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BANK CONCENTRATION AND COMPETITION; EVIDENCE FROM TÜRKİYE

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Abstract

Liberalization of the banking sector has significantly transformed the market structure. The global and Turkish banking markets have become increasingly concentrated due to globalization. Higher concentration may lead to changes in market structure, reducing competition and establishing a situation where a few dominant banks control the market. The issue of competition and concentration should be assessed to create banking rules and reduce the danger of financial crises. It is crucial to properly evaluate, analyze, and comprehend the banking market structure. This research determines the competitive level of the Turkish banking sector from 2010 to 2020 through the Panzar-Rosse model and the concentration level via k-bank concentration ratio and HHI (Herfindahl Hirschman Index). As a result of concentration analyses, it is concluded that the Turkish banking sector is moderately concentrated. Monopolistic competition has been present throughout the 11 years analyzed. Furthermore, the level of competition exhibited minor fluctuations, indicating no significant changes during the analyzed time.

Keyword

Competition, Concentration, Banking

INTRODUCTION

The Structure-Behaviour-Performance hypothesis is considered to be the basic hypothesis of the traditional structural competition approach and provides the most competent framework for understanding competition in the banking sector. In its simplest form, it may be explained as more firms exhibit more competitive pricing

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behaviour, leading to a decrease in extraordinary profits in the sector and an increase in consumer welfare (Mendes and Rebelo 2003). This paradigm, which comes from the Classical Industrial Organisation approach, was developed by Mason (1939) and Bain (1956) and is defined as the SCP (Structure- Conduct- Performance) hypothesis in the literature. This view, which tries to explain competition in the sector with the behaviour of firms, argues that firms are also formed according to the market structure. Market structure refers to the level of concentration of the market, and in a concentrated market, the market power of firms high and exceptionally high profits are inevitable. Another hypothesis derived from and supported by SCP was proposed by Bain (1951) is the Collaboration hypothesis. According to related hypothesis, concentration weakens competition by encouraging collusive behaviour among firms, leading to higher prices and lower household welfare. As an alternative to the SCP paradigm, the Efficient Structure Hypothesis, proposed by Demsetz (1973), attributes the relatively higher profitability of banks operating in concentrated markets to the fact that large banks operate more effectively than small banks. In today's world where information and resource mobility is high, the way a sector can concentrate under competitive conditions depends on its ability to reduce costs or to capture a different advantage that will increase efficiency. The cost advantage that causes an increase in density enables economies of scale to occur in the sector, thus enabling households to access higher quality products at more affordable prices (Demsetz1973). The conflict between the Collaboration and Efficiency hypotheses arises from the fact that large banks attribute their profitability to two different inputs. While the Collaboration hypothesis attributes profitability to inter-firm agreement, the Efficiency hypothesis attributes it to economies of scale. The relative-market-power hypothesis (RMP) which was suggested by Sepherd (1986), a similar theory, contends that only companies with substantial market shares and distinctive products can use market power to set prices for these goods and generate supernormal profits.

The banking sector acts as a significant channel for transmitting instability to other economic sectors by disrupting the interbank lending market and payment systems, diminishing credit availability, and freezing deposits. The apprehension that heightened competition could exacerbate financial system fragility has historically driven regulators to prioritize the formulation of policies aimed at maintaining stability within the banking sector. (Berger et all., 2008)

Consequently, it is essential to ascertain the market structure of the banking sector, and the objective of this study is to analyze the market structure of the Turkish banking sector from 2010 to 2020. The paper's hypothesis, is that the industry is moderately competitive and concentrated. Subsequent to assessing the concentration and competition levels, a separate investigation analyzed the influence of these values on stability. (Arslan, 2024)

LITERATURE REVIEW ON BANK COMPETITION AND CONCENTRATION

The relationship between competition and concentration in the banking sector has been a subject of extensive research. The interaction between these two factors is complex and often varies across countries and over time, with multiple dimensions influencing the overall dynamics of the market. The impact of competition in banking is especially significant in emerging economies, where the banking system plays a crucial role in resource allocation, cost structure, service quality, and ultimately, economic development.

