Mergers and Acquisitions Between Systemic Banks in Greece and Their Impact on Concentration and Control

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1 Introduction

The financial crisis, which originated in the USA (2007) and spread to other countries, also affected Greece. In 2010, Greece sought bailout funding and signed an M0U with the so-called Troika, that is, the EU the ECB and the IMF. However, although the Greek crisis started as a sovereign debt crisis, it soon turned into a banking crisis, as banks were the main holders of Greek bonds.

On the other hand, liberalization allowed banks to undertake excessive risks, which played a significant role in the global financial crisis of 2007 and, to some extent, in the Greek financial crisis of 2010 [1, 2]. As a result, regulators started to reconsider their decisions emphasizing on the stability of the banking system. This

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D. P. Sakas et al. (eds.), *Computational and Strategic Business Modelling*,
Springer Proceedings in Business and Economics,
https://doi.org/10.1007/978-3-031-41371-1_37

new environment led researchers to turn their interests to topics such as (i) Concentration-Competition, (ii) Concentration-Stability and (iii) Competition-Stability.

2 Literature Review

The existing literature does not lead to clear results in terms of the relationships among market concentration, market power and the financial stability of the banking system. In fact, even empirical studies fail to make safe conclusions as to what is ultimately valid. This ambiguity is evident in the available literature as we demonstrate in the following section.

2.1 Concentration-Competition

The existing literature mainly researches the relationship between competition and concentration. There are two prevalent views on the relationship between these two components.

The first view is based on the Structure-Conduct-Performance relationship [3, 4], according to which increasing concentration will have a positive impact on the increasing market power of large banks (and a negative impact on competition in the banking industry); taking advantage of the increase in their market share and/or the eradication of their competitors, banks can more easily impose higher prices and record (abnormally) higher profits. On the other hand, the second relation is based on the effective structure Hypothesis [5, 6], which suggests that most efficient banks can increase their profitability and size, simultaneously increasing their concentration. Therefore, an increase in this concentration does not imply market power, which means that there is, not necessarily, a causal relationship between concentration and competition in the banking sector.

However, other studies have concluded that there is no significant relationship between concentration and competition [7–12].

2.2 Concentration-Stability

The first view emerging in the existing literature is that increasing concentration under certain conditions has a positive impact on the sector's stability. Such results can be found in cases of M&As occurring in the context of restructuring required of the sector (e.g., the acquisition of the 'Agricultural Bank of Greece' by 'Piraeus Bank' and the acquisition of the 'Emporiki Bank of Greece' by 'Alpha Bank'). The increasing degree of concentration led to an improved stability within the sector [2, 13].

This view holds that stability in the industry improves when the degree of concentration within the industry increases, whether this is due to new M&As or comes because of an increase in the market share of the bigger banks.

Other studies conclude that it is easier to monitor a system with a few big banks rather than one where many small banks operate, and therefore, more detailed and systematic monitoring is required.

The proponents of this view support that in the most concentrated markets, individual banks can charge higher interest rates for loans, which increases the likelihood of moral hazard as borrowers make risky decisions, and, as a result, banking portfolios become riskier, too [14].

In a more recent study, Shim (2019) [15] shows that high concentration leads to a more stable financial environment compared with less concentrated markets, whereas Azmi et al. (2019) [16] also argue that concentration is beneficial for banking stability, focusing on dual banking economies.

2.3 Competition-Stability

Perhaps the more intensely studied relationship is the relationship between Competition and Stability. It all began in the 1990s, when there was a tendency to reduce restrictions on the banking sector to obtain the benefits an increased level of competition might offer. These tactics following deregulation are also the main reason leading to the 2007 crisis [17, 18]. Thus, the study of the Competition-Stability relationship was considered by experts as a major issue.

As in the relationships discussed above, opinions in the literature differ. The two main relationships under discussion are Competition-Stability and Competition-Fragility.

Big banks were considered 'too big to fail' having a 'safety net' provided by the state can engage in activities with greater risk. In more competitive markets, interest rates are lower and the 'too big to fail' and 'safety net' parameters are of lesser importance. Thus, the moral hazard problem is mitigated, and we are led to stability [14].

In addition to the aforementioned studies that focused on the impact of concepts like concentration and competition on the stability of the financial system, researchers also studied the aftermath of the unconventional monetary policies that central banks applied as remediation measures regarding the recent economic crises [19–22]. The effect of the unconventional monetary policies by Central Banks in general is positive for the real economy [23, 24].

