

Empirical Analysis of Competition Dynamics by Competition Determination Approaches: Turkish Banking Sector for 1997- 2014

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Abstract

Due to the complex and close interaction of banks with other economic units, any trouble in banking sector might have repercussion on the whole economy which makes the market structure and competition in banking sector as a cynosure. Business world is facing with gradually increasing competition. It seems that the existence of firms depends on the power and the advantage of their competitiveness. The purpose of this study is to analyze the competition structure and the market conditions of Turkish banking system for the periods 1997-2014. Despite the existence of a number of studies about competition in banking sector, there is still a lack of the studies which has been done with Lerner's Index. Due to this fact, Lerner's Index is used in this study. Bank level determinants of Lerner Index are analyze using Panel Data Regression Method and were reached of actors effecting competitive behavior in Turkish Banking Sector.

Keywords: Banking, Lerner Index, Panel Data Analysis.

JEL Classification Codes: L11, C1.

Rekabet Değerlendirme Yaklaşımları ile Rekabet Dinamiklerinin Ampirik Analizi: 1997-2014 Yılları için Türk Bankacılık Sektörü

Öz

Diğer iktisadi kesimlerle olan karmaşık ve yakın ilişkisinden dolayı bankalarda oluşabilecek sorunlar tüm ekonomiye yansıdığından, bankacılık sektörünün piyasa yapısı ve rekabet ortamı her zaman ilgi odağı olmuştur. İş dünyası giderek artan bir rekabetle karşı karşıyadır. Firmaların varlığını sürdürmesi rekabet edebilme gücüne ve üstünlüğüne bağlı görünmektedir. Rekabet üstünlüğü sağlamanın yolu ise rekabet stratejisi geliştirmektir. Çalışmanın amacı Türk Bankacılık sisteminin rekabet yapısının ve piyasa koşullarının 1997-2014 yılları için incelenmesidir. Bankacılık rekabet konusunda birçok bilimsel çalışma bulunmasına rağmen, Lerner indeksi ile yapılan çalışma sayısının yok denecek kadar azdır. Bu nedenle çalışmada Lerner İndeksi kullanılmaktadır. Lerner indeksinin banka ölçeğindeki belirleyicilerinin tespiti, Panel Veri Analizi ile gerçekleştirilmiştir. Analiz sonucu Türk Bankacılık Sektöründe rekabetçi davranış üzerinde etkili olan faktörlere ulaşılmıştır.

Anahtar Kelimeler: Bankacılık, Lerner Endeksi, Panel Data Analizi.

JEL Sınıflandırma Kodları: L11, C1.

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1. Introduction

Although competition is known like the opposite of monopoly, it is described like a power which is equating price and marginal cost and providing the efficiency (Mc Nulty, 1968, 636). According to Stigler (1987), competition is a race where everyone tries to acquire anything in spite of the fact that it is impossible to do so at the same time. In the litterateur of industrial economics, competition is a necessary mechanism to increase the welfare (Frexias & Rochet, 1998, 113).

2. Theoretical framework

2. 1. The Structure-Behavior-Performance Paradigm

According to this approach, the industry's performance depends on the behavior of buyers and sellers in the market, depending on the structure of the market. So it is used like the prediction of structure, behavior and performance. The structure of the market (perfect competition, monopoly, and oligopoly) is described according to their concentration ratio when the strength of the performance market (rate of return) is measured by the difference in cost and price. This paradigm involves intercompany secret agreements, price adjustments, structural factors, the market entry barriers and product differentiation.

2.1.1. The Collusion Hypothesis

The hypothesis by Bain (1951, 293-324) claims that there is a linear relationship between market concentration and profitability. At the same time, reverse relationship exist between condensation and market performance.

2.1.2. Theory of Contestable Markets

The theory of contestable markets is associated with the American economist William Baumol. In essence, a contestable market is one with zero entry and exit costs. This means that there are no barriers to entry and no barriers to exit, such as sunk costs and contractual agreements (Baumaol, Panzar & Willing, 1982, 33-34). According to theory, entry and exit of market is pretty quick and free so that firms in Theory of Contestable Markets have no control over price (Martin, 2002, 22). All consumers and producers are assumed to have perfect knowledge for production of price, utility, quality and production methods. Bratland (2004) says that monopolist change its pricing behavior due to fear of the market.