Competition in banking has traditionally been seen as beneficial to economic efficiency, as it disciplines pricing behavior, enhances consumer welfare, and promotes cost-effectiveness. Classical microeconomic theory supports this view, as increased competition generally leads to lower prices and improved service quality. However, it is also well-established that the effects of competition cannot be understood solely through concentration levels, as competition is influenced by a variety of factors such as market structure, regulatory environment, and technological advancements.

Berger et al. (2004, 2008) argued that market concentration alone is insufficient for explaining competition in banking. They stressed that competition should be evaluated not only through concentration metrics but also through behavioral indicators, which reflect how market participants behave within the competitive environment. This view is supported by Panzar and Rosse (1987), who developed the H-statistic, a widely used method for determining competition levels in a sector. Their work contributed significantly to the structural analysis of markets and underscored the importance of considering both structural and behavioral factors when assessing competition in banking.

Furthermore, Boone (2008) directly linked the effects of competition to bank performance, particularly focusing on profitability. His research suggested that competition tends to improve performance by forcing banks to operate more efficiently. However, while many studies support this view, the evidence is not always consistent. Some research, such as that by Casu and Girardone (2009), found that increased competition in the European banking sector had a detrimental effect on economies of scale, reducing cost efficiency. Other studies, such as Fernandez de Guevara and Maudos (2007), showed that heightened competition leads to a reduction in pricing power, ultimately benefiting consumers through lower prices and better services.

The relationship between concentration and competition is also highly contextual, varying by country and over time. For instance, Bikker and Spierdijk (2008) observed that competition in the European banking sector had decreased over time, with rising concentration being a significant contributing factor. Their study suggested that this decline in competition was associated with increased market concentration, where a few large players dominate the market. This trend highlights the potential negative effects of high market concentration, as it can reduce competition and harm consumer interests.

In Türkiye, several studies have explored the effects of competition and concentration within the banking sector. Hazar et al. (2017) found that after the 2001 crisis, there was an increase in the market share of large

banks, signaling a rise in market concentration. This concentration, in turn, may have limited competition and affected pricing behaviors. Kocaman (2021) emphasized the growing dominance of public banks, particularly during the COVID-19 period, suggesting that the concentration of the banking sector could result in reduced competition, potentially harming the sector's overall stability. In contrast, Ildırar and Kıral (2018) observed that competitive structures within sectors could vary, highlighting the need for micro-level analysis to understand how competition operates within different segments of the banking industry.

The effects of competition and concentration in the banking sector are also shaped by broader economic conditions, regulatory policies, and technological developments. Studies have shown that regulatory environments play a critical role in shaping competitive dynamics. In countries where regulations are more stringent, competition may be constrained, leading to higher concentration levels. On the other hand, countries with liberalized banking systems often experience greater competition, but this can sometimes lead to destabilization or market volatility.

METHODOLOGY

K-Bank concentration index

A prevalent method for assessing banking sector concentration is the k-bank concentration approach. The primary advantage of the method is its calculation using a straightforward and restricted data set. K-bank concentration indicates the percentage ratio of the assets of a specified number of banks within the sector to the total assets of all banks in that sector. CR3, CR4, CR5 and CR8 ratios are frequently used in the literature. This study used concentration ratios CR3 and CR5, referencing Bikker and Haaf (2000).

Herfindahl-Hirschman index (HHI)

In market concentration analysis, the Herfindahl-Hirschman index is one of the most significant indicators. The squares of each bank's sector share are added up to determine the HHI index. The formula used in the calculation is given in Equation 1 below.

$$HHI = \sum_{i=1}^{N} (Bi/BT)^2 \quad (1)$$

Where Bi symbolises the asset size of bank i and BT symbolises the asset size of all banks.

Since they are complementary methods with the k-bank concentration ratio, they are frequently used together in the literature.(Boďa (2014), Hazar et.al., (2017), Kasman and Kasman (2015)) In this method, firms with high market shares are given more weight due to the squaring of market shares (Ildirar and Kiral 2018).

