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Article — Published Version

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Journal of Economics Bibliography

Suggested Citation: Açıkalın, Süleyman; Sakıncı, İlker (2015) : Assessing Competition with the Panzar-Rosse Model in the Turkish Banking Sector, Journal of Economics Bibliography, ISSN 2149-2387, KSP Journals, Istanbul, Vol. 2, Iss. 1, pp. 18-28,
<http://www.kspjournals.org/index.php/JEB/article/view/212>

This Version is available at:

<https://hdl.handle.net/10419/108376>

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Assessing Competition with the Panzar-Rosse Model in the Turkish Banking Sector

By Süleyman AÇIKALIN^a & İlker SAKINÇ^{b †}

Abstract. The Turkish banking sector was reformed with new regulations after 2000. The aim of this study is to measure the degree of concentration and assess the state of competition in the Turkish banking sector using data from 22 commercial banks for the period of 2002-2013. The data is analyzed using the pooled Generalized Least Square (PGLS) method. Concentration measures of CR3, CR4 and HHI are used and they show a moderate but slightly decreasing concentration in the sector. The widely accepted Panzar and Rosse (1987) model and its H-statistic are used as a non-structural method to assess the degree of competition. The H-statistic of 0.599 is found for the period of 2002-2013. It indicates a monopolistically competitive market structure for the Turkish banking sector.

Keywords: PanzarRosse Model, Concentration, Competition, Turkish Banking Sector, Pooled Generalized Square Model.

JEL.D43, G21, C23

1. Introduction

The period of the 1990s in Turkey is characterized by political and economic instability. However, this situation changed considerably during the 2000s. Political stability, in the sense of a single-party government, was established with the 2002 election, and this situation has not changed by 2015. Fiscal stability was obtained during this period as the fiscal deficit to GDP ratio declined from 11.2% in 2002 to 5.4% in 2004. With the exception of 5.6% in 2009, the public deficit ratio stayed under 5%. Moreover, this ratio was below 3% in 2012 and lower than 2% in 2013 (TUIK, 2013).

Turkey started to take steps to stabilize the economy and to increase competition starting in the mid-1990s. One of the important steps taken to reach this goal was the establishment of the Competition Authority (CA) in 1994. The CA became operational in 1997 with a delay of three years. The aim of the CA is to enforce competition laws to prevent monopolization and cartelization in the markets. The Banking Regulation and Supervision Agency (BDDK) in 2000 and the Energy Market Regulatory Authority (EPDK) in 2001 are established to supervise the activities of firms in these sectors to establish and maintain a competitive environment in their area of authority.

Following these steps, Turkey has experienced a consolidation in the banking sector. The total number of banks operating in Turkey was 79 and 61 of them were depository banks at the end of 2000. Total number of banks declined to 45 and 32 of them were depository banks at the end of 2013 (www.tbb.org.tr). As the banking

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sector plays a crucial role in economic growth by providing most of the funds, the amount of research in banking sector intensified and increased during 2000s.

There are studies in the literature using cost and revenue functions of firms under different competitive environment to measure the degree of competition and its effects on industries. [Bain \(1951\)](#) provides one of the earliest contributions to the concentration-competition-efficiency paradigm and explains that under constant cost, demand and market entry conditions, monopoly and collusive oligopoly result with higher prices and profits relative to competition or non-collusive oligopoly in long run equilibrium.

Competition in a given industry and its effects are analyzed by Microeconomics and Industrial Organization (IO). Regarding competition in the banking sector, there are two main methods of analysis developed in IO: structural and non-structural approaches. The structural approach is based on the Structure-Conduct-Performance (SCP) hypothesis. Concentration leads to potential collusive behavior and higher profits for the firms in this structure [Bain \(1951\)](#). Concentration ratios such as CR4 and Herfindahl-Hirschman Index (HHI) are the most commonly used indices to measure the degree of concentration. While the line of argument goes from market share to efficiency in SCP, the later developed efficiency structure hypothesis, which is also called “efficiency hypothesis” (EH), turned the argument upside down. The EH explained that efficient firms would get bigger as they finance their growth with higher earnings, and in turn this would turn into market concentration ([Demsetz, 1973](#); [Peltzman, 1977](#)).

