AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Asian Journal of Applied Economics Vol. 32 No. 1 (January-June 2025): 58-77
Copyright © 2025 Center for Applied Economics Research
ISSN: 2985-1610 (Online)

Received: 8 July 2024
Received in revised form: 29 October 2024
Accepted: 4 November 2024

Multimarket Contact, Competition, and Performance: An Application to Turkish Deposit Banks*

Berna Dogan Basar†

Bolvadin Faculty of Applied Sciences, Banking and Insurance, Afyon Kocatepe University, Turkey

Ibrahim Halil Eksi

Faculty of Economics and Administrative Sciences, Department of Management, Gaziantep University, Turkey

Abstract

The banking sector plays a pivotal role in financial markets, providing an ideal setting to examine multimarket contact (MMC)—a phenomenon where banks compete against the same rivals across multiple markets. This study investigates how MMC dynamics influence bank risk and performance, particularly in the context of technological advancements and the post-COVID-19 banking landscape. Using panel data from 17 deposit banks operating continuously in the Turkish banking system between 2012 and 2021, the study employs the Generalized Method of Moments (GMM) to analyze the effects of MMC. The findings indicate that MMC intensifies competition in the Turkish banking sector, leading to improved asset quality but negative impacts on profitability, overall performance, and bankruptcy risk. These results suggest that while broader market exposure enhances risk management and credit quality, heightened competition erodes profitability and financial stability. Given the increasing digitalization of banking services and the shift towards branchless banking, regulators and financial institutions should reconsider market expansion strategies, balancing competition with financial sustainability. This study contributes to the literature by offering empirical insights from an emerging market and highlighting the interplay between MMC, financial stability, and technological evolution in banking. The findings hold practical implications for policymakers, regulators, and financial institutions seeking to optimize competitive strategies while ensuring banking sector resilience.

Keywords: banking; multimarket contact; financial performance; risk; generalized moments method (GMM)

JEL Codes: G21; G32; L25

---

*This study is derived from Berna Dogan Basar's doctoral thesis entitled "Multimarket Contact, Competition and Performance: An Application on Turkish Deposit Banks".

†**Corresponding Author**, Address: Afyon Kocatepe University, Bolvadin Faculty of Applied Sciences, Banking and Insurance

Email: dogan.brn@gmail.com.

1. Introduction

Multimarket contact has been identified as a competition-dampening factor, particularly in industries with recurring firm interactions. This concept and its competitive intensity are central to linked oligopoly theory or mutual forbearance theory, which suggests that multimarket contact can reduce local market competition intensity. When firms operate across multiple markets, retaliatory potential increases, potentially creating losses too substantial to offset through aggressive profit-seeking behavior, ultimately reducing overall competition. This perspective is supported by Alexander (1985), Edwards (1955), Feinberg (1984), and Hughes and Oughton (1993), though some theoretical studies like Mester (1992) and Solomon (1970) contest this view.

The banking sector, characterized by intense competition, provides an ideal laboratory for testing mutual forbearance theory, as banks offer identical products and services across various geographical markets. According to mutual forbearance theory, firms operating in shared geographic markets may exhibit reduced competitive aggression across all common markets (Edwards, 1955).

Over the past two decades, banking systems globally have undergone significant structural transformation driven by deregulation and technological advancement. Many countries responded through consolidation and bank mergers, substantially reducing their banking system numbers. Deregulation eliminated geographical constraints, enabling banks to establish diverse branch networks domestically and internationally. This led to an increase in large, geographically diversified banks competing simultaneously across multiple markets, potentially affecting their performance, profitability, costs, liquidity, risk, and stability. Consequently, understanding how multimarket competition influences bank risk and performance becomes crucial for risk management and sustainable profitability.

The banking sector presents an optimal setting for multimarket contact analysis for two reasons: banks sell identical products across multiple geographic markets, and recent structural reforms, consolidation, and technological advances have altered the sector's competitive conditions and market structure. Particularly, mergers and acquisitions have enabled expanded branch networks and increased inter-bank competition across local markets. Examining this multimarket contact is vital for analyzing the sector's competitive structure and its impact on performance and risk, as well as testing sector reliability and soundness.

Turkish banks are categorized into three groups: deposit, participation, and development & investment banks. Development and investment banks neither accept deposits nor compete with other banks, while participation banks operate on a profit-loss basis, distinct from deposit banks. Provincial branch data for participation and development and investment banks is only available for 2021. This study analyzes 17 deposit banks that accept deposits, compete with other banks, operate on a common basis, and maintain comprehensive provincial branch networks. These deposit banks command 86% of the Turkish banking sector's total assets as of March 2023, holding significant economic and technological influence (BAT, 2023). Analyzing competitive factors affecting these banks' risk and performance may assist banks and financial regulators in crisis preparation.

This study examines the relationship between multimarket contact and bank risk and performance in the Turkish banking sector from 2012-2021. Technological developments and banks' adaptation to these

changes motivate this research. Financial technology development and innovation have prompted strategic shifts in banking, potentially affecting banks' risks and performance. Consequently, this study investigates whether income diversification levels moderate multimarket contact's impact on bank risk and performance. The paper proceeds as follows: Section 2 reviews relevant literature, Section 3 details data and methodology, and Section 4 presents results.

2. Literature review

The theoretical foundation of multimarket contact was established by Edwards (1955), catalyzing rapid development in theoretical literature. Empirical investigations of multimarket contact span various sectors: manufacturing (Hughes & Oughton, 1993; Li & Greenwood, 2004), airlines (Asahi, 2023; Gimeno, 2002; Su & Dresner 2021; Yimga, 2023), telecommunications (Busse, 2000; Giachetti et al., 2022; Waldfogel & Wulf, 2006), hotels (Batini**ć**, 2015; Deng et al., 2023), fuel (Balaguer & Ripollés, 2021), cement (Chicu & Ziebarth, 2013), and financial services (Cruz-García et al., 2021; Dao et al., 2021; Haveman & Nonnemaker, 2000; Hoang et al., 2021; Le & Pham, 2022; Ljubownikow et al., 2023; Molnar et al., 2013).

The literature reveals diverse findings regarding competition's effects on performance, with researchers employing varied approaches to measure competition intensity. Several studies link mutual forbearance to enhanced business outcomes: higher profits (Feinberg, 1984; Scott 1982), increased prices (Evans & Kessides, 1994; Parker & Roller, 1997), improved yields (Gimeno & Woo, 1996; Singal 1996), and greater market share stability (Heggestad & Rhoades 1978; Martinez, 1990).