The thresholds used in EU competition law (European Commission, 2004) are as follows: If HHI<1000, the market can be called unconcentrated. If 1000<HHI<2000, it can be called a moderately concentrated market. 2000<HHI symbolises a highly concentrated market (Yanık, 2021).

The HHI index was calculated separately for assets, deposits and loans.

Panzar-Rosse model

The Panzar-Rosse model, extensively employed to ascertain banking market structure since the 1990s and to evaluate market competition, was introduced in studies done in 1977 and 1987 (Kuzucu 2014). The Panzar-Rosse model, utilized to assess the level of competition in this study, posits that the market should achieve equilibrium in the long run. The logarithmic and linear marginal cost and marginal income functions posited by Bikker and Haaf (2002) must be equivalent for a profit-maximizing bank. The optimum amount of output derived from this equation indicates equilibrium. For ease of application, the reduced income equation, in which the conditions in the equation are realised, is used in the studies.

$$\ln(P_{it}) = \alpha + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \beta_3 \ln(W_{3,it}) + \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln(Y_{2,it}) + \gamma_3 \ln(Y_{3,it}) + \varepsilon_{it} \quad (2)$$

In Equation (2), the sub-indices t and i represent years and banks, respectively. Additional elucidations of the variables are provided below.

P: Interest income/ Total Assets

W_1: Interest Expense / Total Deposits

W_2: (Personnel Expenses + Severance Pay) / Total Assets

W_3: Other Operating Expenses / Total Assets

Y_1: Equity/Total Assets

Y_2: Total Loans/Total Assets

Y_3: Total Assets (thousand TL)

This study employs the commonly utilized -reduced-form income equation- identified in the literature. When conducting research, the selection of dependent and independent variables is a crucial decision that rests with the individual researcher. While this study utilizes the ratio of interest income to total assets as its dependent variable, it's important to acknowledge the diversity in methodological approaches across the literature. Some researchers, for instance, have opted for the ratio of total income to total assets as their dependent variable, recognizing a broader scope of financial performance. Furthermore, other studies have focused directly on total income or interest income in isolation as the primary dependent variable, reflecting varied research objectives and theoretical frameworks. (Bikker, 2006).

The H-statistic, a key measure derived from the Panzar-Rosse model, is calculated as the sum of the estimated coefficients β1+β2+β3 within equation (2), with its value theoretically ranging between 0 and 1. A fundamental

prerequisite for the valid interpretation of the Panzar-Rosse model's coefficients is that the market under examination must be in equilibrium. To empirically ascertain this crucial equilibrium condition, equation (3) is estimated.

$$\ln(ROA_{it}) = \alpha + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \beta_3 \ln(W_{3,it}) + \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln(Y_{2,it}) + \gamma_3 \ln(Y_{3,it}) + \varepsilon_{it}, \quad (3)$$

For clarity in interpreting the empirical results, the theoretical evaluation scale of the H-statistic is presented in Table 1.

Table 1: H-statistic evaluation scale

H-statistic	Evaluation
H≤0	Monopoly Market
0<H<1	Monopolistic Competition
H=1	Perfect Competition Market

RESULTS

In this section, we present the results derived from the concentration and competition analyses undertaken as part of this study.