2.1.3. Herfindahl-Hirschman Index

The market is equal to the sum of the squares of the market shares of each company. For any market where the value of HHI is under 1000 will be

considered a perfect competition market. Market with the HHI value between 1000 and 1800 is described as an ideal market. It can be said an oligopoly market should be under the condition that HHI value is over 1800.

2.2. Non-structuralist Approaches

Structuralist Approaches assume that concentrated markets aren't competitive because being contestable depends on the degree of competition. So that the most important advantage of the non-structuralist approaches is to be able to assume the cause effect relationship (Casu & Girardone, 2006, 122).

2.2.1. Lerner Index

Generally, empirical approaches for measuring competitions involve kind of problems. (Guevara, Maudos & Pe'rez, 2005, 109-137). Especially interest in the measuring of the competition in banking sector increased in the academic field. As a result of this fact, lots of scientific studies have done by developing new methods (such as Lerner Index, Panzar Rosse Model, Breshanan Model). Today, the Lerner index is one of the most widely used tools for measuring market power. It is usually taken as an indicator of market power because the larger the index, the larger the difference between price and marginal cost, that is, the larger the distance between the price and the competitive price. And also depends on the elasticity of demand. So that it is also called the price-cost margin.

Lerner Index = (Price – Marginal Cost) / Price

For any market when the value of Lerner Index closes to 1, strength of market increases. Banks with the significant market power will be able to play an effective role. Obtained high profit levels can be evaluated as an indicator of bad economic performance and market power.

2.2.2. Panzar-Rosse Model

The Panzar Rosse test (1987) has been widely applied to asset competitive conduct, often is specifications controlling for firm scale or using a price equation. Panzar Rosse model was created in order to compare of market structure. In this test H test statistic is measured in order to understand the competitive behavior of banks. H test is obtained from both the measure of the balance of production where profit is maximum level and banking market model.

$$\ln R = j_0 + \sum_{k=1}^m h_k \ln W_{k_i} + j_1 \ln A_1 + j_2 \ln K_i \quad i = 1, \dots, n \quad (1)$$

W: Input price vector

R: The company's revenue

A: The impact variables vector of demand

K: Capacity

Table 1: Panzar and Rosse H values of Market Types

The predicted H Value	Market Structure
$H \leq 0$	Monopoly: Each company has its own demand curve is acting like a monopolist on the independent firm.
$0 < H < 1$	The market is monopolistic competition entries free (Chamberlin Models)
$H = 1$	Perfect competition market. There is an Active (full) capacity utilization.

Source: Vesela (1995, 59)

2.2.3. The Klein Monti Model of Monopoly

In the case of full competition condition, all banks accept price as a data. In competitive balance, marginal must be equal to the both interest margin and deposits. Monopoly banking model offers the opposite limit of full competition market. Each bank's demand function for loans is $L(rL)$ like a downward curve and demand function for deposits is $D(rD)$ like an upward curve. And also the opposite of these functions are formed like $rD(D)$ and $rL(L)$.

2.2.4. The Cournot Model

Cournot competition is an economic model used to describe an industry structure in which companies compete on the amount of output they will produce, which they decide on independently of each other and at the same time (Farrell & Shapiro 1990, 110-122). Model has features like below:

- There is more than one firm and all firms produce a homogeneous product, i.e. there is no product differentiation;
- Firms do not cooperate, i.e. there is no collusion;
- Firms have market power, i.e. each firm's output decision affects the good's price;
- The number of firms is fixed;
- Firms compete in quantities, and choose quantities simultaneously;
- The firms are economically rational and act strategically, usually seeking to maximize profit given their competitors' decisions.

In the Cournot Model, in spite of the fact that banks see the reaction of opponent banks, they behave as if they don't see. In the Cournot model, first derivate of the Klein Monti model is changed as below;

$$\frac{r_{L*}-(r+c_L)}{r_L} = \frac{1}{N\epsilon_L(r_{L*})} \quad (2)$$

$$\frac{r(1-\alpha)c_D-r_{D*}}{r_{D*}} = \frac{1}{N\epsilon_d(r_{D*})} \quad (3)$$

2.2.5. Bertrand Modeli

Bertrand is a marketing model in which two or more parties determine pricing for similar or same items. Some assumption of model is like below;

- There are at least two firms producing homogeneous products;
- Firms do not cooperate;
- Firms have the same marginal cost (MC);
- Marginal cost is constant;
- Demand is linear;
- Firms compete on price, and choose their respective prices simultaneously;
- There is strategic behavior by both firms;

The most important criticism of the model is that big banks aren't affected from small ones behavior.