In rural banking markets, Hannan and Prager (2009) found significant associations between small single-market bank profitability and non-market bank presence, noting that increased non-market bank presence diminishes concentration's positive effect on small bank profits. Coccorese and Pellecchia's (2009) research demonstrates positive correlations between multimarket contacts and bank profitability, particularly pronounced for banks with higher contact numbers, though market concentration showed no significant profitability relationship. Their 2013 study further revealed positive associations between multimarket contact and market power indices, suggesting increased collusion likelihood among firms with more contacts.

Molnar et al. (2013) found that banks with broader multimarket contacts exhibit less competitive behavior, with smaller banks demonstrating collaborative profit-maximization tendencies. Pham et al. (2016) supported the mutual forbearance hypothesis, showing banks' preference for cooperation over aggressive competition when facing similarly sized rivals across multiple markets. Conversely, Dao et al. (2021) identified negative impacts of multimarket contact on bank profitability in Vietnamese banks, though finding positive associations between contact numbers, bank size, capitalization, and risk-adjusted profitability.

Prior literature predominantly focuses on multimarket contact in developed countries' banking sectors (Coccorese & Pellecchia, 2009, 2013; De Bonis & Ferrando, 2000), particularly in Italy, the USA, and Spain. This study makes two significant contributions to existing literature.

First, it examines deposit banks in Turkey, a developing nation undergoing recent structural banking reforms. This perspective is particularly valuable as developing countries' financial systems heavily rely on

banking sectors, and rapid technological advancement has created nearly unlimited market access through communication networks. Analyzing multimarket contact's impact on performance and risk in the Turkish banking sector offers novel insights to international banking literature, especially given that behavioral patterns of bank managers, customers, investors, and politicians—along with technological adoption tendencies—may differ significantly from developed nations.

Second, this study expands the limited research examining multimarket contact's influence on banking sector risk and performance. While only three studies have analyzed this relationship's functional form in banking markets (Fuentelsaz & Gomez, 2006; Haveman & Nonnemaker, 2000; Kasman & Kasman, 2016), none have specifically investigated multimarket contact's impact on asset quality and bankruptcy risk. This research provides a comprehensive, simultaneous analysis of how multimarket contact requirements affect banks' risk and performance, suggesting that mutual forbearance behavior can emerge even with limited market exposure.

Geographic diversification's impact on bank performance has been extensively studied, yet previous research has not adequately considered the average number of competitors banks facing per market. Studies examining whether banks' multimarket contacts influence competition levels remain limited. Despite multimarket contact's empirical investigation across various industries, banking sector research remains notably sparse (Hoang, et al., 2021; Kasman & Kasman, 2016; Le 2020; Le, et al., 2019), particularly regarding how geographic diversification might trigger competitive retaliation in shared markets.

3. Research Methodology

This study uses data from the Turkish banking sector (2012-2021), sourced from the Banks Association of Turkey (BAT) and FinNet database. Data from 2022 was excluded due to unavailability during the study period. Initially, 35 deposit banks were considered, but only 17 were included in the final analysis due to data constraints.

The dataset explores the relationship between banks' risk, performance, and multimarket contact, with annual data from BAT's December publications across 10 years (2012-2021). As shown in Figure 2, multimarket contact indices remained stable during the COVID-19 pandemic (2020-2021), so its effects are not considered. Figures 1 and 2 show the evolution of branch numbers in the Turkish banking system and average multimarket contact over the study period (2012-2021), respectively.

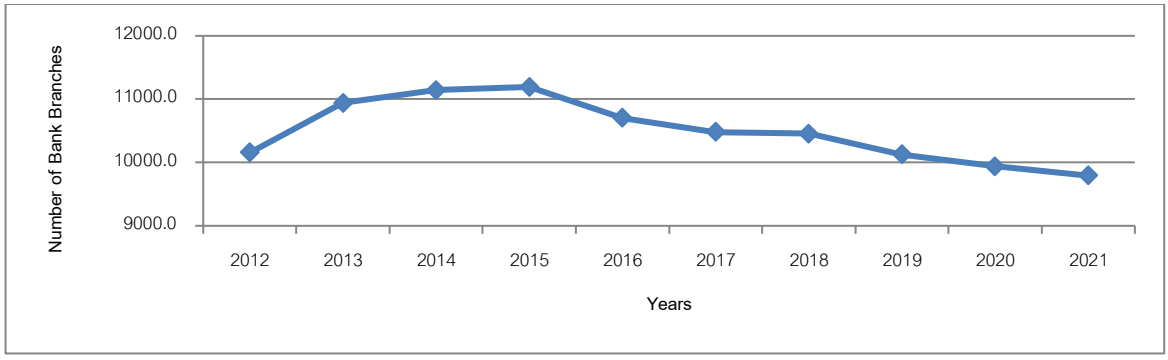

Figure 1: Development of the Number of Bank Branches in Turkey

Source: Authors' calculation based on the Banks Association of Turkey (BAT) and FinNet database

MMC1 refers to the similarity of competing banks, MMC2 refers to the proportion competing in the same market, and MMC3 refers to the size of competitors, and these are indicators of multimarket contact. For Turkish deposit banks, the evolution of these indicators for 2012-2021 is presented in Figure 2.

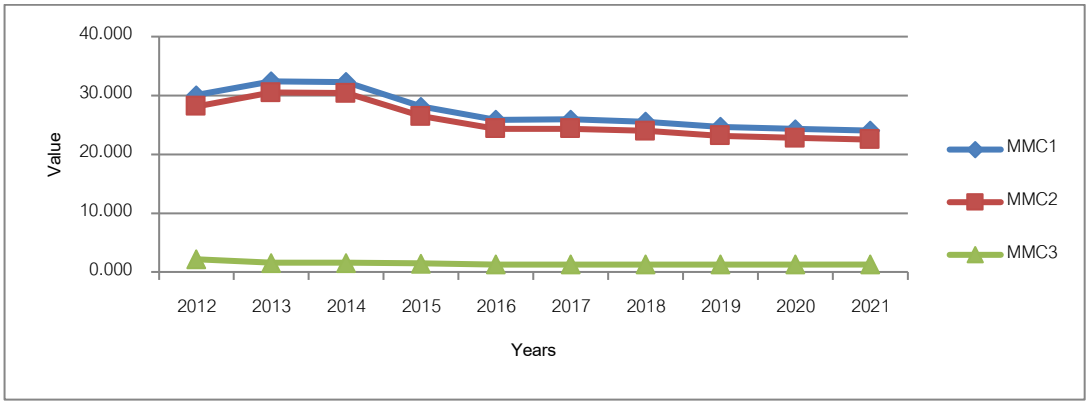

Figure 2: Mean development of MMC1, MMC2 and MMC3

Source: Authors' calculation based on the Banks Association of Turkey (BAT) and FinNet database

Multimarket contact indices (MMC1 and MMC2) exhibited an increasing trend during 2012-2014, followed by a consistent decline from 2014 onward. These fluctuations in multimarket contact parallel the changes in bank branch numbers during the same period.