K-Bank Concentration Results

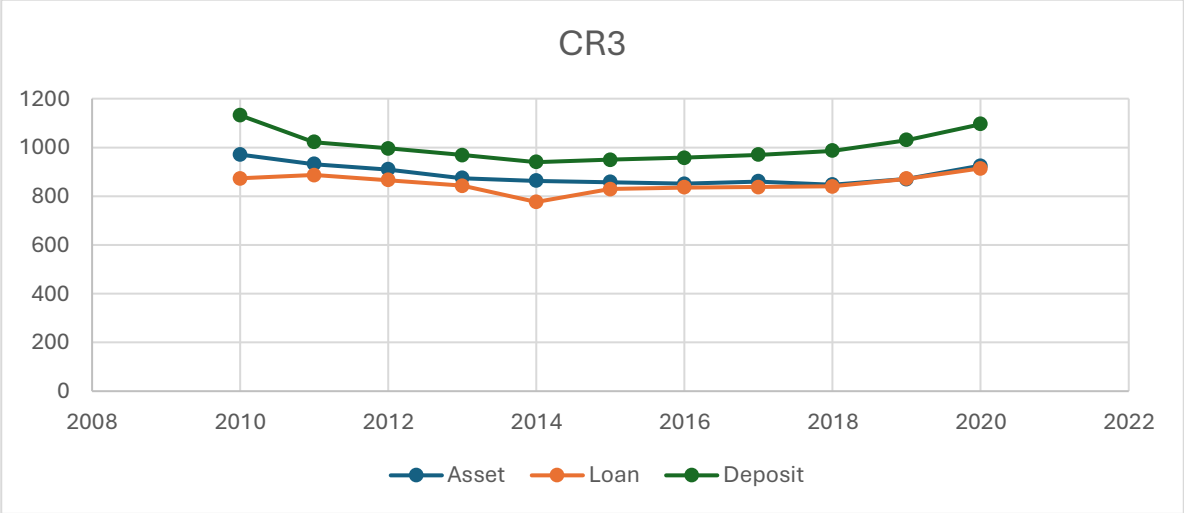
While k-bank concentration ratios are commonly presented as a value between 0 and 1 in much of the existing literature, this study expresses these ratios as percentages. These ratios are computed separately for loans, assets, and deposits to provide a comprehensive view of market concentration. The detailed results are systematically presented in Table 2. For illustrative purposes, in 2010, the combined asset ratio of the three largest banks affiliated with the Banks Association of Türkiye (BAT), relative to the total assets of all other BAT-affiliated banks, stood at 42.304 percent.

Table 2: K-Bank Concentration Results

	CR3			**CR5**		
	Asset	Loan	Deposit	Asset	Loan	Deposit
2010	42.304	36.749	46.643	62.883	57.482	66.482
2011	40.404	37.16	42.339	61.223	57.946	62.807

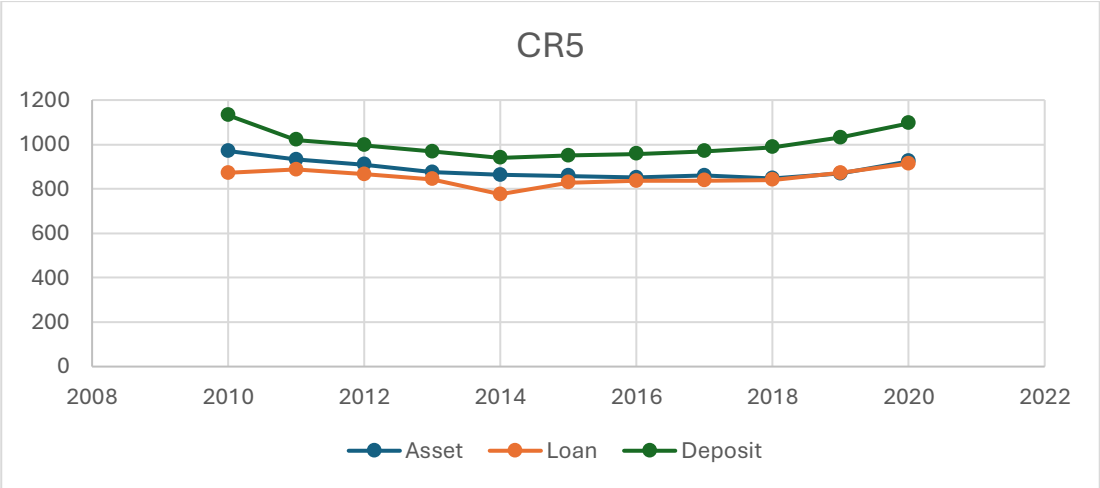
2012	38.401	37.273	40.495	59.817	56.414	62.063
2013	37.600	35.941	39.136	57.938	59.491	60.977
2014	37.296	35.698	38.492	57.771	56.199	59.15
2015	37.248	35.918	38.471	57.604	55.837	59.727
2016	36.739	36.288	38.390	56.922	55.771	59.796
2017	36.246	36.115	38.720	56.321	55.349	60.084
2018	36.428	37.292	40.515	55.777	56.087	61.166
2019	37.479	38.119	42.056	56.768	57.752	62.269
2020	40.983	41.284	45.376	60.170	60.143	66.244