On the non-structural hypothesis side, the most well-known models are developed by [Panzar & Rosse \(1987\)](#), [Bresnahan \(1982\)](#), and [Iwata \(1974\)](#). In [Panzar & Rosse \(1987\)](#) model the H-statistic is calculated to provide a quantitative measure for the degree of competition in the market. The H-statistic is calculated from a reduced-form revenue function where a vector of input prices and other bank variables are used as explanatory variables. The sum of elasticities of revenue with respect to production factors’ prices is equal to the H-statistic ([Bikker, Shaffer, & Spierdijk, 2009](#)). Labor (L), loanable funds (LF) and capital (C) are generally used in this approach as the production factors. Under certain assumptions, this H-statistic provides a measure for the degree of competition. The H-statistic is negative for a monopolist or a collusive oligopolist and between 0 and 1 for a monopolistically competitive market. As the value gets closer to 1 it indicates an increasing degree of competition. The H-statistic of 1 shows a perfect competition in the long run equilibrium.

In this paper, we focus on the analysis of the Turkish banking sector for the period of 2002-2013. This analysis used the tools of both structural and non-structural models. While CR ratios and HHI are used as part of the structural approach, the Panzar-Rosse model and H-statistic are used as part of the non-structural approach. The period of 2002-2013 is divided into two sub-periods in our analysis, hoping to capture any possible effect of the global financial crisis of 2008.

The paper is organized as follows: Section 2 is a literature review of the topic of banking; Section 3 discusses data; Section 4 outlines the model and the main findings and lastly the conclusion is presented in Section 5.

2. Literature Review

There are two main approaches in the literature analyzing the effects of market structure and competition on efficiency: structural and non-structural approaches.

The SCP hypothesis and efficiency hypothesis (EH) are parts of the structural approach. The SCP hypothesis establishes a direct link between market share and concentration to market power and concludes that market power would result with

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higher prices and higher profits and also social efficiency losses (Berger, Demirgüç-Kunt, Levine, & Haubrich, 2004; Berger & Hannan, 1989; Bikker & Haaf, 2002; Casu & Girardone, 2006; Duncan & Langrin, 2002; OECD, 2011).

Economic theory shows that under certain assumptions, the degree of competition and efficiency are related to each other. According to the generally accepted argument in microeconomics, competition brings lower prices and efficiency by forcing or motivating firms to lower costs to survive under the conditions of declining profits. Again, according to the competition theory, increasing efficiency provides higher social welfare. The topic of competition is also strongly related to the issue innovation. In case of perfect competition, prices are lowered up to a point where the price is equal to the marginal cost, and therefore, excess profits are eroded and social efficiency is reached.

While the economic theory relates concentration, competition and efficiency under restrictive assumptions, the applied literature in banking indicates that concentration alone is not a good measure of competition (Claessens & Laeven, 2004; Duncan & Langrin, 2002; Shaffer, 1999).

The efficiency hypothesis, EH, which stems from Demsetz (1973) and Peltzman (1977) states that efficient firms increase in size and, therefore, in market share due to their ability to generate higher profits, leading to higher market concentration (Demirgüç-Kunt & Levine, 2000; Evanoff & Fortier, 1988; Smirlock, 1985).

Following the efficiency hypothesis, the discussions on the need to endogenize the market structure into the models resulted with the non-structural models. Iwata (1974), Bresnahan (1982) and Lau (1982), Panzar and Rosse (1987) with a distinct feature of measuring competition by estimating deviation from competitive pricing became the three separate applications of the non-structural approach (Gutiérrez de Rozas, 2007).

Among these three models, the Panzar-Rose model became probably the most often used one to analyze the competition-efficiency issues in banking sector in both developed and developing economies. The application of the P-R model was sometimes used on a single country and sometimes on an international level. For example, Gutiérrez de Rozas (2007) applied the model to Spain's banking sector for the period of 1986-2005 and Shaffer and Spierdijk (2013) analyzed the duopolistic market structure of Dewey County of South Dakota, USA for the period of 1976-2010. On the other hand, Bikker et al., (2009) used data from 17,913 different banks in 67 countries for the period of 1986-2004 in their model. Casu and Girardone (2006) questioned the effect of increased consolidation on competition of European Union's banking sector for the period of 1997-2003. Claessens and Laeven (2004) used data from 54,038 banks on yearly average from 55 countries for the period of 1994-2001. For the developing economies, Mlambo and Ncube (2011) analyzed the evolution of competition and efficiency of the banking sector in South Africa using firm-level data for the period 1999-2008. Duncan and Langrin (2002) studied the situation of Jamaica's banking sector; Simpasa (2013) for Zimbabwe, and Ye, Xu, and Fang (2012) for China.

