

Measuring Market Power in the Iranian Banking Industry According to the Boone Efficient-based Approach

Forough Jahantigh¹ Mohammad Nabi Shahiki Tash² Mosayeb Pahlavani³

Abstract

The main objective of this paper is to evaluate the structure of the Iranian banking system and to measure the market power factor based on the Boone approach. In this paper, we investigated the Iranian organized money market, including 18 banks operating in the period of 2008-2015. To calculate the marginal cost (MC), we used a *Translog Stochastic Frontier Cost Function*. Findings based on the Boone approach confirm that the size of efficient-based competition is low in Iranian organized money market. Based on the Boone index, this value in the Iranian banking market equals -0.022, and Bank Melli and Bank Mellat due to having high marginal cost elasticity with respect to market share, have a higher power in market transformations and distortion of market structure towards monopoly. In contrast, Karafarin Bank, Post Bank, Sarmayeh, and Sina Bank have produced the least distortion in market structure.

JEL classification: G21, L00, L1

Keywords: Banks, Boone Approach, Degree of Competition, Elasticity Factor

1. Introduction

The banking industry in the Iranian economy plays a key role in equipping deposits toward investment expenses due to the capital market defects. Indeed, this sector in the Iranian economy can be regarded as the most important bridge between the supply and demand of monetary resources, so that any deficiencies in the structure of this sector and its performance inefficiency will provide grounds for disturbing other sectors.

In recent years, banks have been practically affected by many market improvements. Deregulation, liberalization, globalization and various innovations, each of these developments have affected the competitive conditions of banks. As the market power of banks affects their profitability, competitive behavior also affects the authenticity and

¹ Ph.D. Student of Economics, University of Sistan and Baluchestan, Iran

² Corresponding Author, Associate Professor of Economics, University of Sistan and Baluchestan, Iran

³ Associate Professor of Economics, University of Sistan and Baluchestan, Iran.
pahlavani@eco.usb.ac.ir

stability of the financial sector. The 2007 financial crisis showed how the bankruptcy of several large banks can put the whole country in a deep recession. The specific characteristics of banks in different countries have caused the impact of the financial crisis to be different on them, as each bank's response to economic shocks varies depending on the strength of their balance sheets, such as bank size, bank capital, etc. Experience has shown that banks with more liquidity or capital and assets are more powerful in dealing with economic shocks. Instead, small banks undergo many changes in allocating and equipping their resources. In recent years, due to economic sanctions, the economic structure of Iran has become very fragile. Market structure is one of the issues that is considered when examining the degree of competition and monopoly in microeconomic analysis. This concept embraces a wide range of market conditions and approaches to monopoly space, depending on the severity of the deviation from pure competition conditions. Pure competition in microeconomic analysis has always been an indication of the allocative efficiency and maximum social benefits, while monopoly is associated with inefficiencies. Perfect competition theory is the basis on which the structure of different markets can be evaluated and analyzed. In fact, as the market is closer to competitive conditions and have more distance from monopoly conditions, the function of the market in question will be more appropriate in terms of efficiency. In the theories presented in the neoclassical approach, the competition is judged based on comparing the size of the firm and the market. In other words, the process of market competition is characterized by the small size of firms relative to market size. But what is seen in real markets is a different structure than the description of neoclassicals from a competitive market, and a market that has a perfect competition conditions is rarely found. Accordingly, in order to identify the structure of markets, one must use the criteria and attributes that are consistent with actual market approach and be able to properly analyze market conditions from the point of view of the degree of competition and monopoly.

One of the most suitable criteria for evaluating market structure is the Boone index, which can be used to examine the marginal cost elasticity with respect to market share in each industry or in the economy as a whole.

Considering the importance of market structure in the field of policy-making, by understanding the importance of recognizing the banking

industry in Iranian economy, the present study seeks to identify the competitiveness level of this industry. Economic studies and researches have shown that the capital market in Iran is not sufficiently deep and most of the production and service needs are provided through banks. To this end, it is needed to adopt a mechanism so that by pinpointing the competitiveness level of banks, one can take an effective step to improve this sector; additionally, by reducing the market power of banks and expanding the competitive environment among them, one can made a positive contribution to the functioning of the banking market, in order to take effective steps in direction of the economic development and growth of the country. The central goal of this paper is to assess market power based on the marginal cost elasticity with respect to the market share in the Iranian organized money market (Boone approach). To calculate the Boone index, we use the cost function of banks, which in this study, is considered to be the Translog cost function. The reason for choosing this function is that the structure of the Translog cost function is such that it involves the interactions between inputs and the interactions between the level of production and inputs. While other functions do not have this capability. It also has high flexibility and imposes fewer restrictions on the structure of the cost function.