The Turkish banking sector has undergone significant structural reform and liberalization over the past twenty-five years, substantially impacting competitive conditions and market structure. This transformation led to a substantial increase in branch numbers, while bank numbers showed moderate changes due to sector consolidation. However, recent technological advancements coupled with the COVID-19 pandemic have accelerated the adoption of open and branchless banking initiatives, reducing the need for physical bank branches. The sector is expected to continue this trend of decreasing physical branches, as FinTech (financial technology) gain prominence and customers increasingly utilize digital banking services, particularly through mobile applications (Incirkus & Kalpaklioglu, 2023).

In this study, models incorporate bank-specific variables alongside the primary explanatory variable (multimarket contact measure). Variable selection focused on relevant micro indicators affecting banks. The models employ several dependent variables: return on assets, return on equity, return on interest, bankruptcy risk, and asset quality. For multimarket contact indices, which serve as independent variables, three measures are utilized: MMC1, calculated by dividing the total contacts of a bank by the number of banks encountered in a particular market; MMC2, which accounts for similarity between banks in terms of market shares; and MMC3, which considers competitors in terms of size. The study also incorporates control variables including non-interest income diversification index, bank size, capital adequacy, and number of employees.

Existing literature suggests multimarket contact negatively affects banks' performance and risk levels (Dao et al., 2021; Degl'Innocenti et al., 2014; Kasman & Kasman, 2016). This relationship stems from significant structural changes in banking systems over the past two decades, driven by deregulation and technological advancement. The widespread adoption of mobile banking has shifted transactions away from physical

branches, negatively impacting multimarket contact. Conversely, the control variables—diversification index (HHI), bank size, capital adequacy, and employee numbers—are expected to positively influence bank performance and risk levels.

To examine the impact of multimarket contact on bank risk and performance, we employ model (1) as follows:

$$ROA_{it} = \beta_0 + \beta_1 ROA_{i(t-1)} + \beta_2 MMC1_{it} + \beta_3 HHI_{it} + \beta_4 SIZE_{it} + \beta_5 CAR_{it} + \beta_6 PERS_{it} + \varepsilon_{it} \quad (1)$$

For our dependent variables, we employ several performance indicators: return on assets (ROA) as the primary measure, supplemented by net interest margin (NIM) and return on equity (ROE) to assess soundness (Hoang et al., 2021). Risk assessment incorporates two dependent variables: bankruptcy risk (Z-Score) and asset quality (NPL). The dynamic model's construction draws from the methodological frameworks established by Wintoki et al. (2012) and Muchtar et al. (2018).

The study incorporates several bank-specific variables: the Herfindahl-Hirschman Index (HHI) for non-interest income diversification, bank size (SIZE), capital adequacy ratio (CAR) calculated as shareholders' equity to total assets, and number of employees (PERS). The HHI is calculated as follows:

$$HHI = \left(\frac{COM}{NON}\right)^2 + \left(\frac{TRD}{NON}\right)^2 + \left(\frac{OTOP}{NON}\right)^2 \quad (2)$$

The NON variable represents the sum of three components: COM (net fee and commission income), TRD (net trade income), and OTOP (income from other operations). The study employs three distinct multimarket contact measures as independent variables: MMC1, weighted by bank similarity; MMC2, weighted by same-market competition rates; and MMC3, weighted by competitor size. Detailed measurement specifications for these indices are provided in the Appendix. An increase in MMC1, MMC2, or MMC3 indices indicates greater market exposure and heightened competitive intensity for the banks. Table 1 presents descriptive statistics for all variables included in the models.

Table 1: Descriptive statistics of variables used in the model

Variables	Unit	Mean	Median	Standard Deviation	Minimum	Maximum
Return on Assets (ROA)	Ratio	1.093	1.199	0.735	-2.210	2.603
Return on Equity (ROE)	Ratio	11.235	12.559	6.768	-31.424	24.760
Return on Interest (NIM)	Ratio	0.162	0.044	0.508	0.015	2.783
Insolvency Risk (Z-score)	Ratio	5.516	4.179	5.949	-1.430	64.876
Asset Quality (NPL)	Ratio	0.043	0.039	0.0218	0.005	0.148
Multimarket Contact (MMC1)	Ratio	27.530	32.654	11.085	4.731	40.192
Multimarket Contact (MMC2)	Ratio	25.881	30.682	10.153	4.656	38.277
Multimarket Contact (MMC3)	Ratio	1.421	0.95	1.081	0.038	2.933

Variables	Unit	Mean	Median	Standard Deviation	Minimum	Maximum
Herfindahl–Hirschman Index (HHI)	Index	0.554	0.538	0.115	0.341	0.933
Bank Size (SIZE)	Log	10.045	10.816	2.292	3.591	12.174
Personnel (PERS)	Log	3.832	4.079	0.488	2.787	4.410
Capital Adequacy (CAR)	Ratio	0.16	0.152	0.025	0.121	0.256

Source: Authors' calculation

The study encompasses 170 observations for each variable, collected annually between 2012 and 2021 from Turkish deposit banks. The descriptive statistics reveal mean values of 1.093 for return on assets (ROA), 11.235 for return on equity (ROE), 0.162 for return on interest (NIM), 5.516 for bankruptcy risk (Z-score), and 0.043 for asset quality (NPL).

The primary research variables, MMC1, MMC2, and MMC3, demonstrate mean values of 27.530, 25.881, and 1.419, respectively. The MMC1 index range spans from one to the total number of local markets. In theory, the index minimum is zero (indicating monopoly in operating markets), while the maximum equals the number of provinces when all banks operate in all markets. As of 2021, Turkey comprises 81 provinces. MMC2 incorporates market share similarity weights across all provinces where banks operate, while MMC3 accounts for competitor size. These latter two indices serve as robustness checks for MMC1, resulting in differentiated multimarket contact indicator values.