According to Acharya et al. (2019) [25], the ECB's Outright Monetary Transactions program indirectly recapitalized European banks through its positive impact on periphery sovereign bonds. Kenourgios, D., Christopoulos, A., and Dimitriou, D. (2013) [26] examined the returns on stocks, bonds, commodities, shipping, foreign exchange and real estate and found evidence of a correlated-information channel as a contagion mechanism between markets within different countries.

Yu (2017) [27] and Keddada and Schalckb (2020) [28] found that the correlation between sovereign and bank CDS spreads before the crisis remained small but had increased significantly until the end of the sample. Similarly, attempted to determine the extent to which European banks were vulnerable to sovereign credit risk from 2010 to 2013.

Thus, we conclude that for each case concerning a country, industry, system, or whether carried out for a different time-period, new research should be conducted to draw conclusions that are most likely to be valid for each case.

3 Data and Methodology

3.1 Data

The data in this research came from published consolidated financial statements, and specifically the balance sheets and profit and loss statements of the five largest banking groups in Greece for the period 2008–2018. Although only these five banks were included, our sample represents 97% of the industry's total assets. Considering country-level data, these were collected from the databases of the World Bank and the European Central Bank.

The Herfindahl-Hirschman Index as a measure of concentration

The Herfindahl-Hirschman index (HHI) is one of the most widely used indicators in the theoretical literature. It can often be used as a benchmark to assess other concentration indicators. This indicator is the sum of the squares of bank shares as shown in the following formula:

$$\mathrm{HHI} = \sum_{i=1}^{n} S_i^2$$

where S_i is the market share of the bank, and i and n are the number of enterprises in the sector. This indicator can take values from $1/n$ ($\mathrm{HHI} = n(1/n)^2 = 1/n$) where all banks are of equal size, and we have an indication of full competition up to10000 ($\mathrm{HHI} = 100^2$), when a bank has 100% of the shares and so we have an indication of a monopoly.

According to ECB 's instructions, market shares are calculated using the total assets.

The Lerner index as a measure of competition

This study uses the Lerner index, which has been commonly used in banking research, as a measure of competition (or market power). The Lerner index captures the capacity of price power by computing the disparity between price and marginal cost as a percentage of the price and ranges between 0 and 1. In case of perfect competition and monopoly, the index equals 0 and 1, respectively. The time-variant Lerner index at the bank-level is calculated as follows:

$$L = \frac{p_{it} - \mathrm{mc}_{it}}{p_{it}}$$

where the p_{it} is the price of total assets proxied by the ratio of total revenues (interest and non-interest income) to total assets for bank i at time t. mc_{it} is the marginal cost for bank s at time t.

The marginal costs are obtained by differentiating a translog cost function with respect to one output. We use a stochastic frontier model to estimate a translog cost function with one output (total assets) and three inputs (labour, funding and physical capital). The cost function for a given bank s at time t can be specified as follows:

$$\begin{aligned}\ln \mathrm{TC}_{it} &= \alpha_0 + \alpha_{\mathrm{Q}} \ln Q_{it} + 0.5\alpha_{QQ}(\ln Q_{it})^2 + \sum\nolimits_{k=1}^{3} \alpha_k \ln W_{k,it} \\ &+ \sum\nolimits_{k=1}^{3} \alpha_{Qk} \ln Q_{it} \ln W_{k,it} + 0.5 \sum\nolimits_{j=1}^{3} \sum\nolimits_{k=1}^{3} \alpha_{jk} \ln W_{j,it} \ln W_{k,it} + \varepsilon_{it} \qquad (1) \\ \varepsilon_{it} &= v_{it} + u_{it}\end{aligned}$$

where C is the total costs, Q is the output (total assets) and W is a vector of input prices (price of labour, price of funds and price of physical capital), v represents standard statistical noise and u captures inefficiency. Following Turk-Ariss (2010) [29], the total costs and prices of funds and labour are scaled by the price of physical capital to correct for heteroscedasticity and scale biases.

$$\begin{aligned}\ln(\mathrm{TC}_{it}/W_{3,it}) &= \alpha_0 + \alpha_{\mathrm{Q}} \ln Q_{it} + 0.5\alpha_{QQ}(\ln Q_{it})^2 + \sum\nolimits_{k=1}^{2} \alpha_k \ln(W_{k,it}/W_{3,it}) \\ &+ \sum\nolimits_{k=1}^{2} \alpha_{Qk} \ln Q_{it} \ln(W_{k,it}/W_{3,it}) \\ &+ 0.5 \sum\nolimits_{j=1}^{2} \sum\nolimits_{k=1}^{2} \alpha_{jk} \ln\left(W_{j,it}/W_{3,it}\right) \ln(W_{k,it}/W_{3,it}) + \varepsilon_{it}\end{aligned}$$