The paper is organized as follows. After the introduction, the research literature is reviewed. In this section, we will have a glance at the studies conducted inside and outside the country on the market structures. The third section is devoted to theoretical foundations in which we deal with the methodology of research and the introduction of the studied index and then we evaluate the market structure. The fourth section addresses the econometric estimation of model and data analysis, and in the final section, conclusions and policy recommendation will be provided.

2. Literature review

Regarding evaluation of the structure of economic markets and identifying market power in the form of different models, various studies have been carried out both inside and outside the country. The most important studies in this area are presented in this section.

In an article Hussain khan et al. (2017) measures the competition in the banking industry. In their paper, they used the Boone, Herfindahl, Panzar-Rosse and Lerner Indices for measuring competition in South-East Asia during 1996-2016. The results of their study indicate that the level of

banking concentration in the countries of South East Asia (ASEAN) has increased dramatically due to structural reforms in the banking sector and thus raising concerns about its potential negative impact on the performance of banks. Research evidence suggests that increased concentration has reduced banking competition.

In their article entitled "efficiency, growth and market power in the banking industry", Hussain Khan et al. (2017) developed evidence on the relationship between the efficient-structure (ES) hypotheses. To reach this goal, using the causality test they reached from the cost of efficiency to the growth of the bank, and then from the growth of the bank reached to market concentration. The method used in their study was the Generalized Method of Moments (GMM) with two-step system and Panel Vector Autoregression (PVAR). Research results indicate that efficiency costs enable banks to grow and gain a higher market share. As a result, further growth will lead to more market concentration and ultimately lead to increased market power.

Kasman and Kasman (2015) in their paper analyzed the impact of competition and the concentration on banking stability in the Turkish banking industry during 2002-2012. In their paper, the Boone index and the Lerner adjusted efficiency index are used as proxies for measuring competition. In addition, Non-Performing Loans (NPL) ratio and The Z index has been used as a proxy for bank stability. The results of their paper show that competition has a negative relationship with the NPL ratio and has a positive relationship with the Z index. Furthermore, the funding shows that the concentration has a positive impact on the NPL and a negative impact on the Z index. The results of their study confirm the viewpoint of competition-fragility.

In his article, Coccoresse (2014), evaluated the Lerner index in the banking industry during the period 1994-2012 using the econometric method proposed by Kumbhakar et al. (2012). In this method, there is no longer a need to calculate the price, and to calculate the Lerner index, the division of the inefficient component on the elasticity of the cost function is used. This method is based on the stochastic frontier methodology. They compared their results with existing studies on market power in the banking industry to examine the consistency and coherence of empirical evidence, and their results confirmed that they are consistent with existing evidence and previous studies.

Leuvensteijn et al. (2007) in a paper able to measure the competitiveness of the banking market sectors, such as the lending market using the Boone index. They assessed competition on lending markets in five major EU countries, along with the United Kingdom, the United States and Japan over the period 1994-2004. Their research finds that United States has the most competitive lender market. And lending markets in France, Japan and the UK have been less competitive.

In their article Carbó et al. (2005) assessed competitive behavior and bank competition within and between countries using several important indicators (NTMTA) (profit margin / total assets), Lerner, Panzar-Rosse and Herffindal Hirschman indices. Results from the 14 European countries show that existing indicators for measuring competition often present conflicting forecasts. In order for further compatibility of indicators, they tried to separate the pricing power of banks from other (non-central) banks that affect competition indicators. In this case, they were able to find improvements in the compatibility of these indicators.

Moradi et al. (2016) in their article measured the market power of the Iranian banking industry in a parametric approach. Bank level data is related to 33 banks for the years 2001- 2014. The results indicate that the monopoly power of the banking industry in the loan market has been declining and the competitive conditions have improved slightly during this period. There is, of course, a gap between the price and the marginal cost at a high level.