Regarding control variables, the non-interest income diversity indicator (HHI) shows a mean of 0.554. Additional metrics include bank size (SIZE) at 10.045, logarithm of headcount (PERS) at 3.832, and capital adequacy (CAR) at 0.160. Table 2 presents the correlation matrix for all independent variables.

Table 2: Correlation matrix between independent variables

Correlation matrix for the models for MMC1

	MMC1	HHI	SIZE	PERS	CAR
MMC1	1.000				
HHI	0.033	1.000			
SIZE	0.142	0.094	1.000		
PERS	0.47	0.227	0.209	1.000	
CAR	-0.08	-0.016	0.128	-0.226	1.000

Correlation matrix for the models for MMC2

	MMC2	HHI	SIZE	PERS	CAR
MMC2	1.000				
HHI	0.036	1.000			
SIZE	0.134	0.094	1.000		
PERS	0.443	0.227	0.209	1.000	
CAR	-0.088	-0.016	0.128	-0.226	1.000

Correlation matrix for the models for MMC3

	MMC3	HHI	SIZE	PERS	CAR
MMC3	1.000				
HHI	-0.012	1.000			
SIZE	0.134	0.094	1.000		
PERS	0.535	0.227	0.209	1.000	
CAR	-0.118	-0.016	0.128	-0.226	1.000

Source: Authors' calculation

The correlation analysis indicates no multicollinearity problems among the variables. All correlation coefficients presented in Table 2 fall below 90%, confirming the absence of multicollinearity among the independent variables used in the analysis.

4. Results and Discussion

Panel data analysis has gained prominence in econometrics and social sciences, examining relationships between dependent and independent variables across multiple units over time. Given our data structure, where the time dimension is N>T and accounts for time series features, we employ the system GMM estimator. This method, initially developed by Arellano and Bond (1991) and later refined by Arellano and Bover (1995), combines difference and level equations to test multimarket contact effects on selected dependent variables.

The system GMM estimator represents an advancement over the first difference GMM estimator through methodological improvements. Blundell and Bond (1998) and Blundell et al. (2000) demonstrated that while difference GMM showed weak predictive power in finite samples and produced biased coefficient estimates, system GMM exhibited superior predictive capability (Dökmen, 2012). The system GMM estimator's advantages include lower bias and higher efficiency compared to other estimators, particularly the first difference GMM (Bond et al., 2001).

Tables 3 and 4 present the model estimation results. The significant and positive correlation between lagged dependent variables and their corresponding dependent variables validates our use of a dynamic model. The AR(2) test and Hansen test p-values exceed 10 percent, satisfying second-order autocorrelation and overidentification conditions, thus confirming the estimates' validity for statistical inference.

Table 3: Performance variables and regression results with multimarket contact.

	ROA						ROE						NIM					
	1		2		3		4		5		6		7		8		9	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
$ROA_{(t-1)}$	0.558**	0,000	0.494**	0,000	0.479**	0,000												
$ROE_{(t-1)}$							0.514**	0,000	0.363**	0,000	0.604**	0,000						
$NIM_{(t-1)}$													1.364**	0,000	1.362**	0,000	1.376**	0,000
MMC1	-0.051**	0,001					-0.614**	0,000					-0.001**	0,000				
MMC2			-0.024**	0,000					-0.683**	0,000					-0.001**	0,000		
MMC3					-0.180**	0,000					-3.618**	0,001					-0.028**	0,000
HHI	-0.821*	0,043	-1.101*	0,019	-0,99	0,147	-6,824	0,242	3,38	0,671	-70,167	0,113	0.031*	0,013	0.031*	0,012	0,02	0,128
SIZE	0,119	0,584	-0.042**	0,002	-0,018	0,173	7.292*	0,035	8.389*	0,036	16.112**	0,004	-0.014**	0,000	-0.013**	0,000	-0.016**	0,000
PERS	0,118	0,69	0,021	0,882	-0,061	0,72	-1,262	0,843	-0,796	0,856	-3,592	0,275	0.141**	0,000	0.138**	0,000	0.160**	0,000
CAR	1,675	0,397	0,338	0,891	2,132	0,121	2,105	0,48	-3,488	0,581	-52,511	0,189	-0.392**	0,000	-0.392**	0,000	-0.460**	0,000
AR(1)	-1,807	0,071	-1,917	0,055	-1,924	0,054	-1,77	0,077	-1,7	0,089	-1,717	0,086	2,55	0,011	1,67	0,095	-1,051	0,06
AR(2)	-0,267	0,79	-0,429	0,668	-0,819	0,413	-0,466	0,641	-1,33	0,184	-0,7965	0,426	-0,997	0,319	0,87	0,385	-1,04	0,2983
Hansen	14,481	0,884	13	0,448	14,467	0,342	13,719	0,911	13,982	0,6	14,26	0,161	14,46	0,342	14,69	0,327	13,341	0,576

Source: Authors' calculation. Note: **, * indicate significance at the 1 percent, and 5 percent levels, respectively.

Table 4: Regression results with risk variables and multimarket contact.

	Z-Score						NPL					
	10		11		12		13		14		15	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
$Z-Score_{(t-1)}$	1.099**	0,000	0.773**	0,000	1.004**	0,000						
$NPL_{(t-1)}$							0,323	0,873	0.329**	0,000	0.374**	0,000
MMC1	-0,026	0,762					-0.001**	0,000				
MMC2			-0.084*	0,029					-0.001**	0,000		
MMC3					-1.209**	0,000					-0.004**	0,001
HHI	-4.256**	0,000	-2,658	0,171	-2.857*	0,025	0,006	0,725	0,006	0,717	-0,003	0,838
SIZE	-1,402	0,524	-0,031	0,829	-0,099	0,336	0,001	0,936	0,001	0,852	0,001	0,579
PERS	-1.449**	0,000	-5.655*	0,048	-11.370**	0,000	0.007*	0,018	0,007	0,249	0,003	0,483
CAR	-4.116**	0,007	15,511	0,255	-14,862	0,126	0.297**	0,000	0.294**	0,000	0.310**	0,000
AR(1)	-1,666	0,096	-1,766	0,077	-1,499	0,047	-1,69	0,091	-1,691	0,091	-2,085	0,037
AR(2)	0,831	0,406	0,874	0,382	1,356	0,175	-1,204	0,229	-1,199	0,231	-1,239	0,215
Hansen	12,287	0,873	10,857	0,623	12,168	0,351	13,318	0,578	13,325	0,577	14,989	0,452

Source: Authors' calculation.