There are number of studies on the Turkish banking sector dealing with issues such as market concentration, competition and efficiency, mostly during the 2000s. Macit (2012) analyzed the situation of the banking sector in Turkey for the period of 2005-2010. The results showed that the degree of concentration did not change too much and there exists a monopolistic competition in the sector and the degree of competition decreased between 2005 and 2010. Özcan (2012) analyzed the banking sector for the period of 2002-2009 with the P-R model and concluded that the sector is monopolistically competitive. Abbasoğlu, Aysan and Gunes (2007) evaluated the degree of concentration and competition in the Turkish banking sector for the period of 2001-2005 applying the P-R model. Their results did not

find any significant relationship between concentration and competition. Aysan and Ceyhan (2008), on the other hand, questioned the trend in efficiency in the Turkish banking sector for the years between 1990 and 2006.

3. Data

The data is obtained from the unconsolidated balance sheets and income statements of 22 banks listed on the Banks Association of Turkey over the period of 2002-2013.

The total assets of 22 commercial banks in our study could be used as a proxy to the Turkish banking sector's total assets. The proxy is justified on the ground of total assets of the 22 banks is about 95% of the Turkish banking sector in 2012 (TBB, 2013).

Table 1. Market Structure Indicators (CR and HHI)

Years	CR3_TA	CR3_TD	CR3_TL	CR4_TA	CR4_TD	CR4_TL	HHI_TA	HHI_TD	HHI_TL
2002	0.48	0.48	0.47	0.59	0.58	0.60	1188.42	1198.26	1143.88
2003	0.49	0.49	0.44	0.60	0.59	0.56	1208.29	1231.60	1034.85
2004	0.48	0.48	0.40	0.57	0.59	0.52	1168.41	1261.14	974.56
2005	0.51	0.50	0.45	0.61	0.60	0.55	1181.19	1228.72	1019.62
2006	0.45	0.46	0.42	0.56	0.56	0.53	1077.95	1116.20	980.00
2007	0.43	0.45	0.41	0.56	0.56	0.52	1054.01	1104.19	957.75
2008	0.44	0.45	0.41	0.57	0.57	0.52	1058.65	1106.43	979.11
2009	0.45	0.47	0.39	0.58	0.58	0.49	1100.75	1140.08	961.96
2010	0.45	0.47	0.39	0.57	0.58	0.50	1086.11	1168.07	981.60
2011	0.42	0.43	0.39	0.54	0.54	0.50	1023.88	1038.42	971.15
2012	0.40	0.41	0.39	0.53	0.52	0.50	1002.53	1007.08	958.98
2013	0.40	0.41	0.39	0.52	0.52	0.50	990.31	1003.55	966.86

Before analyzing the competitive structure with the Panzar-Rosse (1987) model, it would be helpful first to review the market concentration in the Turkish banking sector. We used CR3, CR4, and HH indices to determine the degree of concentration in the banking sector for the period under consideration. CR3 and CR4 show the market share of the largest three and four banks in the sector, respectively. The market shares are calculated according to three separate criteria: total deposits (TD), total loans (TL), and total assets (TA). CR3_TA shows the market share of the largest three banks in banking sector's total assets. CR3_TD and CR3_TL show the market shares of the three largest banks in sector's total deposits and total loans, respectively. CR4_TA, CR4_TD, CR4_TL ratios show the same information for the largest four banks. HH index is another frequently used indicator to measure the degree of concentration. The square of the market share of the largest 50 banks in the sector summed up in each year. This number would be equal to 10,000 for a pure monopolist and would be less than 1000 for a competitive market. On the other hand, if the HHI is between 1000 and 1800, it indicates a moderately competitive market. Finally, an HHI value ranging from 1800 to 10000 could be interpreted as an uncompetitive market.

Regardless of the base criteria used to measure the market share (i.e. TA, TD or TL) both CR3 and CR4 indicate a decline in concentration as a general trend in the banking sector of Turkey from 2002 to 2012. On the other hand, once we have a close look on the data, there are two points that need to mention. First, CR3_TL and CR4_TL indicate a slight decline in market concentration from 2002 to 2008.