2.2.6. The Salop Model

This model takes place between perfect competition and monopoly markets. This model is the most common type of market in the real life. Like perfect competition market, there is a lot of economic units play an important role in the Salop Model.

3. A Review of Previous Research

Empirical studies about competition in banking sector can be divided into three different groups. First group studies include theoretical property. The second group is less theoretical content such as reduced-form. Third group studies include descriptive analyses.

Shaffer (1982), who is one of the first implementer of the Panzer Rosse model in banking system, examined the behavior of banks. According to obtained banks, the level of concentration in the market has been associated with power.

Greenberg & Simbanegavi (2009) determined the level of competition in the banking sector. For this purpose, non-structural P-R model and Breshanan models were used. When P-R model trying to identify the level of competition among the decision unit, Breshanan try to determine whether or not it is competitive market at the level of the sector as a whole.

Fisher & Hempell (2008) calculated the lerner index for banks which are working in Germany during the period between 1993-2001. According to obtained result, market properties which affect the demand of bank products and local market concentration level is interacting with each other.

Çelik & Kaplan (2010) examined the relationship between the banking sector activity and competitiveness by using cross section models for Turkish banking system during the period between 2002 and 2007. They have reached the result that there is a linear relationship between the activity and the operation of competition.

4. An Empirical Analyze of Banking Dynamic in Turkish Banking Sector

In this section, competitiveness structure of Turkish banking sector will be analyzed by using Lerner index for

4.1. Calculation of the Lerner Index for Turkish Banking System and Data Set

Lerner Index is being used to show the competitiveness degree of monopoly. Index gets a value between 0 and 1. 0 refers to perfect competition market and 1 refers to monopoly. Generally Lerner index is seen smaller than 0 which means banks go out of the optimum pricing behavior.

According to table 2, Lerner Index of foreign banks is much higher than domestic banks. In a similar way, especially in the financial crisis terms, domestic banks are more efficient for in term of the use of market power.

Table 2: Lerner Index Values of Turkish Commercial Banking Sector

Years	Avarage of Sector	Public banks	Private Banks	Foreign Banks Set Up In Turkey	Banks Open a Branch In Turkey
1997	0.35	0.19	0.33	0.19	0.51
1998	0.30	0.10	0.49	0.05	0.00
1999	0.35	0.21	0.47	0.39	0.05
2000	0.20	0.33	0.32	0.25	0.03
2001	0.27	0.12	0.58	-0.14	-0.25
2002	0.23	0.07	0.17	0.55	0.33
2003	0.10	0.04	0.23	-0.19	0.09
2004	0.40	0.39	0.44	0.17	0.39
2005	0.16	0.25	0.36	0.02	-0.34
2006	0.38	0.32	0.36	0.33	0.44
2007	0.05	0.16	0.14	-0.02	-0.09
2008	0.40	0.33	0.42	0.33	0.44
2009	0.44	-0.24	0.44	0.44	0.57
2010	0.53	0.35	0.46	0.82	0.68
2011	0.55	0.49	0.53	0.66	0.70
2012	0.41	0.69	0.42	0.82	0.54
2013	0.13	0.39	0.39	-0.87	0.38
2014	0.13	0.39	0.35	-0.88	0.39

Source: Banking Regulation and Supervision Agency

Table 1: Interaction with the Actor which are Shaping the Competitive Structure and Lerner Index

Variables	Relationship between market power and Lerner Index
Financial Ratios	It is considered that if ratio is high, banks reduces the market power
Profitability	It is considered that if ratio is high, banks reduces the market power
Risk	There is a negative relationship between risk and Lerner Index
Specialization	There is a negative relationship between risk and Lerner Index
Capitulation	It is expected to increase market power
Balance sheet structure	Due to short position, it is expected to negative relationships.
Market share	it is considered to increase to market power
Scale	Big scale banks can increase market power by providing cost advantage

Source: Banking Regulation and Supervision Agency

4.2. Unit Root Test

It is widely recognized in the literature that a testing strategy is needed when testing for a unit root. Levin, Lin & Chu (2002) propose a panel unit root test for the null hypothesis of unit root against a homogeneous stationary hypothesis. The model is specified as

$$t_{\rho}^* \xrightarrow[N, T \rightarrow \infty]{d} N(0, 1) \text{ with } \sqrt{N}/T \rightarrow \infty \quad (4)$$

In this study, because of the following variables are stationary, deterministic components have not been investigated. In order not to cause a spurious regression, variables should be stationary. In our study, whether or not variables are stationary were tested by using Levin, Lin & Chu (2002) unit root test. Stationary of variables has been tested so far as variables contain the deterministic components. Consequently it has been understood that the following variables are stationary for three levels which are deterministic component, trend component and discrete component.