Khodadad Kashi and Hajian (2013) have examined the market power in the Iranian banking industry during 2001-2010. In their research, they evaluated market power in lending and deposit markets (including 10 public banks and 4 private banks) using Lerner index. The results indicate that monopoly power in the loan market has decreased, but the deposit market moves towards more monopoly. They argue that their research shows the importance of economic policy in reducing barriers to entry and to in better regulating competition rules.

In another research entitled "the effect of banking regulations on competition in the Iranian banking Industry," Talebloo and Bahmanpour (2011) examined the effect of banking regulation on competition in the banking industry using the panel data of 17 private and public banks during the years 1996-2009. They used the Lerner Index to measure competition. The results of their research showed that the coefficient of capital adequacy variable in all of the estimation methods is positive and

significant. As a result, increasing the ratio of capital to banks' risk-weighted assets increases competition. Also, the index of bank size is significant in most of the models, indicating that increasing the size of the bank will increase the risk taking of banks.

In their article, Khiabani and Hamidisahneh (2011) evaluated the influence of private banks entry on the level of competition in the Iranian banking industry during the period 1996-2006 using the Lerner index. The results of their research show that the competition conditions in this industry have tended toward monopoly until the year 2000 and competition has increased significantly after the entry of private banks, but there is still a significant gap in the level of competition in the banking industry of Iran and other countries.

3. Theoretical foundations

The intellectual basis of market power measurement is divided into Structural and non-structural approach. According to Boone, the Lerner index calculated by structural methods cannot well show monopoly power in some markets. For this reason, profit elasticity is an appropriate alternative to this problem. The Boone's approach is based on the efficiency approach, and to estimate which one should do based on optimization of the profit function with respect to the cost.

The Boone's approach is based on two views: the first view states that more efficient firms (firms with lower marginal costs) will achieve a more market share or profit. And second, as the market moves towards more competition, this effect will be more powerful.

Boone (2000-2004) consider a banking industry in which each bank i produces a product q_i , facing with a demand curve in the form of:

$$p(q_i, q_{j \neq i}) = a - bq_i - d \sum_{j \neq i} q_j \quad (1)$$

Where the marginal cost mc_i is fixed. The bank maximizes the profit $\pi_i = (p_i - mc_i)q_i$ by choosing the optimal product level. We assume that $a > mc_i$ and $0 < d \leq b$. Thus, the first-order condition for a Cournot-Nash equilibrium can be written as follows:

$$a - 2bq_i - d \sum_{i \neq j} q_j - mc_i = 0 \quad (2)$$

When N banks produce positive levels of the output, the N first-order conditions can be solved for (2), yielding:

$$q_i(c_i) = [(2b/d - 1)a - (2b/d + N - 1)mc_i + \sum_j mc_j] / [(2b + d(N - 1))(2b/d - 1)] \quad (3)$$

The profits π_i are defined as variable profits excluding entry costs . Hence, a bank enters the banking industry if, and only if, in equilibrium we have $\pi_i \geq \varepsilon$. It should be noted that Eq. (3) gives the relationship between output and marginal costs. From $\pi_i = (p_i - mc_i)q_i$ we can see that profits depend on marginal costs in a quadratic way.

In this market, competition may increase in two ways. First, competition increases when the produced services of the various banks become closer substitutes, that is, d increases (but below b). Second, competition will increase when entry costs decline. Equation (3) supports the use of the following model for market share, defined as $s_i = q_i / \sum_j q_j$:

$$\ln s_i = \alpha + \beta \ln mc_i \quad (4)$$

It is expected that the market shares of banks with lower marginal costs to increase. The stronger competition is, the stronger this effect will be, and the larger this absolute (negative) value of β . The β parameter is referred to as the Boone indicator. Equation (4) has been specified in log-linear terms in order to deal with heteroskedasticity. Moreover, this specification implies that β is an elasticity, which can be easily interpreted across equations.

In the following, we describe how to calculate the boon index. To obtain the boon index, we must first calculate the marginal cost and then the market share of each firm. To calculate the marginal cost, we need a cost function. In this study, we use the translog frontier cost function and secondly, we use market share instead of profit as a dependent variable. Considering the impact of efficiency on market share and its relationship with competition, one can look deeper into measuring competition. The advantage of using a market share model relative to a profit model is that market share values are always positive. While profit includes both positive and negative (economic losses) values, and since our specification is log-linear, the estimation results would be distorted by the sample bias, because inefficient and loss-making banks should be ignored.