The same ratios stayed stable between 2009 and 2013. Second, once we look at the concentration based on the TA calculation, we see a further decline in concentration from 2009 to 2013.

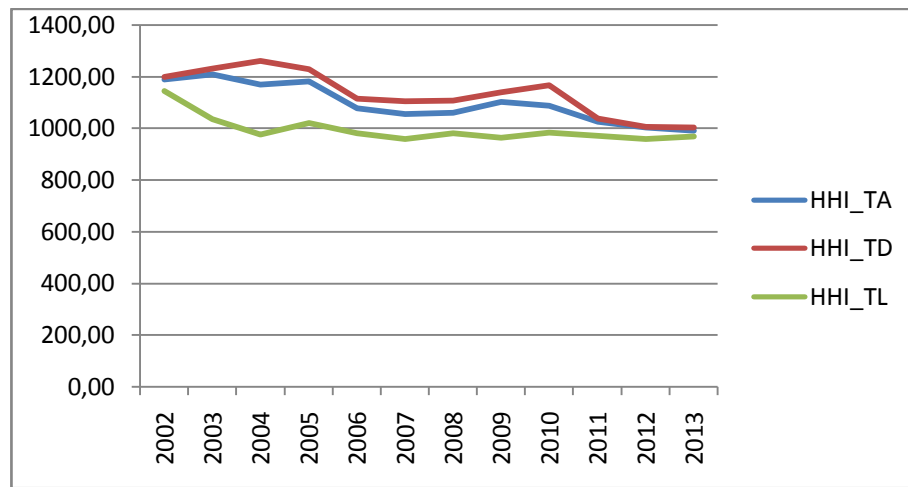


Figure 1. HHI values in TA, TD, and TL

CR3 and CR4 use market share information of only the largest three or four banks. The HH index is a better measure of concentration since it includes information from all 22 banks rather than only three or four. HHI_TA, HHI_TD and HHI_TL, all three of them, started with higher values in 2002, for example 1198 for HHI_TD, and end up with lower values, for example 1003 HHI_TD, in 2013. Similar to the values calculated in concentration ratios, HHI values show a decreasing level of concentration in the banking sector. The highest HHI value is 1261 and it belongs to HHI_TD category in the year 2004. The lowest index value calculated with TD is 1003 in 2013. As a general rule of thumb, the HHI values lower than 1800 indicate an unconcentrated market structure. Based on these criteria alone, it is possible to conclude that the Turkish banking sector in 2002-2013 period showed moderately competitive characteristics. The trend of HHI from 2002 to 2013 is illustrated above on figure 1. Our result is similar to the findings reported by Macit (2012) and Abbasoğlu et al., (2007).

4. The Empirical Model

The original Panzar-Rosse (1987) model utilized the total revenues (TR) of banks as the dependent variable. There are variations of this model in the literature where other variables, such as, interest revenues (IR); the ratio of total revenues to total assets (TRTA); the ratio of interest revenues to total assets (IRTA); the net income to total assets (NITA) ratio are used as the dependent variable (Casu & Girardone, 2006; Gutiérrez de Rozas, 2007).

There is an agreement in the literature regarding the role and importance of banking sector in an economy. However, when it comes to formulating banking activities, there are two separate approaches. The first one considers banks as producers of services for both depositors, creditors and for all other customers by using inputs of labor and capital. The second approach underlines the “intermediation” role of banks and argues that banks produce loans by using labor, funds, and capital as inputs (Gutiérrez de Rozas, 2007).

The model presented below takes the interest revenue as the dependent variable into consideration. There are similar studies in the literature taking interest earnings as revenue to capture the traditional “intermediation” role of banks (Bikker &

Haaf, 2002). Furthermore, we take the ratio of interest revenue to total assets (IRTA) as the dependent variable to avoid potential problems of correlation between interest revenue and total assets.

$$\ln IRTA_{it} = \alpha_i + \beta_{1t} \ln PL_{it} + \beta_{2t} \ln PF_{it} + \beta_{3t} \ln PC_{it} + \delta_{1t} \ln TLTA_{it} + \delta_{2t} \ln TDTA_{it} + \delta_{3t} \ln EQTA_{it} + \mu_{it} \quad (1)$$

The dependent variable is IRTA, which is the ratio of total interest revenue to total assets. The first independent variable is price of labor (PL), which is calculated by dividing the total personnel expenses to number of employees. The second independent variable is price of funds (PF), which is calculated by dividing the total interest expenses to total loanable funds. The third independent variable is price of capital (PC), which is calculated by dividing capital expenses to fixed assets.