Note: **, * indicate significance at the 1 percent, and 5 percent levels, respectively.

The analysis reveals significant relationships between multimarket contact measures (MMC1, MMC2, MMC3) and bank performance and risk variables. All three multimarket contact indicators demonstrate negative and statistically significant relationships with performance measures (ROA, ROE, NIM) and risk indicators (Z-Score and NPL) at the 1% significance level according to the GMM estimator. The exception is the relationship between Z-score and MMC2, which shows significance at the 5% level, while MMC3 maintains a 1% significance level correlation with Z-score. These results indicate statistically significant inverse relationships between multimarket contact measures and ROA, ROE, NIM, and Z-Score, while demonstrating a positive relationship with NPL.

The NPL ratio, reflecting banks' effectiveness in borrower selection and monitoring, shows an expected negative relationship with multimarket contact measures. As MMC1, MMC2, and MMC3 increase, NPL decreases, indicating an inverse relationship between competition and non-performing loans. Specifically, a one-unit increase in multimarket contact leads to decreases of 0.001 units in Models 13 and 14, and 0.004 units in Model 15 regarding banks' asset quality. This suggests that heightened inter-bank competition promotes more institutionalized banking practices, including enhanced collateral requirements and improved financial intelligence studies for credit risk minimization. These practices contribute to improved asset quality through reduced non-performing loan ratios.

These findings indicate that increased multimarket contact competition decreases both bank profitability and bankruptcy risk. While these results contradict the findings of Coccorese and Pellecchia (2009) and Pilloff (1999), they align with more recent studies by Dao et al. (2021), Hoang et al. (2021), Kasman and Kasman (2016), and Le (2020).

The study employs MMC2 and MMC3 as robustness indicators for multimarket contact, demonstrating consistent directional relationships with dependent variables across all models. This consistency reinforces the reliability of our findings. While return on assets may show bias by excluding off-balance sheet activities, and larger banks in the Turkish banking sector may have reached profitability saturation points, our analysis of return on equity and return on interest yields statistically comparable results, further validating our findings.

The negative relationship between multimarket contact and bankruptcy risk suggests that geographical expansion increases bankruptcy risk and reduces bank stability. This dynamic creates a chain effect where reduced profitability from multimarket contact adversely affects bank stability and bankruptcy risk. The analysis indicates that broader market exposure and diversified activities intensify competition, subsequently reducing bank profitability.

Regarding non-interest income diversification, the study reveals significant negative relationships with return on assets and bankruptcy risk. This suggests banks might benefit from focusing on core deposit-taking and lending activities rather than diversifying non-interest income streams. However, increased non-interest income diversification positively affects interest profitability, particularly benefiting geographically dispersed banks with diverse business activities.

Bank size demonstrates a negative relationship with returns on assets and interest returns, suggesting larger banks may inadvertently encourage market entry, challenging profit sustainability. This aligns with Eichengreen and Gibson's (2001) observation that size benefits profitability only up to a certain threshold. Conversely, larger banks show improved return on equity, potentially due to better equity capital adequacy and fund utilization.

Personnel numbers positively correlate with interest returns but negatively affect bankruptcy risk and asset quality. While experienced, technologically proficient staff may enhance interest margins through improved productivity, aggressive loan targeting might increase non-performing loans and bankruptcy risk if credit risks are inadequately hedged.

Capital adequacy ratio shows negative relationships with interest returns, bankruptcy risk, and asset quality, suggesting that excessive capital might lead to missed growth opportunities. This finding aligns with previous research (Agusman et al., 2008; Blum, 1999; Brewer & Lee, 1986; Jacques & Nigro, 1997; Jahankhani & Lynge, 1980; Karels et al., 1989). While high capital adequacy typically indicates financial stability, our findings suggest suboptimal capital utilization.

High capitalization may negatively impact profitability through increased fixed and operating costs, potentially hindering development and credit expansion. This suggests that bank regulators should balance capital adequacy requirements with strategic monitoring and regular assessments, considering broader Basel II and III requirements to maintain both financial stability and operational performance.

5. Conclusions

This study provides novel insights into how competition dynamics, specifically multimarket contact, affect bank risk and performance in the Turkish banking sector. Examining 17 deposit banks operating continuously between 2012 and 2021, the research leverages Turkey's unique banking environment, characterized by recent geographical diversification and technological advancement.

While competition traditionally strengthens banks' resistance to financial crises and corruption through improved corporate governance and audit structures, our findings suggest a negative impact on financial performance. The expansion of branch networks in the Turkish banking sector may lead to customer attrition, adversely affecting profitability and bankruptcy risk through reduced lending. However, multimarket competition has positively influenced asset quality, potentially attributable to digitalization and technological development. Enhanced digital infrastructure has facilitated more efficient customer information management and inter-bank information flow. The declining NPL ratio indicates improved risk management effectiveness and asset quality.

Technology increasingly shapes the financial ecosystem and banking future. The COVID-19 pandemic has accelerated digital technology adoption across financial services, responding to growing customer demand for mobile and digital banking solutions. Banks prioritize digital transformation to remain competitive,

attract customers, and reduce costs. While branches traditionally served as primary distribution channels, alternative channels—from ATMs to mobile banking—offer advantages in cost reduction, efficiency, and service quality. This digital paradigm shift has automated routine tasks, improved service speed and accuracy while generating cost savings.

Increasing digitalization expands codified information bases, enabling sophisticated data analytics and AI-driven decision-making. The banking sector's digitalization has yielded dual benefits: enhanced service quality and accessibility alongside reduced branch operations. The COVID-19 pandemic has further catalyzed innovations like remote account opening, demonstrating how digital transformation enables new service channels while optimizing operational costs.

Our analysis reveals that digitalization has reduced branch dependency, while multimarket contact has negatively impacted profitability, performance, and stability. Turkish deposit banks should therefore consider significant investments in e-banking infrastructure, optimizing resource allocation through customer technology adoption and traditional banking rationalization. Additionally, banks should encourage broader adoption of technological products such as mobile and internet banking.

These findings have important implications for:

- Financial regulators promoting economic development
- Researchers developing new models
- Bank management fostering healthy banking environments and improved performance

Policy recommendations include:

- Strategic branch expansion based on profitability and risk assessments
- Development of B2B business models to increase business volumes
- Adaptation of business models to enhance customer interactions and office operations
- Investment in cybersecurity and emerging technologies (e.g., ChatGPT, metaverse)
- Emphasis on e-banking infrastructure development
- Promotion of digital banking products

Future research could examine multimarket contact effects across different sectors or compare impacts between developed and developing countries, providing insights for regulatory frameworks.