Table 4: Levin-Lin and Chu Test Results

Deterministic Component	None		Discrete		Discrete and Trend	
	t Statistic	Probability	t Statistic	Probability	t Statistic	Probability
Variables						
Lerner Index	-6.1332	0.0000	-5.9921	0.0000	-5.9999	0.0000
ROA	-9.1321	0.0000	-5.3212	0.0000	-8.9878	0.0000
ROE	-9.3321	0.0000	-6.1231	0.0000	-10.2102	0.0000
Risk	-6.9921	0.0000	-11,1213	0.0000	-9.4321	0.0000
Total Rant / Total Cost	-1.9912	0.0600	-3.4212	0.0000	-3.1231	0.0000
installment credit/credit	-1.9234	0.0000	-3.4211	0.0000	-3.5213	0.0000
NFM	-6.3212	0.0000	-2.9821	0.0000	-6.5423	0.0000
Credit / assets	-11.231	0.0000	-19.3211	0.0000	-8.7752	0.0000
Credit / deposit	-58.221	0.0000	-170.312	0.0000	-201.231	0.0000
non-interest income / total assets	-8.0012	0.0000	-7.0321	0.0000	-6.4521	0.0000
other operating expenses/ total operating revenues	-3.3212	0.0048	-5.2312	0.0000	-7.8711	0.0000

As can be seen, table 4 includes three different abbreviations. One of them, ROA indicates that the percentage how profitable a company's assets are in generating revenue. And also, ROA is formulated like net income / Average Total assets. The other term ROE means Return on Equity is formulated like Net Income/Shareholder's Equity. This ratio is useful to determine profitability and understand the firm's situation among rivals. NFM shows Net interest margin and this ratio is formulated like Net interest income / total assets.

According to unit root test results, market share and equity / total assets variables contain discrete and Trend. At the same time, Stationary of variables has been seen. LogTA and the balance sheet structure variables are not stable at this level, even though they contain the discrete and trend. For this reason, variables have been transformed stationary level. Out of balance sheet / total assets ratio contain only discrete but stationary at this level.

4.3. Panel Data Regression Analysis

Panel data (also known as longitudinal or cross-sectional time –series data) is a dataset in which the behavior of entities is observed across time. These entities could be states, companies, individuals, countries, etc. Panel data allows you to control for variables you cannot observe or measure like cultural factors or difference in business practices across companies; or variables that change over time but not across entities (i.e. national policies, federal regulations, international agreements, etc.) Model is formulized like below:

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \dots + \beta_n X_{nit} + u_{it} \quad (5)$$

Unbalanced' or 'incomplete' panels data set where some data/observations are missing for some cross-sectional units in the sample period. In other words, A panel is said to be balanced if we have the same time periods, $t = 1, \dots, T$, for each cross section observation. For an unbalanced panel, the time dimension, denoted T_i , is specific to each individual (Wooldridge, 2003). In order to provide balance, 27 continuous operating banks have been preferred.

Table 5: Hausman Test Result

Correlated Random Effects: Hausman Test			
Test Summary	Chi-squared	Chi-squaredD.f.	Probability
Cross-Section			
Random	39.299	13	0.000
Period random	60.121	15	0.000

According to Hausman test result, probability values of random effect are smaller than % 5 for both horizontal sections and time series. In addition, regression analysis result by using fixed effect method can be seen from Table 6.