To obtain the marginal cost, Eq. (1) is differentiated with respect to Q:

$$\frac{\partial \ln \mathrm{TC}_{it}}{\partial \ln Q_{it}} = \left(\frac{\mathrm{TC}_{it}}{Q_{it}}\right)\left(\alpha_Q + \alpha_{QQ} \ln Q_{it} + \sum\nolimits_{k=1}^{2} \alpha_{Qk} \ln(W_{k,it}/W_{3,it})\right) = \mathrm{MC}_{it}$$

The Bank Z Score as a measure of bank stability

The Z-score is a widely used measure of bank stability in the related literature and can be interpreted as the number of standard deviations by which returns would have to fall from the mean to deplete the equity capital. Hence, it determines how many standard deviations in return on assets a bank is from insolvency. The score is computed as follows:

$$\text{Bank } Z_{it} = \frac{\text{ROA}_{it} + \left(\frac{E}{\text{TA}}\right)_{it}}{\sigma(\text{ROA})_{it}}$$

where ROA is the return on assets, *E*/TA represents the equity to total assets ratio and σ(ROA) denotes the standard deviation of return on assets. A higher Z-score implies a lower probability of insolvency (failure), providing a more direct measure of soundness compared to other measures of risk.

3.2 Control Variables

In our econometric models apart from the basic variables, we use a list of bank-specific and macroeconomic control variables.

In this section, we present each one of them with its definition and divided according to the relationship studied.

Table 3 reports the descriptive statistics of the variables used in the regression. Taking a glance at the basic variables (Lerner, HHI, LnBank Z score), we can make a first assumption of the results we might find for the three relationships of this study. The mean value, as well as the median of the Lerner index, is relatively low and quite close to zero, while, on the other hand, the ones of the HHI index and LnBank Z score have higher values. So, this could be a first sign that there might be a negative relationship between Market Power and Concentration, as well as Stability, while there might be a positive between Concentration and Stability.

3.3 Methodology

Before the econometric study, using the HHI index and its yearly change ΔHHI, an analysis on the level of Concentration of the Greek Banking industry is carried out and subsequently we estimate, using the same indices, the change in the sector's Concentration the possible systemic banks merger scenarios might cause.

Then we proceed to the basic econometric study. Our first model has the form:

$$\begin{aligned}\text{COMP}_{it} = {} & a_0 + a_1\text{COMP}_{it-1} + a_2\text{CONC}_{it} + a_3\ \text{LLP}_{it} + a_4\ \text{Liquidity Risk}_{it} \\ & + a_5\ \text{Interest Rate risk}_{it} + a_6\ \text{Lending to Tot.Assets}_{it} \\ & + a_7\ \text{Deposits to Tot.Liabilities}_{it} + a_8\ \text{Other Earning Assets to Tot.Assets} \\ & + a_9\ \text{Fee Based Activities}_{it} + a_{10}\ \text{ATMs to Branches}_{it} + a_{11}\ \text{GDP}_{it} + \varepsilon_{it} \qquad (2)\end{aligned}$$

where COMP_{it} is the dependent variable for competitiveness approached through the Lerner index for bank *i* and year *t*; COMP_{it-1} is the first lag of the Lerner index and is used to examine not only the importance of whether we should consider the previous values of the dependent variable but also the factor a_1, which represents the rate at

Table 1 In the following table, we list the control variables that are used in the econometric model of concentration-competitiveness relationship

Variable	Definition
LLP	The ratio of loan loss provisions to total assets
Liquidity risk	As a proxy for liquidity risk, we employ the ratio 'liquid assets/short term funding'. Liquidity risk is expected to affect bank margins positively [27].
Interest rate risk	Computed as the difference between the interbank market (three months) rate and the interest rate for customer deposits [28].
Inefficiency	Computed as the ratio 'operating costs/gross income'. Higher operating costs imply increased operating inefficiency [29].
Capital to assets ratio	A proxy of banks' solvency, computed as the ratio 'capital and reserves/total assets'. Capital requirements represent a premium on bank margins [30].
Lending/total assets	Customer and interbank loans as a ratio of total assets.
Deposits/total liabilities	Total deposits as a proportion of total liabilities.
Other earning assets/total assets	Total earning assets other than loans as a ratio of total assets.
Fee-based activities	The Boyd and Gertler (1994) [30] estimator is a proxy for bank fee-based activities, which is computed as fee income/total revenue fee income.
ATMs/branches	A proxy for technical change in delivery channels. The ratio is computed using national data for bank ATMs and branches.
GDP	The relationship between bank margins and growth will depend on the correlation among prices, costs and the business cycle [31].

which competitiveness converges at a future level; and CONC_{it} is the concentration variable that is approached through the HHI index. The rest are as described in Table 1 and ε_{it} is the error term.