Graphs 1 and 2 illustrate the concentration ratios for assets, loans, and deposits, designated as CR3 and CR5, respectively. The subsequent conclusions regarding the market structure can be drawn from the progression of the graphs;



Graph 1:CR3 Concentration Graph

The graphical representations indicate a consistent trend between the CR3 and CR5 concentration indices across all observed metrics. Notably, deposit concentration exhibits a pronounced U-shaped trajectory between 2010 and 2020. Specifically, for the CR3, deposit concentration initiated at 46%, subsequently declined to a low of 38%, and then ascended to 45% by the conclusion of the review period. Conversely, loan concentration began at 36%, remained relatively stable around 35% during the mid-period, and ultimately reached 41% by the period's end. Asset concentration, starting at approximately 42% in 2010, decreased to a minimum of 36% in the middle of the review period before recovering to 40% in 2020.



Graph 2:CR5 Concentration Graph

Parallel to the trends observed with the CR3 index, the CR5 concentration index for deposits exhibited a broad U-shaped trajectory. Specifically, deposit concentration began at 66% at the commencement of the period, declined to a low of 59% during the mid-period, and subsequently returned to 66% by the period's conclusion. For loans, the CR5 concentration ratio initiated at 57%, decreased to a minimum of 55% in the middle of the period, and ultimately concluded at 60%. Regarding asset concentration, the CR5 stood at 62% in 2010 and registered 60% in 2020.

A comprehensive analysis of concentration ratios, considering both the CR3 and CR5 indices across all three variables (deposits, loans, and assets), reveals that the years 2010 and 2020 exhibit comparable characteristics in terms of concentration levels. Conversely, a noticeable decline in concentration is consistently observed across all three variables during the mid-period.

Herfindahl-Hirschman index (HHI) Results

The computed HHI index values for assets, loans, and deposits are presented separately in Table 3 and illustrated in Graph 3.

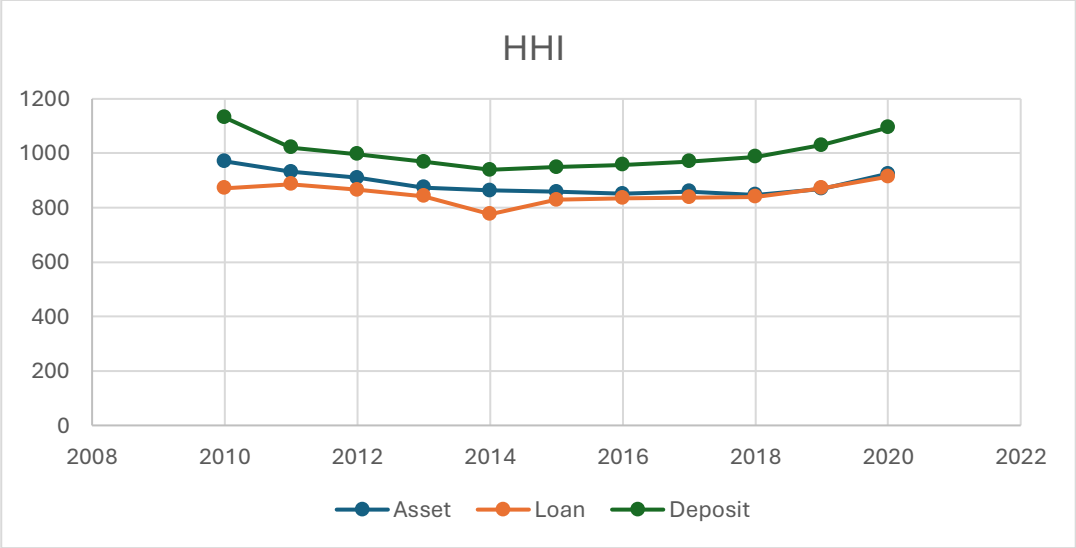
Table 3: HHI Concentration Results

	HHI		
	Asset	Loan	Deposit
2010	970.497	872.193	1131.447
2011	931.614	886.597	1021.121
2012	909.790	865.532	996.308
2013	874.113	842.756	968.173
2014	863.210	776.170	939.476
2015	857.866	829.014	949.319
2016	851.341	835.620	957.489