Table 6: The Results of the Regression Analysis

R square	0.428823			
Recovered R square	0.332123			
F Statistic	0.461211			
Probability	0.000000			
Durbin Watson	1.931212			
	Coefficient	Standard Deviation	T-statistic	Significance
Credit/ total assets*	-0.007701	0.003009	-2.910001	0.0032
Credit/deposit*	-0.000040	8.121291	-1.861029	0.0564
non-interest income/ total assets**	-0.031920	0.000100	-1.871231	0.4212
other operating expenses/total operatin expenses	-4.421112	0.000000	0.3552132	0.8921
Total revenues / total expenses.*	0.031210	0.000122	5.0912121	0.0001
non-performing loans/ Credits	5.991921	0.000000	0.3312121	1.0021
the profitability of equity	0.009912	0.029022	0.0991212	0.8616
The profitability of assets*	-4.33212	0.981212	-5.761221	0.0000
Scale	0.198899	0.177771	-4.442112	0.1121
Risk*	-5.441421	1.333122	-5.031231	0.0000
Equity/total Active**	0.8100875	0.453212	1.883214	0.0321
Market share	-0.912122	2.980090	0.870012	0.8912
balance sheet structure*	0.000000	0.000000	3.121000	0.0432
Net Interest Margin **	-0.100119	0.539812	-2.091212	0.08712
Off-Balance Sheet Transactions/Total Active	-3.35090	2.920129	-0.912000	0.3600
C	0.181210	0.171200	1.1712100	0.23198

Note: The dependent variable is Lerner index. Panel least square method has been used.

The correlation coefficient a concept from statistics is a measure of how well trends in the predicted values follow trends in past actual values. It is a measure of how well the predicted values from a forecast model "fit" with the real-life data. The correlation coefficient is a number between 0 and 1. If there is no relationship between the predicted values and the actual values the correlation coefficient is 0 or very low (the predicted values are no better than random

numbers). As the strength of the relationship between the predicted values and actual values increases so does the correlation coefficient.

In banking sector, one of the most important indicators of banks intermediary functions are the rate of credit / total assets and credit / deposit. Increasing of efficiency in banks intermediary functions, it means there is a direct proportion between both variables. In our econometric results, both variables take negative coefficient which means there is a direct proportion between competition and banks intermediary functions. Analysis result supports that reality. Banks should compete intensively in order to keep the high rate of deposit to credit conversion ratio.

Increase of the amount of the credit depends on the positive expectations about the future of the economy and low interest rates. Our results support this rule and show that banks compete in order to keep the deposits to credit conversion rate.

Taking a positive value of total income / total cost ratio means there is a direct proportion relationship between market power and activity.

ROA and NFM variables which are related with profitability have negative relationships with market power in our econometric result. It is unexpected situation because competition decreases the profitability. A high share of the securities in the total assets indicates that banking profit not only depends on credit/ deposit ratio and competitive behaviors.

Between the equity ratio and the market power is expected to be a positive relationship. Obtained results confirm this expectation.

Foreign currency assets/total assets ratio boosts the Lerner index. So that banks with high foreign currency assets can increase their market shares.

In our study, it has been seen that there is significant negative relationships between risk and Lerner index. This result supports the opinion that competitiveness in banking sector because a high risk level.

Non-Interest Income/Total Assets shows the specialization level of banks. According to empirical results, competitive banks increase the non-Interest Income. We can understand this reality from negative coefficient between both variables.

Structure behavior performance hypothesis was added to analyze and unexpectedly took a negative coefficient. However, it was not found statistically significant. Due to easy calculated, Lerner index has been used as an indicator of competition level.

5. Conclusion

It is commonly believed that competition should be supported for many reasons. In the competitive banking sector, it is expected to decrease of interest rates and increase of deposit interests. As a result of this situation, saving increases and demand of credit for companies in banking system.

This study aims to understand the competition dynamics of Turkish banks which operating commercial banking sector. Lerner index has been used as an indicator of competition due to make calculation easy for each bank. Lerner index for each bank has been calculated by using linear regression analysis. As a result of paper, it has been understood that factors which are playing an important role for competition behavior in Turkish banking system. This factors are Loans/total assets, Loans/currency and deposits, non-interest income/total assets, Total income/total expenses, Asset Profitability (ROA), Risk, shareholders ' equity/total assets, balance sheet Structure and Net interest margin.

As a result, Due to the complex and close interaction of banks with other economic units, any trouble in banking sector might have repercussion on the whole economy which makes the market structure and competition in banking sector as a cynosure. Business world is facing with gradually increasing competition. It seems that the existence of firms depends on the power and the advantage of their competitiveness. The purpose of this study is to analyze the competition structure and the market conditions of Turkish banking system for the periods 1997-2013. Despite the existence of a number of studies about competition in banking sector, there is still a lack of the studies which has been done with Lerner's Index. Due to this fact, Lerner's Index is used in this study. Bank level determinants of Lerner Index are analyze using Panel Data Regression Method and were reached of actors effecting competitive behavior in Turkish Banking Sector.

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