In the second analysis, we calculate two models, where in the first, we consider a linear relationship between competition and stability. In the third model, based on the research of Berger et al. (2009) [31], we add the square term of competition to test for non-linear relationships between Competition and Stability [32].

$$\mathrm{RISK}_{it} = b_0 + b_1\mathrm{RISK}_{it-1} + b_2\mathrm{COMP}_{it} + b_3\mathrm{CONC}_t + b_4\mathrm{SIZE}_{it} + b_5\mathrm{RGDP}_t + b_6\mathrm{LR}_{it} + b_7\mathrm{NIM}_{it} + b_8\mathrm{CRISIS}_t + b_9\mathrm{LLP}_{it} + \varepsilon_{it} \quad (3)$$

$$\mathrm{RISK}_{it} = c_0 + c_1\mathrm{RISK}_{it-1} + c_2\mathrm{COMP}_{it} + c_3{\mathrm{COMP}_{it}}^2 + c_4\mathrm{CONC}_t + c_5\mathrm{SIZE}_{it} + c_6\mathrm{RGDP}_t + c_7\mathrm{LR}_{it} + c_8\mathrm{NIM}_{it} + c_9\mathrm{CRISIS}_t + c_{10}\mathrm{LLP}_{it} + \varepsilon_{it} \quad (4)$$

where RISK_{it} is the dependent variable for stability for Bank I and year t and is proxied by the Bank Z score index's natural logarithm; RISK_{it-1} is the lag of the stability variable and, as previously, is used to examine not only the importance of whether we should consider the previous values of the dependent variable but also the factor a_1, which represents the rate at which stability converges at a future level;

Table 2 In the following table, we list the control variables used in econometric models for Concentration-Stability and Competition-Stability relationships

Variable	Definition
SIZE	The size of the bank is measured as the natural logarithm of the total assets.
LLP	The ratio of provisions for loan losses to total assets (LLP) is used to measure the quality of the exported result and how managers invest in high-risk assets.
NIM	The net interest margin (NIM) is used to monitor the profitability of a bank's investment and lending activities.
Capital requirements	Indicates the minimum capital requirement that is interpreted as an entry barrier indicator.
RGDP	The conditions of the economic cycle are controlled by the introduction of the annual real GDP growth rate.
CRISIS	An indicator variable that takes a value of one for crisis years, and zero in the others, and is included as a control variable.
LR (Loans Ratio-Asset Composition)	Also, for the control of heterogeneity relating to banking-level factors, the composition of assets is included in the regressions. The composition of the assets is measured as the ratio of loans to assets.

and $COMP_{it}$, as before, for competition with the Lerner index, but, in addition, here, based on Berger et al. (2009) [31] and Jimenez et al. (2013) [33], we also use a square term for the competition measure to capture a possible non-linear relationship between competition and risk with $COMP_{it}^2$ in Eq. (4). $CONC_t$ again is for concentration with the HHI index; the rest are as described in Table 2, and finally e_{it} is the error term.

The two models used in this survey are calculated based on the generalized method of moments (GMM) to solve any endogenous problems that may arise. In the first case, the model used is based on the one used in the research by Carbo and Rodriguez-Fernandez (2007) [7], where we examine the relationship between Concentration and Competitiveness, and the second on models of Kasman and Kasman (2015) [34] and Fu et al. (2014) [35] to study the relationship between Concentration and Competitiveness with Stability. In both models, we used panel data from the five banks and the Greek Banking system for the period 2008–2018, which was also the most critical for the industry in Greece. Variables for stationarity reasons are at first difference. To address correlation and possible endogenous problems, Arellano and Bond (1991) [36] propose the use of the lags of the explanatory variables as instruments (Table 3).