2017	859.829	837.300	969.965
2018	846.885	839.792	986.814
2019	869.394	871.666	1030.355
2020	924.573	914.005	1095.508

An examination of the HHI graph reveals a parallel trend to those observed with the CR3 and CR5 concentration ratios. Consistent with the CR3 and CR5 findings, the order of concentration from highest to lowest remains deposits, assets, and loans.

Specifically, deposit concentration, measured by the HHI, commenced at 1131, subsequently declined to a minimum of 939 during the mid-period, and concluded at 1095 by the period's end. Asset concentration, conversely, initiated at 970, experienced its lowest level at 846 in the middle of the period, and concluded at 924. Finally, loan concentration, starting at 872 in 2010, reached its nadir for the period at 776 in 2014, before closing at 914 in 2020.



Graph 3: HHI Concentration Graph

Results of Panzar-Rosse Model (H-Statistic)

The dataset for this study was compiled from the official website of the Banks Association of Türkiye (BAT) and subsequently processed by the author. The sample comprises 21 banks operating within the sector, selected based on the completeness of their financial information for the period spanning 2010 to 2020. This temporal scope was deliberately chosen to precede the recent period of significant interest rate reductions. The dataset's truncation at 2020 further aims to ensure the stability and predictability of the banks' financial indicators.

Methodologically, the study employs the H-statistic, a measure of competition originally proposed by Panzar and Rosse in 1982 and 1987. Its application in this research follows the methodological framework outlined

by Bikker and Spierdijk (2008). The reduced-form income equation, central to the H-statistic estimation, is analyzed using the Fixed Effects method, a widely recognized technique within panel data analysis. Diagnostic testing, specifically the Breusch-Pagan and Honda tests, indicated the presence of both unit and time-specific effects, confirming the appropriateness of the Fixed Effects model. The detailed results of these diagnostic tests are presented in Table 4.

Table 4: Breusch-Pagan and Honda tests

	One sided unit effect	**One sided time effect**	**Two sided effect**
Breusch Pagan	71.629*** (0.0000)	25.500*** (0.0000)	97.129*** (0.0000)
Honda	8.463*** (0.0000)	5.049*** (0.0000)	9.555*** (0.0000)

The Hausman test is employed to ascertain the most appropriate panel data estimation method for the dataset.

Table 5: Hausman test results

Unit and Time Random Effects Test				
Variables	Fixed(b)	Random (B)	Diff (b-B)	Prob.
LW1	0.359	0.364	-0.000	NA
LW2	0.397	0.427	0.000	0.000
LW3	-0.153	-0.139	0.000	0.439
LY1	0.353	0.280	-0.000	NA
LY2	-0.095	-0.119	-0.000	NA
LY3	0.079	0.075	0.000	0.891
Test Summary	Chi-Sq. Statistic		Chi-Sq. d.f.	Prob.
Unit and Time Random	0.000000		6	1.0000

Although the Hausman test yielded a p-value greater than 0.05, the random effects model was deemed inappropriate due to the presence of negative variance estimates. Consequently, the fixed effects model was adopted. Furthermore, diagnostic tests indicated the existence of heteroscedasticity, autocorrelation, and cross-sectional dependence within the model. Therefore, the equation was estimated using the Driscoll-Kraay fixed effects approach, which accounts for these econometric issues. The estimation results are reported in Table 6.