In this study, the Translog frontier cost function is used to calculate the marginal cost. These types of functions are the best type of cost functions due to the flexibility. In these functions, with a sufficient number of parameters, it is imposed no limitation on the cost structure, and there is also an interaction between the inputs as well as all components of the cost

function and other components. Now, using this function, we can extract the marginal cost to calculate the Boone index. Our frontier cost function consists of a composite error component that has two parts: The part that involves random variations outside the control of the firm and is symmetric and the second part involve unilateral changes. Our cost function is a single product based on total assets and includes two inputs (deposit input price, capital) as defined as below. The specification of the cost function- in accordance with the major part of the experimental literature on the banking - is based on the following translog form:

$$C = f(x) + v + \nu \quad (5)$$

$$TC = (Q, W_1, W_2) \quad (6)$$

In the above relationship the total cost (TC), is a function of the production level (Q). W_1 and W_2 are deposit input price and capital price respectively.

$$\begin{aligned} \ln TC_{it} = & \alpha_0 + \alpha_1 \ln Q_{it} + \sum_{h=1}^2 \alpha_h \ln W_{hit} + \frac{1}{2} \alpha_{QQ} (\ln Q_{it})^2 \\ & + \frac{1}{2} \sum_{h=1}^2 \sum_{k=1}^2 \alpha_{hk} \ln W_{hit} \ln W_{kit} + \sum_{h=1}^2 \alpha_{Qh} \ln Q_{it} \ln W_{hit} \end{aligned} \quad (7)$$

To derive the input cost share functions, using Shepherd's lemma, we differentiate the Translog cost function (7), with respect to the price of each of the inputs. The result is the conditional demand for that production factor.

$$S_i = \frac{\partial \ln TC}{\partial \ln W_i} = \frac{\partial TC}{\partial W_i} \cdot \frac{W_i}{TC} = \frac{W_i X_i}{TC} = a_h + \sum_{k=1}^2 a_{hk} \ln W_{hit} + a_{Qh} \ln Q_{it} \quad (8)$$

In the above equation, S_i is the input share of the total cost, W_h is the input price and X_i is the input amount. To satisfy the condition of the normal and well-behaved cost function, the two conditions of symmetry and homogeneity of the first degree in the prices of inputs are applied to the total cost function. The conditions of homogeneity and symmetry are:

$$\begin{aligned} \sum_{h=1}^2 a_h = 1, \quad \sum_{h=1}^2 a_{Qh} = 0, \quad \sum_{k=1}^2 a_{hk} = \sum_{h=1}^2 a_{kh} = 0 \quad h, k = L, K \\ a_{hk} = a_{kh} \quad h, k = L, K \end{aligned}$$

To apply the above conditions in the function, we will do the following:

$$\ln \left(\frac{TC_{it}}{W_{kit}} \right) = a_0 + a_1 \ln Q_{it} + \sum_{h=1}^2 a_h \ln \left(\frac{W_{hit}}{W_{kit}} \right) + \frac{1}{2} a_{QQ} (\ln Q_{it})^2 \quad (9)$$

$$+ \frac{1}{2} \sum_{h=1}^2 \sum_{k=1}^2 a_{hk} \ln\left(\frac{W_{hit}}{W_{kit}}\right) \ln\left(\frac{W_{kit}}{W_{hit}}\right) + \sum_{h=1}^2 a_{Qh} \ln Q_{it} \ln\left(\frac{W_{hit}}{W_{kit}}\right)$$

After estimating the coefficients of the regression function, we can extract the marginal cost function by differentiating the marginal cost function with respect to Q.

$$MC_{it} = \frac{\partial TC_{it}}{\partial Q_{it}} = \frac{TC_{it}}{Q_{it}} \left(a_1 + a_{QQ} \ln Q + \sum_{h=1}^2 a_{Qh} \ln \frac{W_{hit}}{W_{kit}} \right) \quad (10)$$

By calculating the Translog cost function, we can measure market power using the Boone index.

