therefore, the panel data approach is chosen over the pooled approach. Since all banks are considered (not a subset), the fixed effects method, as opposed to random effects, is more suitable for estimation (Harris and Sollis, 2003). The Hausman test results, which are available upon request, also support this conclusion.

Test of Long Run Equilibrium

Before we turn to presenting the estimation results we need to test the hypotheses of the existence of long run equilibrium in the banking market. One of the basic assumptions of the Panzar and Rosse model is the existence of long run equilibrium in the banking market (Nathan and Neave, 1989). Shaffer (1985) has shown that if a long run equilibrium doesn't prevail in the market then the model is only interpretable when $H \geq 0$. If the sample is not in long-run equilibrium, negative values of the H statistic are not particularly associated with a monopoly market.

An empirical test of the long run competitive equilibrium can be obtained through the regression of equation (2) with the dependent variables of return on assets (ROA) or return on equity (ROE). ROA is the ratio of net profit to total assets and ROE is the ratio of net profit to stock holders' equity. After estimating the models, the H_{ROA} and H_{ROE} statistics is obtained by summing the bank's input price coefficients. These equilibrium tests use the fact that in competitive capital markets, risk-adjusted rates of return will be equalized across banks and rates of return should not be correlated with input prices (Rozas, 2007). Therefore, H should not be significantly different from zero if banks are in long-run equilibrium.

The estimated coefficient is 0.15 for H_{ROA} and 0.039 for H_{ROE} with t-values of 2.78 and 4.97, respectively. We conclude that H_{ROA} and H_{ROE} are significantly different from zero. So the null hypothesis is rejected and we can conclude that Iran does not have long run equilibrium in the banking market.

Estimation Results of the Panzar and Rosse Model

The Panzar and Rosse model was estimated under three different situations. The first is using the entire time series (1997-2010) for all 18 banks. The competition level in this time period is judged using the H statistic and specific tests are performed concerning whether the market is perfectly competitive (H=1) or a monopoly (H<0). The second situation uses the P-R model to estimate the level of competition during the period when private banks were more prevalent (2002-2010) and tests whether competition among private banks is stiffer than among public banks. The final analysis divides the time period into two, one where private banking was prevalent (2004-2010) and one where it was not prevalent (1997-2003).

Table 3 presents the results for all 18 banks over the entire time period. All of the coefficients in the model are significantly different from zero and the adjusted R^2 is high, 0.91. The coefficients for AFR, PPE, and PCE are 0.53, -0.40, and 0.31, respectively, so their sum is 0.44. The estimated H statistic is significantly different from zero at the 95% confidence level using one-sided tests, so the banking market structure is monopolistically competitive. It is not a pure monopoly or perfectly competitive.

The results when the P-R model is fitted over the 2002-2010 time period and a dummy variable (DUM) is used to identify government banks are presented in Table 4. Many of the coefficients in the model are significantly different from zero and the adjusted R^2 is high, 0.92. For private banks the coefficients for AFR, PPE, and PCE are 0.76, -0.65, and 0.66, respectively, so their sum is 0.77. For government banks the coefficients are the sum of the coefficient for the private bank plus the coefficient for the variable multiplied by the dummy. These coefficients for AFR, PPE, and PCE are -0.16, 0.18, and 0.25, respectively, so their sum is 0.27. The sum of the coefficients for private banks is significantly different from the sum for government banks. Thus there is greater competition among private banks than government banks.

The separation of the data into two time periods is accomplished by a dummy variable (DUMT) that identifies when an observation is in the early period (1997-2003). The results when the P-R model is fitted in this manner are presented in Table 5. All of the coefficients in the model except the one for ONEA/TA are significantly different from zero and the adjusted R^2 is high, 0.93. For the later time period, the coefficients for AFR, PPE, and PCE are 1.00, -0.39, and 0.22, respectively, so their sum is 0.83.

For the earlier time period (1997-2003), the coefficients are the sum of the coefficient for the later time period plus the coefficient for the variable multiplied by the dummy. These summed coefficients for AFR, PPE, and PCE are 0.13, 0.05, and 0.22, respectively, so their sum is 0.40. The summed coefficient for the earlier time period is significantly different and smaller than the summed coefficient for the later time period. Thus, the entry of private banks into the sector has increased competition in Iran's banking sector, which is consistent with our hypothesis.

Conclusion

Banks are important economic agents that play a pivotal role in absorbing capital and idle funds and channeling them to active economic units. Since a competitive banking environment can improve productivity in the banking system and enhance economic growth, a study of the banking market that identifies structural difficulties in this market can lead policy makers to sound, or at least more efficient,

monetary and fiscal policies that match a society's economic goals. The banking system in Iran was exclusively government controlled from 1983 to 1999. The liberalization of the banking industry provides interesting insights into the effects of private entry. In this article we applied the Panzar and Rosse model to 18 government and private banks to assess competition in the banking market In Iran.