References

Agusman, A., Monroe, G.S., Gasbarro, D., & Zumwalt, J.K. (2008). Accounting and capital market measures of risk: Evidence from Asian banks during 1998–2003. *Journal of Banking and Finance,* 32 (4), 480–488.

Alexander, D.L. (1985). An empirical test of the mutual forbearance hypothesis: The case of bank holding companies. *Southern Economic Journal*, *52*(1), 122-140.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an

application to employment equations. *The Review of Economic Studies*, *58*(2), 277–297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variables estimation of error components models. *Journal of Econometrics*, *68*(1), 29-51.

Asahi, R. (2023). The Impact of cooperation on the multimarket contact effect in the U.S. airline industry. In F. Mizutani, T. Urakami, & E. Nakamura (Eds.), *Current issues in public utilities and public policy (*pp. 231–242*). Kobe University Monograph Series in Social Science Research.* Singapore: Springer.

Balaguer, J., & Ripollés, J. (2021). Does multimarket contact affect prices in the retail fuel industry? First empirical evidence. *Energy Economics*, *93*, 105054.

Barla, P. (2000). Firm size inequality and market power. *International Journal of Industrial Organization, 18*(5), 693-722.

Batini**Ć**, I. (2015). The role and importance of internet marketing in modern hotel industry. *Journal of Process Management and New Technologies*, *3*(3), 34-38.

Blum, J. (1999). Do capital adequacy requirements reduce risks in banking? *Journal of Banking & Finance, 23*(5), 755-771.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115-143.

Blundell, R., Bond, S., & Windmeijer, F. (2001). Estimation in dynamic panel data models: Improving on the performance of the standard GMM estimators. In B.H. Baltagi, T.B. Fomby, & R. Carter Hill (Eds.), *Nonstationary panels, panel cointegration, and dynamic panels* (Advances in Econometrics, Vol. 15, pp. 53-91). Leeds: Emerald Group.

Bond, S. R., Hoeffler, A., & Temple, J. R. W. (2001). *GMM estimation of empirical growth models* (Discussion Papers, No. 3048). London: Center for Economic Policy Research.

Brewer III, E., & Lee, C. F. (1986). How the market judges bank risk. *Federal Reserve Bank of Chicago Economic Perspectives*, *10*(6), 25-31.

Busse, M.R. (2000). Multimarket contact and price coordination in the cellular telephone industry. *Journal of Economic Management Strategy*, *9*(3), 287-320.

Chicu, M., & Ziebarth, N. L. (2013). Multi-market contact and competition: Evidence from the depression-era portland cement industry. *International Journal of Industrial Organization*, *31*(5), 603-611.

Coccorese, P., & Pellecchia, A. (2009). Multimarket contact and profitability in banking: Evidence from Italy. *Journal of Financial Services Research*, *35*, 245-271.

Coccorese, P., & Pellecchia, A. (2013). Multimarket contact, competition and pricing in banking. *Journal of International Money and Finance*, *37*, 187-214.

Compte, O., Jenny, F., & Rey, P. (2002). Capacity constraints, mergers and collusion. *European Economic Review*, *46*(1), 1-29.

Cruz-García, P., de Guevara, J. F., & Maudos, J. (2021). Bank competition and multimarket contact intensity. *Journal of International Money and Finance*, *113*, 102338.

Dao, O. L. K., Ho, T. T. N., Le, H. D., & Duong, N. Q. (2021). Multimarket contact and risk-adjusted profitability in the banking sector: Empirical evidence from Vietnam. *The Journal of Asian Finance, Economics and Business*, *8*(3), 1171-1180.

De Bonis, R., & Ferrando, A. (2000). The Italian banking structure in the 1990s: Testing the multimarket contact hypothesis. *Economic Notes*, *29*(2), 215-241.

Degl'Innocenti, M., Girardone, C., & Torluccio, G. (2014). Diversification, multimarket contacts and profits in the leasing industry. *Journal of International Financial Markets, Institutions and Money*, *31*, 231-252.

Deng, X., Qiu, W., Zhang, L., & He, J. (2023). Within-group multimarket contact, service diversity and consumer rating: Evidence from the hotel industry. *Journal of Hospitality Marketing & Management*, *32*(1), 122-149.

Dökmen, G. (2012). The effects of corruption on tax revenue: A dynamic panel data analysis. *Dogus University Journal*, *13*(1), 41-51.

Edwards, C. D. (1955). Conglomerate bigness as a source of power, In *Business Concentration and Price Policy* (pp. 331-359). Princeton University Press.

Eichengreen, B., & Gibson, H. D. (2001). *Greek banking at the dawn of the new millennium* (Discussion Papers, No. 2791). London: Center for Economic Policy Research.

Evans, W. N., & Kessides, I. N. (1994). Living by the "golden rule": Multimarket contact in The US airline industry. *Quarterly Journal of Economics*, *109*(2), 341-366.

Feinberg, R. M. (1984). Mutual forbearance as an extension of oligopoly theory. *Journal of Economics and Business*, *36*(2), 243-249.

Fuentelsaz, L., & Gomez, J. (2006). Multipoint competition, strategic similarity and entry into geographic markets. *Strategic Management Journal, 27*(5), 477-499.

Giachetti, C., Lampel, J., & Onoz, E. (2024). Do I see what you see? Institutional quality, action observability, and multimarket contact in the global mobile phone industry. *Global Strategy Journal*, *14*(1), 152-195.

Gimeno, J. (2002). The performance effects of unintended and purposive multimarket contact. *Managerial Decision Economics, 23*(4-5), 209-224.

Gimeno, J., & Woo, C. Y. (1996). Hypercompetition in a multimarket environment: The role of strategic similarity and multimarket contact in competitive de-escalation. *Organization science*, *7*(3), 322-341.

Hannan, T. H., & Prager, R. A. (2009). The profitability of small single-market banks in an era of multi-market banking. *Journal of Banking & Finance, 33*(2), 263-271.

Haveman, H. A., & Nonnemaker, L. (2000). Competition in multiple geographic markets: The impact on growth and market entry. *Administrative Science Quarterly*, *45*(2), 232-267.