The econometric estimation of the Boone's market power index (β) when the cost function is a Translog function:

$$\ln\left(\frac{X_{it}}{\sum X_{it}}\right) = \beta_0 + \beta_i \left\{ \ln\left(a_1 + a_{QQ} \ln Q + \sum_{h=1}^2 a_{Qh} \ln W_{hit}\right) \right\} \frac{TC_{it}}{Q_{it}} + \mu_{it} \quad (11)$$

Where, X_i represents the total assets for each bank, and $\sum X_i$ represents the total assets of all banks.

$$\beta = \frac{n \sum_i MC_i \cdot S_i - \sum_i MC_i \sum_i S_i}{n \sum_i MC_i^2 - \left(\sum_i MC_i\right)^2} = \frac{\sum_i (S_i - \bar{S}) (MC_i - \overline{MC})}{\sum_i (MC_i - \overline{MC})^2} \quad (12)$$

In the equation above, S_i represents the market share. Now, if we replace MC_i by the value of the function obtained from the Translog total cost function, we get:

$$\beta = \frac{\sum_i (S_i - \bar{S}) \left\{ \ln\left(a_1 + a_{QQ} \ln Q + \sum_{h=1}^2 a_{Qh} \ln W_{hit}\right) \right\} \frac{TC_{it}}{Q_{it}} - \overline{MC}}{\sum_i \left\{ \ln\left(a_1 + a_{QQ} \ln Q + \sum_{h=1}^2 a_{Qh} \ln W_{hit}\right) \right\} \frac{TC_{it}}{Q_{it}} - \overline{MC}}^2 \quad (13)$$

4. Methodology and data

The data used in this study is related to the 18 banks operating in this industry during the period of 2008-2015. In this section, we report the estimated parameters of the model under discussion. We use the maximum likelihood (ML) method to obtain the efficient estimates for the coefficients of the Translog cost function and the cost share equations for panel data for 18 active banks. Estimation of compound error models using the OLS method is not feasible, since all changes in the performance of banks are not random in comparison with the efficiency frontier, but include another component called inefficiency, which has a semi-normal distribution. Estimates of the coefficients are shown in Table (1).

Table 1: Results of the estimation of the translog frontier cost function

Variable	parametr	T- test	S.T
C	-33.33651	-	9.689362
		3.44	
Ln(Q)	4.231231	4.05	1.044187
(Ln(Q)) ²	-	-	0.0563171
	0.1699807	3.02	
Ln(W2/W1)	2.2102	3.88	0.5701767
(Ln(W2/W1)) ²	-	-	0.521352
	0.0037982	0.07	
LnQ*Ln(W2/W1)	-	-	0.0303838
	0.0941455	3.10	
Sigma_u	0.335		
Sigma_e	0.3004		
R-squared within	0.8499		
R-squared between	0.9374		Validation criteria
R-squared overall	0.9157		
Rho	0.55		

Source: research result

After estimating the coefficients of model (9), in order to estimate the elasticity of the cost function through the Boone's approach, we have to differentiate the total cost function in the asset market with respect to the total assets to extract the marginal cost function for the banking industry.

$$MC_{it} = \frac{\partial TC_{it}}{\partial Q_{it}} = \frac{TC_{it}}{Q_{it}} \left(a_1 + a_{Q0} \ln Q + \sum_{h=1}^2 a_{Qh} \ln W_{hit} \right) \quad (14)$$

In the above function, TC is the total cost, Q the total asset and W_1 is the deposit input price. In this research, the proxy used for that is the ratio of the total joint income to the total bank deposits. W_2 is the capital input price and its proxy is derived from the ratio of operating costs to total assets.

After obtaining the marginal cost function coefficients, it is now time to calculate the market share of each bank in order to calculate the coefficient of marginal cost elasticity with respect to market share. Table (2) represents the market share of banks