Other variables used to control bank specific factors are total loans to total assets ratio (TLTA), total deposits to total assets ratio (TDTA), and total equity to total assets ratio (EQTA). While TLTA and TDTA are used to control for the business mixture of the banks, the EQTA is used to control for the banks' risk. Finally, the μ_{it} is the disturbance term.

The H-statistic at time t is given by the following equation;

$$H_t = \beta_{1t} + \beta_{2t} + \beta_{3t} \quad (2)$$

H-statistic is the summation of the first three coefficients pertaining to the three inputs used in the revenue generating banking activities (Panzar & Rosse, 1977).

Table 2. Descriptive Statistics of Variables

Years	IRTA	PL	PF	PC	TLTA	TDTA	EQTA
2002	0.2059	28,639	0.2195	1.7032	0.2554	0.6720	0.1583
2003	0.1391	35,928	0.1418	2.3082	0.3088	0.6528	0.1510
2004	0.1262	40,739	0.1158	2.3826	0.3887	0.6237	0.1430
2005	0.1067	43,511	0.0967	2.8804	0.4458	0.6227	0.1220
2006	0.1073	47,374	0.1099	3.0178	0.4959	0.6387	0.1124
2007	0.1226	52,863	0.1227	2.6896	0.5414	0.6170	0.1250
2008	0.1234	58,925	0.1232	3.1582	0.5408	0.6199	0.1290
2009	0.1097	60,775	0.0834	3.3326	0.5369	0.6386	0.1434
2010	0.0804	62,072	0.0606	4.2185	0.5740	0.6299	0.1363
2011	0.0764	70,955	0.0664	3.9866	0.5827	0.6319	0.1174
2012	0.0896	78,156	0.0725	4.5113	0.6084	0.6283	0.1291
2013	0.0520	64,941	0.0400	3.5308	0.6109	0.5938	0.1135

Descriptive statistics are presented as Table 2 above. The first variable IRTA is our dependent variable. The following three columns provide the average values of three production factors: price of labor (PL), price of funds (PF), and price of capital (PC).

The price of labor is continuously on the rise during this period, except in 2013. There was a moderate level of inflation which stayed below 11% after 2004. The significant increase in PL is most likely due to this inflation rate.

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Price of funds (PF) declined from 22% in 2002 to only 4% in 2013. This downward trend is again most likely due to decreasing inflation rate. As inflation rate decreased, the nominal interest rates followed a similar path. While the inflation rate in 2002 was 47.2%, it was only 10.7% in 2004 and continued to decrease gradually but stayed around 6-8% for the rest of the period. The interest rate of government bonds was 63.9% in 2002 and declined to 24.8% in 2004, and finally stabilized around 9% during the period of 2010-2012. These figures are quite instrumental to understand the path of the PF for the banks. The price of capital (PC) showed relatively more fluctuations during the period but it followed an upward path. It shows that banks spend larger amounts as capital expenditures.

Among the bank specific variables, the ratio of total loans to total assets (TLTA) showed a steady increase while the rate of increase is declined. This tells us that the increase in total loans was faster than the increase in total assets. However, the increase in total loans slowed down towards the end of the period. The value of TDTA declined from 67% in 2002 to 59% in 2013. There is a significant increase in total loans to total assets (TLTA) ratio while the ratio of total deposits to total assets (TDTA) declined slightly. This could be partially due to decreasing interest rates in the economy and also could be partially due to stronger demand to borrow funds. The value of EQTA declined from about 16% in 2002 to about 11% in 2012. This decrease in EQTA could be interpreted as a small increase in leverage in the Turkish banking sector.