Heggestad, A. A., & Rhoades, S. A. (1978). Multi-market interdependence and local market competition in banking. *The Review of Economics and Statistics*, *60*(4), 523-532.

Hoang, K., Nguyen, L., & Tran, S. (2021). Multimarket contact, income diversification and bank performance. *International Journal of the Economics of Business*, *28*(3), 439-455.

Hughes, K., & Oughton, C. (1993). Diversification, Multi-market contact and profitability. *Economica*, *60*(238), 203-224.

Incirkus, A., & Kalpaklioglu, N. U. (2023). Bank service channel preference factors of retail customers. *Journal of Financial Research and Studies, 15*(28), 15-41.

Jacques, K., & Nigro, P. (1997). Risk-based capital, portfolio risk and bank capital: A simultaneous equations approach. *Journal of Economics and Business*, *49*(6), 533–547.

Jahankhani, A., & Lynge, M.J. (1979). *Commercial bank financial policies and their impacton market-determined measures of risk* (Faculty working papers, no. 556). Urbana, IL: University of Illinois at Urbana-Champaign.

Karels, G.V., Prakash, A.J., & Roussakis, E. (1989). The relationship between bank capital adequacy and market measures of risk. *Journal of Business Finance and Accounting, 16*(5), 663–680.

Kasman, S., & Kasman, A. (2016). Multimarket contact, market power and financial stability in the Turkish banking industry. *Empirical Economics*, *50*, 361-382.

Le, N. Q. A., & Pham, T. T. X. (2022). Multimarket contact: Board characteristics and bank stability in Vietnam. In N. Ngoc Thach, D. T. Ha, N. D. Trung, & V. Kreinovich (Eds.), *Prediction and Causality in Econometrics and Related Topics.* ECONVN 2021. Studies in Computational Intelligence (Vol. 983, pp. 260-275). Cham: Springer.

Le, T. D. (2020). Multimarket contacts and bank profitability: Do diversification and bank ownership matter? *Cogent Economics & Finance*, *8*(1), 1849981.

Le, T. D., Tran, S. H., & Nguyen, L. T. (2019). The impact of multimarket contacts on bank stability in Vietnam. *Pacific Accounting Review*, *31*(3), 336-357.

Li, S. X., & Greenwood, R. (2004). The effect of within-industry diversification on firm performance: Synergy creation, multi-market contact and market structuration. *Strategic Management Journal, 25*(12), 1131-1153.

Ljubownikow, G., Benischke, M., & Nadolska, A. (2023). Multimarket contact and target size: The moderating effect of market concentration and location. *Strategic Organization*, *21*(2), 311-338.

Martinez, J. E. (1990). The linked oligopoly concept: Recent evidence from banking. *Journal of Economic Issues, 24*(2), 589-595.

Mester, L. J. (1992). Perpetual signaling with imperfectly correlated costs. *The Rand Journal of Economics*, *23*(4), 548-563.

Molnar, J., Violi, R., & Zhou, X. (2013). Multimarket contact in Italian retail banking: Competition and welfare. *International Journal of Industrial Organization*, *31*(5), 368-381.

Muchtar, D., Mat Nor, F., Albra, W., Arifai, M., & Ahmar, A. S. (2018). Dynamic performance of Indonesian public companies: An analysis of financial decision behavior. *Cogent Economics & Finance, 6*(1), 1488343.

Parker, P.M., & Roller, L.H. (1997). Collusive conduct in duopolies: Multimarket contact and cross-ownership in the mobile telephone industry. *The Rand Journal of Economics*, *28*(2), 304-322.

Pham, T., Talavera, O., & Yang, J. (2016). *Multimarket competition and profitability: Evidence from Ukrainian banking* (MPRA Paper No.72376). University Library of Munich, Germany: The Munich Personal RePEc Archive (MPRA).

Pilloff, S. J. (1999). Multimarket contact in banking. *Review of Industrial Organization, 14*, 163- 182.

Scott, J. T. (1982). Multimarket contact and economic performance. *The Review of Economics and Statistics*, *64*(3), 368-375.

Singal, V. (1996). Airline mergers and multimarket contact. *Managerial and Decision Economics*, *17*(6), 559-574.

Solomon, E.H. (1970). Bank merger policy and problems: A linkage theory of oligopoly. *Journal of Money, Credit and Banking, 2*(3), 323-336.

Su, H., & Dresner, M. E. (2021). Multimarket contact and capacity: Evidence from the US airline industry. *Transportation Journal, 60*(3), 258-306.

The Banks Association of Türkiye (BAT). (2021). *Our banks 2021*. Retrieved from https://www.tbb.org.tr/tr/bankacilik/arastirma-ve-yayinlar/kitaplar/kitaplar/55?year=&konu=Bankalar%C4%B1m%C4%B1z

The Banks Association of Türkiye (BAT). (2023) *Statistical reports*. Retrieved from https://www.tbb.org.tr/tr/bankacilik/banka-ve-sektor-bilgileri/istatistiki-raporlar/59

Waldfogel, J., & Wulf, J. (2006). Measuring the effect of multimarket contact on competition: Evidence from mergers following radio broadcast ownership deregulation. *The BE Journal of Economic Analysis & Policy*, *5*(1), 06451420.

Wintoki, M. B., Linck, J. S. & Netter, J. M. (2012). Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics, 105*(3), 581–606.

Yimga, J. (2023). Multimarket contact and market power implications in the US airline industry. *Networks and Spatial Economics*, *23*, 985-1024.

Appendices

The calculation methodology used to measure MMC is discussed below and involves transforming unique firm-market-level data into a network of nodes and links. The nodes are banks, and the links are the

number of markets in which both participate. Using the properties of the network, the MMC and its various derivatives can be efficiently calculated.

To calculate interbank contacts and construct the MMC index, the province is considered the relevant market. Multimarket contact in the Turkish banking market is calculated following Coccorese and Pellecchia (2009). The starting point for each year is the N × K matrix describing the geographical distribution of bank branches (where N is the number of banks and K is the number of markets. The number of markets refers to provinces), denoted as D. Its structure is as follows:

$$D=\begin{bmatrix} d_{11} & \cdots & d_{1K} \\ \vdots & \ddots & \vdots \\ d_{N1} & \cdots & d_{NK} \end{bmatrix}$$

Hence the generic term d_{ij} (with j = 1,...,K) is the number of branches of bank i in market j. Then, another N × K matrix is constructed, denoted as C:

$$C=\begin{bmatrix} c_{11} & \cdots & c_{1K} \\ \vdots & \ddots & \vdots \\ c_{N1} & \cdots & c_{NK} \end{bmatrix}$$

Here, for the generic term, c_{ij} = 1 if d_{ij} > 0 and c_{ij}= 0 if d_{ij} = 0. Therefore, A unit value of c_{ij} means that bank i operates in market j.