Table 2: The market share of banks

Year	2008	2009	2010	2011	2012	2013	2014	2015
Melat	0.01025	0.011265	0.014764	0.01793	0.020747	0.031537	0.037057	0.039124
Tejarat	0.000794	0.009052	0.010221	0.012401	0.013754	0.016384	0.022862	0.2521
Saderat	0.010295	0.010922	0.012799	0.01507	0.016347	0.019581	0.02281	0.029993
Refah	0.001691	0.001774	0.001874	0.002355	0.003222	0.004778	0.007433	0.009367
Melli	0.013548	0.014395	0.01718	0.021944	0.025033	-	0.033505	0.038578
Sepah	0.006189	0.005835	0.005932	0.006905	0.008441	-	0.014987	0.016419
Sanat&Madan	0.001397	0.001428	0.002206	0.002585	0.003112	0.003857	0.006085	-
Keshavarzi	0.004368	0.00483	0.005592	0.00666	0.008823	-	-	-
Maskan	0.004635	0.005052	0.00643	0.011505	0.017694	-	-	-
Tosea&Saderat	0.000917	0.00098	0.001219	0.00174	0.001823	0.002637	0.003622	-
Postbank	0.000238	0.000239	0.000368	0.000433	0.000519	0.00061	0.000957	0.001215
Eghtesade								
Novin	0.001986	0.003013	0.002978	0.003633	0.004649	0.00603	0.007808	0.009072
Parseyan	0.004323	0.005263	0.006115	0.007502	0.008819	-	-	0.015172
Pasargad	0.001518	0.002533	0.003215	0.004777	0.005912	0.007917	0.010055	0.1184
Saman	0.000929	0.001112	0.01316	0.002268	0.002941	0.003543	0.005418	-
Sarmayeh	0.00032	0.000633	0.000836	0.001097	0.001559	0.002225	0.003267	0.003715
Sina	0.000643	0.00075	0.000955	0.001273	0.00178	0.002517	0.003278	0.00397
Karafarin	0.000686	0.000939	0.001003	0.001146	0.001587	0.002049	0.002672	0.002987

Based on the findings of the above table (2), we see that the market share of state-owned banks is considerably higher than private banks. Bank Mellat has the highest market share in 2015, after which the Bank Melli earned the second place in the same year, and then the Bank Saderat and the Bank Tejarat are ranked next. In 2014, Bank Mellat has accounted for the largest share of the banking market and banks Melli, Tejarat and Saderat are ranked next. According to the results of the above table, if we

want to classify the data based on the largest share of the banking market, the top ten market shares belong to the four Banks of Mellat, Melli, Tejarat and Saderat. In contrast, the lowest share is related to the Post Bank of Iran in the years 2008-2009. In the third rank, Sarmayeh Bank has the smallest share of the market in 2008. Then, the Post Bank of Iran again accounted for the lowest share of the banking market during the years 2010- 2012. Again, seventh rank in 2008 belongs to Sarmayeh Bank. Sina Bank is in the next position during 2008-2009 and Karafarin Bank is ranked tenth of this group in 2008. As the results of the research show, state-owned banks have the highest market share, and in contrast, private banks have the smallest share of the banking market. This is the most important factor in the low level of competition among banks. To this end, the government can have a positive impact on the market share of private banks by reducing barriers to entry and changing attitudes toward private banks from executive to supervisory.

Table 3: The marginal cost of the banks

year	2008	2009	2010	2011	2012	2013	2014	2015
Melat	0.914343	0.929987	0.87852	0.860478	0.806735	-	0.7745	0.787355
Tejarat	1.172591	0.972088	0.990972	0.953548	0.952943	0.944426	0.877909	0.882749
Saderat	0.955933	0.929609	0.918273	0.912437	0.862766	0.853489	0.829831	0.790888
Refah	1.259945	-	-	1.179833	1.132006	1.06948	1.05554	1.015512
Melli	0.899741	0.641561	0.644805	0.767072	0.719036	-	0.750227	0.756151
Sepah	1.026167	1.012025	0.963676	0.923928	0.926073	-	0.840607	0.818099
Sanat&Madan	1.369964	1.356493	1.341348	1.253917	1.246813	1.15635	1.092681	-
Keshavarzi	1.105218	1.081708	1.042855	1.029834	0.976244	-	-	-
Maskan	-	1.049716	0.980258	0.870404	0.919616	-	-	-
Tosea&Saderat	1.568515	1.438822	1.340509	1.229094	-	1.1611	1.118107	-
Postbank	1.716105	1.700014	1.522732	1.499393	1.455436	1.33635	1.279121	1.293105
Eghtesade Novin	1.081984	1.138672	1.128168	1.089687	1.046701	0.993985	0.948611	0.90061
Parseyan	0.935096	0.897033	0.894406	0.86894	0.844434	-	-	1.08304
Pasargad	1.397913	1.311193	1.267598	1.233627	1.216577	1.144069	1.124861	1.077398
Saman	1.222452	1.136451	1.152253	1.127349	1.030016	1.050465	0.979166	-
Sarmayeh	-	1.577816	1.447305	1.415596	1.340947	1.256714	1.195403	1.194852
Sina	1.436358	1.340896	1.29161	1.305692	1.255197	1.34053	1.312497	1.271097
Karafarin	1.519499	1.492702	1.499639	1.467492	1.405123	1.376996	1.335057	1.318164

According to table (3), banks Melli and Mellat have the lowest marginal cost and Post Bank and Sarmayeh Bank have the highest marginal cost.