Table 3. Correlation Matrix

	lnIRTA	lnPL	lnPF	lnPC	lnTLT A	lnTDTA	lnEQT A
lnIRTA	1.0000						
lnPL	-0.5967	1.0000					
lnPF	0.8478	-0.5563	1.0000				
lnPC	-0.1143	0.2422	-0.2542	1.0000			
lnTLTA	-0.3400	0.2844	-0.4005	0.3347	1.0000		
lnTDTA	0.2177	-0.2160	-0.0950	0.1615	0.2459	1.0000	
lnEQTA	-0.0429	0.1762	-0.0280	-0.1084	-0.2709	-0.4910	1.0000

Table 3 above gives us the correlation matrix of all variables used in our model. There is a relatively high and positive correlation between dependent variable lnIRTA and lnPF, since the price of funds is an indicator of the interest paid on deposits and IR is very highly related to the interest received on the given loans. However, the correlation between independent variable lnIRTA and lnPL and lnPC was low, as expected.

5. Results

The data is balanced panel data with both time series and cross sectional dimensions. The annual figures for the 22 commercial banks in Turkey for the period of 2002-2013 were obtained from the web site of the Banks Association of Turkey. Following the examples in the literature ([Gutiérrez de Rozas, 2007](#)), in order to offset the potential problem of heteroskedasticity in the data, we used the Pooled Generalized Least Square (PGLS) method.

Table 4. Results of PGLS

Dependent Variable : lnIRTA			
Variable	2002-2013	2002-2007	2008-2013
	Coefficient	Coefficient	Coefficient

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	P value	P value	P value
lnPL	-.0835726 0.004	-.1020504 0.016	-.0661662 0.217
lnPF	.6271276 0.000	.547021 0.000	.6453603 0.000
lnPC	.0563015 0.000	.0565171 0.014	.0617516 0.001
lnTLTA	-.0370519 0.067	-.0691228 0.010	.0491384 0.294
lnTDTA	.4897623 0.000	.4576793 0.000	.486024 0.000
lnEQTA	.1979167 0.000	.1538014 0.001	.2434318 0.000
Cons	.714436 0.021	.6030206 0.159	.7045636 0.243
No.of.obs	264	132	132
Wald chi2(6)	1425.2	327.33	750.17
Prob> chi2	0.0000	0.0000	0.0000
Log likelihood	113.6381	46.4552	74.26836
H Statistic	0.5998565	0.5014877	0.7071119
H0=0	Chi2	161.39	41.24
	p-value	0.0000	0.0000
H0=1	Chi2	71.82	40.75
	p-value	0.0000	0.0000

The period of 2002-2013, which is under our consideration, is divided into two sub periods: 2002-2007 and 2008-2013. The period of early 2000s in the Turkish banking sector was characterized by new regulations, consolidations and high inflation. During the later part, there was a period of global financial crisis starting in 2008. By dividing the period into two parts, it was our understanding that we might capture any possible changes in the competitive environment of Turkish banking sector due to financial crisis.

The Table 4 above is a summary of our results. The first column provides the coefficients and their p-values for the whole period of 2002-2013. It can be seen on the table that while the prices of two production factors, PF and PC, have a positive effect; price of labor (PL), on the other hand, has a negative effect on the dependent variable of IRTA. The negative coefficient of PL is expected as an increase in labor price is likely to negatively affect both the total and also the interest revenues of the banks. The sign of PF is positive and it is consistent with the results of other applied research in the related literature. The sign of PC is positive in our case but it could take also a negative sign in other applied studies.

The coefficient of TLTA is -0.037 for the whole period of 2002-2013 and it is statistically significant only at a 10% significance level. The expected sign of this variable is positive since higher loans are expected to result in higher interest earnings. However, as mentioned above, Turkey managed to lower its inflation rate from around 70% in 2002 to around 8% in 2014. Nominal interest rates followed a similar pattern during the same period. These huge changes could be a reason behind the weak negative sign. The coefficient of TDTA is 0.489 and it is statistically significant at 1% significance level. The expected sign of this variable is positive since it indicates that the business mixture of the banks is leaning towards a traditional way of collecting deposits and giving credits at a margin. The sign of the EQTA is found to be 0.198, and it is statistically significant at 1%

significance level. The general expectation is that as equity increases, it would result in possible lower earnings for banks, as it generally has higher costs associated with it. However, it is possible that a bank with higher equity feels confident enough to take higher risks and increase their earnings from the high risk loan portfolios.