Table 6: Results of fixed effects model

		Number of Observation	231
		Number of group	21
		F (16, 10)	151.95
		Prob> F	0.000
		R^2	0.8002
Independent Variables	Kats.	Driscoll/Kray Std. Error	t	P>ItI
LW1	0.286***	0.035	7.98	0.000
LW2	0.241***	0.075	3.19	0.010
LW3	0.039	0.102	0.39	0.706
LY1	0.171***	0.060	2.82	0.018
LY2	-0.069***	0.016	-4.18	0.002
LY3	-0.061	0.067	-0.92	0.379

The H-statistic for the Turkish banking sector, calculated as the sum of the β1, β2, and β3 coefficients, is 0.286+0.241+0.039=0.568, which we can round to approximately 0.57. However, for this derived competition measure to be considered valid, we must re-estimate the reduced-form income equation (Equation 3) using Return on Assets (ROA) as the dependent variable. We then need to test whether the sum of the β1, β2, and β3 coefficients is statistically equal to zero. We perform this test using the Wald testWhile the full details of this analysis are available in the associated thesis (Arslan, 2024), we'll only present the Wald test results here. Table 7 reports the outcomes of the Wald statistic, which specifically tests the long-run market equilibrium condition. This condition is a crucial prerequisite for the validity of our estimated competition value.The null hypothesis (H_0) for the Wald test is formulated as follows:

H_0: $\beta_1+\beta_2+\beta_3=0$

Table 7: Wald Test

Wald Test			
Test statistics	Value	Degree of Freedom	Prob.
T statistics	-1.621	204	0.106
F statistics	2.630	(1, 204)	0.106
Chi-square	2.630	1	0.105

Since the Wald test statistic is $p>0.05$, the null hypothesis $\beta_1+\beta_2+\beta_3=0$ cannot be rejected. Considering that the condition $\beta_1+\beta_2+\beta_2+\beta_3=0$, which signifies long-run market equilibrium, is fulfilled, it is said that the competition rate established in the initial section is accurate. The competitiveness score in the Turkish banking sector from 2010 to 2020 is 0.57, signifying a monopolistic competition market structure.

CONCLUSION

This study analyzes the concentration and competitive dynamics of Turkish commercial banks from 2010 to 2020. Two methodologies were employed to ascertain concentration levels: the K-bank concentration ratio and the Herfindahl-Hirschman Index (HHI). The Panzar-Rosse approach was employed as a measure of competition. The results indicate a moderate amount of market concentration, as demonstrated by the K-bank concentration ratio and the HHI. The Panzar-Rosse competition analysis indicates that the competition level in the Turkish banking sector is 0.57, denoting an environment of monopolistic competition.

The significance and prevalence of banks within the financial system, particularly in developing nations, is substantial due to the scarcity of alternative financial channels. Any detrimental change in the banking sector does substantial damage to national economies. Besides operational, financial, and market-related hazards, the banking system is also susceptible to asymmetric information, moral hazard, and adverse selection. The financial turmoil of an individual bank might adversely affect the other banks consumers. The intrinsic interdependence among banks is robust, necessitating their collaborative and harmonious operation, irrespective of their preferences. Accordingly, in contrast to other industries, the banking sector necessitates oversight by regulatory and supervisory authorities.

Therefore, it is imperative to evaluate the concentration and competitive dynamics of the banking sector at all times. Specific degrees of competition within the banking sector are both acceptable and advantageous in a competitive landscape, low loan interest rates and elevated deposit interest rates are desirable from the perspective of welfare economics. The value of h- statistic of 0.57 shows that there is a measurable level of competition in the industry and banks have a considerable degree of pricing power. The banking system under consideration can be characterized as operating within a monopolistic competition framework, accompanied by low market concentration. The low concentration level implies that no single or small group of banks dominates the market. This structure supports a competitive dynamic that enhances both financial stability and consumer welfare. Such a market configuration is generally favorable, as it combines competitive pressures with a degree of strategic flexibility for individual banks. Nevertheless, ongoing monitoring is warranted to detect potential shifts in concentration or emerging dominance by larger institutions, which could alter the competitive landscape over time For these reasons, it is vital to determine the level of competition and to establish a balanced relationship between concentration and competition. Continuous assessment of

competitive dynamics, coupled with forward-looking adaptation to macroeconomic and institutional shocks, enables banks to strengthen the resilience and precision of their risk management strategies.

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