The results reported in the table show that private banks face a rise in their marginal cost at the beginning of entering the market, which in the coming years, with the proper management of costs, it takes a downward trend. In addition, further control of the marginal cost by some banks will

increase the profit margin of these banks, which will lead to market power for these banks. Banks usually increase the profit from the increase in profits received from facilities; as a result, the borrowers suffer losses. The government can decrease the market power of banks by further monitoring of the profit margin of banks.

Table 4: Evaluation of the marginal cost elasticity with respect to market share

Variable	Coefficient	Std. Error	t-Statistic
SI_MELAT	0.038906	0.007445	5.225834
SI_TEJARAT	0.003625	0.005916	0.612742
SI_SADERAT	0.029581	0.006716	4.404335
SI_REFAH	-0.021025	0.005783	-3.635590
SI_MELI	0.079705	0.007732	10.30895
SI_SEPAH	0.014386	0.006200	2.320429
SI_SANAT&MADAN	-0.039088	0.004977	-7.853053
SI_KESHAVARZI	-0.009170	0.006831	-1.342365
SI_MASKAN	0.008945	0.008300	1.077658
SI_TOSEA&SADERAT	-0.041982	0.004979	-8.432283
SI_POSTBANK	-0.050990	0.003636	-14.02186
SI_EGHTEADENOVIN	-0.007946	0.005091	-1.560812
SI_PARSEYAN	0.018077	0.006482	2.788883
SI_PASARGAD	-0.038317	0.005186	-7.388980
SI_SAMAN	-0.015913	0.004791	-3.321755
SI_SARMAYEH	-0.046441	0.004583	-10.13386
SI_SINA	-0.042645	0.004276	-9.972813
SI_KARAFARIN	-0.054443	0.004237	-12.84804
R-squared	0.881242	Mean dependent var	0.087055
Adjusted R-squared	0.862374	S.D. dependent var	0.211841
S.E. of regression	0.078589	Akaike info criterion	-2.116666
Sum squared resid	0.660849	Schwarz criterion	-1.709389
Log likelihood	150.2916	Hannan-Quinn criter.	-1.951211

As discussed in previous sections of the study on the Boone index, which is based on the Demsetz's (1973) efficient-structure hypothesis and the relationship between markets efficiency and performance, the efficient firms earn more profits and market share. The parameter β in equation (4) is the marginal cost elasticity with respect to market share. The more negative the beta parameter value, the more competitive the banks are. The positive value of the Boone index means that despite increased costs, because of the market power of the firm, it will be able to increase profitability and gain more market share. Based on the results in Table 2,

Karafarin Bank, Post Bank, Sarmayeh Bank, Sina, Tosse and Saderat with a negative coefficient make the least distortion, respectively, in market evolution and in restructuring the market. And these banks, because of the low elasticity of MC_i to S_i , cause the least distortion and change in the market structure. Based on the above tables, the market share of these banks is very small, but their marginal cost is higher than other banks. In contrast, banks Melli and Mellat have a positive parameter and because of the high elasticity of MC_i with respect to S_i , they have more power to divert the market toward monopoly.

According to the results shown in the table (2), the market share of Melli and Mellat are higher than the other banks. Additionally, the marginal cost of these banks are lower compared to other banks, which itself led to a margin of profit for these banks, which makes Melli and Mellat to be able to make the most deviations in the market toward monopoly.

5. Conclusions

In this research, we measured market power in the Iranian banking industry using the Boone index. Our estimation of the Boone index is equal to -0.022. This indicates that our banking industry is competitive to a very small amount. Also, we measured the marginal cost elasticity coefficient of each bank with respect to its market share. To calculate the marginal cost, we used the translog cost function. This function is set based on total assets, and its inputs include the deposit input price and the capital input price. The MLE method was used to estimate the translog function and the data used are the bank level data included the balance sheet and the income statement of 18 banks of the country during the period 2008-2015.