Now with an N × N symmetric matrix M can be constructed as follows:

$$M = C.C^T=\begin{bmatrix} m_{11} & \cdots & m_{1N} \\ \vdots & \ddots & \vdots \\ m_{N1} & \cdots & m_{NN} \end{bmatrix}$$

Superscript T indicates the cycle.

$$m_{ij} = \sum_{l=1}^{K} c_{il}c_{jl} \quad (1)$$

The above formula represents the number of markets where bank I and bank j meet, while the diagonal term m_{ii} represents the number of markets in which bank I operates. Hence, it follows that the sum of the off-diagonal terms of row I is the total number of contacts of bank i.

Dividing the above sum by the number of banks encountered by bank I (given by the number of positive elements in row I minus 1) yields the average number of contacts for the bank. For illustrative purposes, the first indicator of multimarket contact for bank I is calculated as follows:

$$MMC1_i = \frac{\sum_{j\neq i} m_{ij}\delta_{ij}}{\sum_{j\neq i} \delta_{ij}} \quad (2)$$

This one here.

$$\delta_{ij} = \begin{cases} 1 & if \quad m_{ij} > 0 \\ 0 & if \quad m_{ij} = 0 \end{cases}$$

The lower and upper values of the MMC1 index depend on the distribution of banks across provinces. Theoretically, the minimum is zero if a bank has a monopoly in the markets in which it operates and the maximum is equal to the number of provinces, provided that all banks meet in all markets (provinces). Under normal conditions, the MMC1 index for single-market banks is equal to 1 (unless they are monopolistic).

In line with the common method of calculating multimarket contact linkages, the MMC1 index is calculated considering only the number of contacts between firms. However, for a bank, each competitor may not be of the same importance as they have different market shares and are of different sizes. Therefore, as a robustness check, the other two indicators of multimarket contact is also calculated.

The MMC2 index is weighted by an index that measures the number of contacts, m_{ij}, between any pair of banks and their similarity (in terms of market share) in all provinces where they meet. In fact, industrial organization theory[1]argues that symmetry between firms can facilitate collusion (Barla, 2000; Compte et al., 2002). The N × K matrix S, the share of bank i in market j, is calculated as follows:

$$S_{ij} = \frac{d_{ij}}{\sum_{i=1}^{N} d_{ij}} \tag{3}$$

The similarity index between banks i and j is calculated as the sum of the absolute differences of their market shares for the provinces where they meet:

$$SI_{ij} = \sum_{l=1}^{K} \left| s_{il} - s_{jl} \right| . c_{il} . c_{jl}$$ [2] (4)

The SI index theoretically ranges between zero (which is the case when firms have the same market share in each market) and the number of markets where banks meet[3] and is smaller the more similar two banks are in terms of their market shares. To obtain a measure that increases with similarity and ranges between 0 and 1, we consider the following transformation of the SI:

$$\acute{w}_{ij} = \frac{m_{ij} - SI_{ij}}{m_{ij}} \tag{5}$$

The relevant matrix for the calculation of multimarket contact is as follows:

---

[1] Industrial organization theory is particularly interested in the interdependence of firms in the market and the link between market conditions, firm behavior and economic performance.

[2] In the formula, c_{il} and c_{jl} function as indicators that allow to identify the markets where the two banks meet.

[3] Assume that banks i and j meet in 3 markets and in each of them bank i's market share is close to 1 and bank j's market share is close to 0. As a result, the SI similarity index will be close to 3.

$$\acute{M} = \begin{bmatrix} \acute{m}_{11} & \cdots & \acute{m}_{1N} \\ \vdots & \ddots & \vdots \\ \acute{m}_{N1} & \cdots & \acute{m}_{NN} \end{bmatrix} = \begin{bmatrix} m_{11}.\acute{w}_{11} & \cdots & m_{1N}.\acute{w}_{1N} \\ \vdots & \ddots & \vdots \\ m_{N1}.\acute{w}_{N1} & \cdots & m_{NN}.\acute{w}_{NN} \end{bmatrix},$$

The new measure of multimarket contact, the MMC2 index, is calculated as follows:

$$MMC2_i = \frac{\sum_{j \neq i} \acute{m}_{ij} \delta_{ij}}{\sum_{j \neq i} \delta_{ij}} \tag{6}$$

This one here.

$$\delta_{ij} = \begin{cases} 1 & if \quad \acute{m}_{ij} > 0 \\ 0 & if \quad \acute{m}_{ij} = 0 \end{cases}$$

The second (weighted) measure of multimarket contact, the MMC3 index, takes into account only the size of competitors. Given a matrix of market shares S, the weight is calculated as follows:

$$\grave{w}_{ij} = \frac{\sum_{l=1}^{K} s_{il}.c_{il}.c_{jl}}{m_{ij}} \text{ [4]} \tag{7}$$

The share of the above formula again varies between 0 and the number of markets where banks i and j meet and increases with the size of competitors. Therefore, it is normalized by the maximum m_{i_j} , so that it varies between 0 and 1.

The matrix to be considered for the calculation of the third multimarket contact index is as follows:

$$\dot{M} = \begin{bmatrix} \dot{m}_{11} & \cdots & \dot{m}_{1N} \\ \vdots & \ddots & \vdots \\ \dot{m}_{N1} & \cdots & \dot{m}_{NN} \end{bmatrix} = \begin{bmatrix} m_{11}.\dot{w}_{11} & \cdots & m_{1N}.\dot{w}_{1N} \\ \vdots & \ddots & \vdots \\ m_{N1}.\dot{w}_{N1} & \cdots & m_{NN}.\dot{w}_{NN} \end{bmatrix},$$

and the MMC3 index is calculated as follows:

$$MMC3_i = \frac{\sum_{j \neq i} \dot{m}_{ij} \delta_{ij}}{\sum_{j \neq i} \delta_{ij}} \tag{8}$$

This one here.

$$\delta_{ij} = \begin{cases} 1 & if \quad \dot{m}_{ij} > 0 \\ 0 & if \quad \dot{m}_{ij} = 0 \end{cases}$$

[4] By construction, $MMC1_i \geq MMC2_i$. These can be equal if all competitors that bank i faces have the same market share.