Structural tests revealed that neither perfect competition nor pure monopoly conditions govern the banking system in Iran. The results for the entire banking system (18 banks) during 1997-2010 showed that the degree of competition among these banks is 0.44 which indicates a monopolistic competition market structure. The results also showed that there is a significant difference in the degree of competition among private banks (0.76) and government banks (0.25). This indicates that competition among private banks is stiffer. We also showed that when private banks entered the banking system the competition index, H, increased from 0.40 during 1997-2003 to 0.82 during 2004-2010.

Based on the finding of this study we recommend that the Iranian government remove all obstacles for private banks entering the market to enhance productivity and stimulate growth. The government should also reduce its market share of banking, which is more than 75 % right now, and provide incentives for more private banking[2]. And last but not least, although this has not been a study of the effect of government interference policies in the banking market, it is clear that the government should continue to liberalize banking regulations and refrain from policies such as setting interest rate ceilings on private banks and forcing compulsory loans to certain interest groups.

[2] This percentage is based on total bank capital and it comes from Iran's Central Bank Reports. During the period for this study public banks had not entered into the Tehran Stock Exchange, so they were all government owned and managed.

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Table 1. Basic Statistics on Iranian Banks, 2010.

		Government banks	Private banks
Total assets			
	billion rials	2,709	621
	billion US $	260	60
Average assets			
	billion rials	271	78
	billion US $	26	8
Total loans outstanding			
	billion rials	1,813	429
	billion US $	179	41
Average loans outstanding			
	billion rials	181	54
	billion US $	17	5

Source: www.bankscope.com and various bank reports.

Table 2. Unit Root Tests for all Variables

Variable	**Levin et al.**	**Im et al.**	**PP-Fisher**
Ln II	-13.52	-6.06	113.28
	(0.00)	(0.00)	(0.00)
Ln AFR	9.51	-2.84	51.95
	(0.00)	(0.00)	(0.00)
Ln ppe	-2.79	-1.48	48.6
	(0.00)	-0.07	-0.02
Ln pce	-2.55	-1.44	43.18
	(0.00)	-0.08	-0.05
Ln LNS/TA	-2.13	-3.15	78.6
	-0.02	(0.00)	(0.00)
Ln ONEA/TA	-6.23	-2.13	36.99
	(0.00)	-0.02	-0.17
Ln DPS/F	-40.26	-15.43	87.12
	(0.00)	(0.00)	(0.00)
Ln EQ/TA	-3.45	-1.8	75.5
	(0.00)	-0.03	0
OI/II	-8.6	-2.57	62.32
	(0.00)	(0.00)	(0.00)

The numbers in parentheses give the significance level for the test statistic

Table 3. Estimated Coefficients from the P-R Model for 1997-2010.

Variable	Coefficient	t-Statistic	Prob.
C	6.390268	9.432468	0.0000
Ln(AFR)	0.525335	5.728442	0.0000
Ln(PPE)	-0.395635	-2.704560	0.0076
Ln(PCE)	0.313755	3.583391	0.0005
Ln(EQ/TA)	-0.433291	-4.686098	0.0000
OI/II	-0.266978	-4.901358	0.0000

R^2 0.92; Adjusted R^2: 0.91; F-statistic 53.5; H = 0.44

Table 4. Results of the P-R Model for 2002-2010 with a Dummy Variable to Identify Government Banks.

Variable	Coefficient	t-Statistic	Prob.
C	7.977999	10.51320	0.0000
Ln(AFR)	0.761695	6.462369	0.0000
Ln(PPE)	-0.654519	-3.586754	0.0005
Ln(PCE)	0.661022	4.118868	0.0001
OI/II	-0.254242	-4.444698	0.0000
Ln(AFR)*DUM	-0.920185	-4.522008	0.0000
Ln(PPE)*DUM	0.827011	2.914288	0.0044
Ln(PCE)*DUM	-0.410668	-2.281161	0.0246

R^2: 0.94; adjusted R^2 : 0.92 F-statistic: 51.1; H (privates) = 0.77; H (government) = 0.77 – 0.50 = 0.27

Table 5. Results of the P-R Model for 1997-2010 with a Dummy Variable to the 1997-2003 Period.

Variable	Coefficient	t-Statistic	Prob.
C	8.919804	14.76782	0.0000
Ln (AFR)	0.998995	9.279606	0.0000
Ln (PPE)	-0.394022	-3.363349	0.0010
Ln (PCE)	0.216872	3.159091	0.0020
Ln (ONEA/TA)	0.083906	1.436499	0.1533
OI/II	-0.284479	-6.388182	0.0000
Ln (AFR)*DUM	-0.865668	-7.422036	0.0000
Ln (PPE) *DUM	0.442595	3.323143	0.0012

R^2: 0.94; adjusted R^2: 0.93 F-statistic: 63.6; H (2004-2010) = 0.82; H (1997-2003) = 0.82 – 0.42 = 0.40