When the results are evaluated as two sub-periods, we do not see any significant change for coefficients of the variables from the period of 2002-2007 to 2008-2013, except a couple of points. The most important change took place in the sign of TLTA. While the sign of TLTA is -0.069 in 2002-2007 and it is significant at 1%, it changed to 0.049 and became insignificant even at 10% significance level. Another small but probably interesting point is observed at the coefficient of PC; its coefficient for the whole period is 0.056 and 0.057 in 2002-2007, it increased slightly to 0.062 in 2008-2013. It shows a slightly increasing effect on the interest revenue of the banks in the study.

The H-statistic is found as 0.599 for the whole period of 2002-2013. The H-statistic for the first period of 2002-2007 is equal to 0.501. When we calculated the same statistic, we see a considerable increase as it reaches to 0.707 in 2008-2013 period. All these results indicate an improvement in the competitive environment of the Turkish banking sector. There are two tests conducted for the H-statistics obtained in the pooled GLS model. While the null hypothesis of “ $H = 0$ ” means a colluding oligopoly exist in the market, the null hypothesis of “ $H = 1$ ” means the market is competitive. Since both of these null hypotheses are rejected at 1% significance level, it is possible to characterize the Turkish banking sector in 2002-2013 as monopolistically competitive. Moreover, we see that the degree of competition increased from the period of 2002-2007 to the period of 2008-2013.

6. Conclusion

The Banking Regulation and Supervision Agency (BDDK) was established in 2000 to supervise the activities of banks and to maintain a competitive environment in the sector. Following the regulation of 2000 and the financial crisis of 2001 in Turkey, a consolidation is experienced in the Turkish banking sector. The total number of banks decreased from 61 in 2001 to 54 in 2002 and to 50 in 2003. We expected to see the effects of these changes start to take place during the early years of 2000 on the market structure and the competitive nature of the Turkish banking sector.

Market concentration ratios indicate a decrease in concentration of the Turkish commercial banking from 2002 to 2013. The CR3, CR4, and HH indices based on market share calculations with total assets (TA), total deposits (TD), and total loans (TL) all showed the same result of decreasing concentration during the period. This could be interpreted as a slightly increasing competition in the sector accepting the argument of the SCP hypothesis and therefore, could be interpreted as a positive development.

However, reaching conclusions on the competitive side of the sector only based on the concentration indices is not a very sound approach. Therefore, we decided to use the P-R method to obtain further information regarding the competitive aspect of the sector. The H-statistic calculated based on the P-R model provided results supporting the findings of possibly increasing competition in Turkey from 2002 to 2013. The H-statistic is calculated as 0.599 for the period of 2002-2013, as 0.501 for the sub-period of 2002-2007 and as 0.707 for the second sub-period of 2008-2013. These values indicate that the market structure in commercial banking in Turkey for the whole period of 2002-2013 could be labeled as a “monopolistic competition”.

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Some of the applied literature provides arguments for the theoretical claim that competition increases efficiency. It is possible to claim that the banking sector is characterized by a low degree of concentration and a moderate degree of competition, i.e. monopolistic competition for the period of 2002-2013. However, further research is needed to claim that this decreasing concentration and increasing competition resulted in greater efficiency for the whole economy.