Findings suggest that banks with lower marginal costs have a larger market share, such as Bank Mellat and Bank Melli. Also, due to the high MC_i to S_i coefficient, these banks have more power in diversion of market towards monopoly and this suggests that Iranian state-owned banks play a more significant role in changing market structure and market diversion towards monopoly than private banks. Because the market share of private banks is much lower than that of state-owned banks, competitive power in the banking industry in Iranian banking industry is very low, which, according to the results of the research, this value based on the Boone approach equals -0.022.

Regarding the non-competitive environment in Iranian banking system, a more competitive environment can be created by increasing the number of private banks and decreasing the role of the government in determining the interest rate. Of course, by increasing the number of private banks and reducing the concentration in state-owned banks one can reduce the market power, if the government's policy to the private banks shift from executive commands to supervisory, and also the government interventions in determining the rate of profit be limited. Because the command control of the bank rate means the elimination of one of the important variables of competitive space. Otherwise, an increase in the number of private banks will not have a significant effect on the decline in market power of this industry. Also, by close monitoring of the banks' profit margin through the central bank, the government can play a significant role in reducing market power and reducing market diversion toward monopoly.



References

- 1-Boone, J.(2000). Competition. *CEPR Discussion Paper Series*, NO.2636.
- 2-Boone, J.(2001). Intensity of competition and the incentive to innovate. *International Journal of Industrial Organization*, 19(5), 705-726.
- 3-Boone, J.(2004). A new way to measure competition. *CEPR Discussion Paper Series*, No.4330.
- 4-Boone, J., Griffith, R., & Harrison, R.(2004). Measuring competition. *Presented at the Encore Meeting 2004 'Measuring Competition'*.
- 5-Carbo, S., Humphrey, D., Maudos, J., & Molyneux, P.(2005). Cross-Country comparisons of competition and pricing power in European banking. *Munich Personal RePEc Archive*.
- 6-Coccorese, P.(2014). Estimating the lerner index for the banking industry: A stochastic frontier approach. *Applied Financial Economics*,
- 7-Cruz-Garcia, P., Fernandez de Guevara, J., & Maudos, J. (2017). The evolution of market power in European banking. *Finance Research Letters*, 23, 257-262.
- 8-Demstesz, H. (1973). Industry structure, market rivalry and public policy. *Journal of Law and Economics*, 1-9.
- 9-Hussain Khan, H., Kutan, A. M., Ahmad, R. B., & Gee, C. S.(2017). Does higher bank concentration reduce the level of competition in the banking industry? Further evidence from South East. *International Review of Economics and Finance*, 52, 91-106.
- 10-Hussain Khan, H., Kutan, A.M., Naz, I., & Qureshi, F.(2017).
- 11-Efficiency, growth and market power in the banking industry: New approach to efficient structure hypothesis. *North American Journal of Economics and Finance*, 42, 531-545.
- 12-Kasman, S., & Kasman, A. (2015). Bank competition, concentration and financial stability in the Turkish banking industry. *Economic Systems*, 39, 502-517.
- 13-Khiabani, N., & Hamidisahneh, M.(2011). The effect of entry regulation on bank competition: the case of the Iranian banking industry. *Journal of Applied Economics*.
- 14-Khodadad Kashi, F., & Hajian, M. R. (2013). Evaluating cost-efficiency of Iran's banking industry: 2001-2007. *The Journal of Planning and Budgeting*, 18(1), 3-24.

15-Kumbhakar, S. c., Baardsen, S., & Gudbrand, L. (2012). A new method for estimating market power with an application to Norwegian sawmilling. *Review of Industrial Organization*, 40, 109-129.

16-Leuvensteijn, V. M., Bikker, J. A., Van Rixtel, A.A.R.J.M., & Kok Serensen, C.(2007). A new approach to measuring competition in the loan markets of the Euro area. *Working Paper Series*, No. 7680.

17-Moradi, M., Khodadad Kashi, F., Biabani, J., & Ghafari, H. (2016). Parametric investigation of lerner index in the bank deposit and loan market using the Translog cost function. *Economical Modeling*, 10(34), 1-27.

18-Talebloo, R., & Bahmanpour, H. (2012). The analysis of banking regulation on competition in Iranian banking industry. *Financial Knowledge of Security Analysis (Financial Studies)*, 5(14), 13-40.