References

- Abbasoğlu, O. F., Aysan, A. F., & Gunes, A. (2007). *Concentration, competition, efficiency and profitability of the Turkish banking sector in the post-crises period* (No. 5494). Retrieved from <http://mpira.ub.uni-muenchen.de/5494/>
- Aysan, A. F., & Ceyhan, Ş. P. (2008). What determines the banking sector performance in globalized financial markets? The case of Turkey. *Physica A: Statistical Mechanics and Its Applications*, 387(7), 1593–1602.
- Bain, J. S. (1951). Relation of profit rate to industry concentration: American manufacturing, 1936-1940. *The Quarterly Journal of Economics*, 293–324.
- Berger, A. N., Demirgüç-Kunt, A., Levine, R., & Haubrich, J. G. (2004). Bank concentration and competition: An evolution in the making. *Journal of Money, Credit and Banking*, 433–451.
- Berger, A. N., & Hannan, T. H. (1989). The price-concentration relationship in banking. *The Review of Economics and Statistics*, 291–299.
- Bikker, J. A., & Haaf, K. (2002). Competition, concentration and their relationship: An empirical analysis of the banking industry. *Journal of Banking & Finance*, 26(11), 2191–2214.
- Bikker, J. A., Shaffer, S., & Spierdijk, L. (2009). Assessing competition with the Panzar-Rosse model: The role of scale, costs, and equilibrium. *Tjalling C. Koopmans Institute Discussion Paper Series*, 9(27), 1–39.
- Bresnahan, T. F. (1982). The oligopoly solution concept is identified. *Economics Letters*, 10(1), 87–92.
- Casu, B., & Girardone, C. (2006). Bank Competition, Concentration and Efficiency in the Single European Market*. *The Manchester School*, 74(4), 441–468.
- Claessens, S., & Laeven, L. (2004). What drives bank competition? Some international evidence. *Journal of Money, Credit and Banking*, 563–583.
- Demirgüç-Kunt, A., & Levine, R. (2000). Bank concentration: cross-country evidence. In *World Bank Global Policy Forum Working Paper*.
- Demsetz, H. (1973). Industry structure, market rivalry, and public policy. *Journal of Law and Economics*, 1–9.
- Duncan, D., & Langrin, B. (2002). Testing for competition in the Jamaican banking sector: evidence from bank level data. *Financial Stability Department, Bank of Jamaica*.
- Evanoff, D. D., & Fortier, D. L. (1988). Reevaluation of the structure-conduct-performance paradigm in banking. *Journal of Financial Services Research*, 1(3), 277–294.
- Gutiérrez de Rozas, L. (2007). Testing for competition in the Spanish banking industry: The Panzar-Rosse approach revisited. *Banco de España Research Paper No. WP-0726*.
- Iwata, G. (1974). Measurement of conjectural variations in oligopoly. *Econometrica: Journal of the Econometric Society*, 947–966.
- Lau, L. J. (1982). On identifying the degree of competitiveness from industry price and output data. *Economics Letters*, 10(1), 93–99.
- Macit, F. (2012). Recent evidence on concentration and competition in Turkish banking sector. *Theoretical and Applied Economics*, 8(8), 19.
- Mlambo, K., & Ncube, M. (2011). Competition and efficiency in the banking sector in South Africa. *African Development Review*, 23(1), 4–15.
- OECD. (2011). *Bank Competition and Financial Stability*. Organisation for Economic Cooperation and Development (OECD).
- Özcan, A. (2012). Türkiye’de Ticari Bankacılık Sektöründe Rekabet Düzeyinin Belirlenmesi (2002-2009). *C.Ü. İktisadi ve İdari Bilimler Dergisi*, 13(1), 195–211.

Journal of Economics Bibliography

- Panzar, J. C., & Rosse, J. N. (1977). Chamberlin versus Robinson: An Empirical Test for Monopoly Rents. Workshop on Applied Microeconomics, Industrial Organization, and Regulation, Department of Economics, Stanford Univ.
- Panzar, J. C., & Rosse, J. N. (1987). Testing for“ monopoly” equilibrium. *The Journal of Industrial Economics*, 443–456.
- Peltzman, S. (1977). *The gains and losses from industrial concentration*. National Bureau of Economic Research Cambridge, Mass., USA.
- Shaffer, S. (1999). The competitive impact of disclosure requirements in the credit card industry. *Journal of Regulatory Economics*, 15(2), 183–198.
- Shaffer, S., & Spierdijk, L. (2013). *Duopoly conduct and the panzar-rosse revenue test*. Working paper.
- Simpasa, A. M. (2013). Competition and Market Structure in the Zambian Banking Sector.
- Smirlock, M. (1985). Evidence on the (non) relationship between concentration and profitability in banking. *Journal of Money, Credit and Banking*, 69–83.
- TBB. (2013). *Bankalarımız 2013. Türk Bankalar Birliği*. Retrieved from http://www.tbb.org.tr/Content/Upload/istatistikraporlar/ekler/708/Bankalarimiz_2013_TR.pdf
- TÜİK. (2013). *Ekonomik Göstergeler*. Retrieved from http://www.tuik.gov.tr/Kitap.do?metod=KitapDetay&KT_ID=0&KITAP_ID=241
- Ye, Q., Xu, Z., & Fang, D. (2012). Market structure, performance, and efficiency of the Chinese banking sector. *Economic Change and Restructuring*, 45(4), 337–358.



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