Table 3 Descriptive statistics of the variables used in the study

Variable	Full Sample				
	Mean	St. Dev.	Median	Min	Max
Lerner	0,210	0,433	0,280	−1762	1107
HHI	0,181	0,051	0,214	0,117	0,233
LnBankZ	1163	0,552	1193	−1523	1920
LLP	0,026	0,030	0,017	0,005	0,171
Liquidity risk	0,204	0,079	0,201	0,035	0,363
Interest rate risk	−0,017	0,009	−0,018	−0,038	0,006
Inefficiency	0,627	0,247	0,576	0,279	1803
Capital to assets ratio	0,084	0,050	0,087	−0,039	0,185
Lending/total assets	0,699	0,096	0,707	0,433	0,888
Deposits/total liabilities	0,633	0,113	0,628	0,424	0,909
SIZE	24,456	1199	24,925	21,932	25,517
NIM	0,027	0,006	0,027	0,011	0,041
Capital requirements	13,543	2880	13,508	9569	17,100
RGDP	−0,024	0,036	−0,004	−0,091	0,019
CRISIS	0,455	0,503	0,000	0,000	1000
LR	0,664	0,089	0,663	0,408	0,831
Other earning assets/total assets	0,205	0,069	0,213	0,031	0,320
Fee-based activities	6212E +09	3893E +09	6860E +09	1578E +08	1596E +10
ATMs/branches	1967	0,642	1892	0,732	3589
GDP (bil.€)	255,192	52,921	239,862	195,222	354,461

4 Empirical Results

4.1 Merger Scenarios

In this section, we present the level of Bank Concentration in Greece as well as its yearly change measured by the HHI and ΔHHI indices, respectively, for the period 2004–2018.

Table 4 shows that up to 2012 the HHI index in column 4 is below the limit of HHI $>$ 2000 set by the ECB. However, in 2012, the change in the index as seen in column 5 comes quite close to the limit of ΔHHI $>$ 150, due to the forced acquisitions that followed the debt crisis in that period. In 2013, however, we see that the index combined with its change (ΔHHI) far exceeds the limits. The fact that regulators allowed these acquisitions is because they were used as a measure to restore stability for the Greek banks, instead of injecting further capital coming from Greek taxpayers [2, 13]. So, we see that this index acts more as a guideline and is combined with other factors characterizing its situation, by regulators, to allow or not a M&A deal.

Over the next few years, mergers and acquisitions did not cause any significant change in the index, but the previous events had already raised the index to very high

Table 4 Greek banking sector HHI index for the period 2004–2018

(1)	(2)	(3)	(4)	(5)	(6)
YEAR	HHI	ΔHHI	HHI*10000	ΔHHI*10000	CONCENTRATION SUSPICION
2004	0,107		1070		SLIGHTLY PROBABLE
2005	0,1096	0,0026	1096	26	SLIGHTLY PROBABLE
2006	0,1101	0,0005	1101	5	SLIGHTLY PROBABLE
2007	0,1096	−0,0005	1096	−5	SLIGHTLY PROBABLE
2008	0,1172	0,0076	1172	76	SLIGHTLY PROBABLE
2009	0,1183	0,0011	1183	11	SLIGHTLY PROBABLE
2010	0,1214	0,0031	1214	31	SLIGHTLY PROBABLE
2011	0,1278	0,0064	1278	64	SLIGHTLY PROBABLE
2012	0,1487	0,0209	1487	209	SLIGHTLY PROBABLE
2013	0,2136	0,0649	2136	649	YES
2014	0,2195	0,0059	2195	59	SLIGHTLY PROBABLE BUT ALREADY CONCENTRATED
2015	0,2254	0,0059	2254	59	SLIGHTLY PROBABLE BUT ALREADY CONCENTRATED
2016	0,2332	0,0078	2332	78	SLIGHTLY PROBABLE BUT ALREADY CONCENTRATED
2017	0,2307	−0,0025	2307	−25	SLIGHTLY PROBABLE BUT ALREADY CONCENTRATED
2018	0,2304	−0,0003	2304	−3	SLIGHTLY PROBABLE BUT ALREADY CONCENTRATED

Source: European Central Bank
Note: To present the results at the scale presented by the ECB guidelines, we multiply the index by 10,000. Also, based on these guidelines, we characterize the level of concentration for each year according to the value of the index and its yearly change

Table 5 Merger scenarios of the four systemic Greek Banks for the year 2019

Merger	Results		
	HHI AFTER MERGER	ΔHHI	SUSPICIOUS
Ethniki Bank – Alpha Bank	3502	1198	YES
Ethniki Bank – Piraeus Bank	3519	1215	YES
Ethniki Bank – Eurobank	3443	1139	YES
Alpha Bank – Piraeus Bank	3443	1139	YES
Alpha Bank – Eurobank	3371	1067	YES
Piraeus Bank – Eurobank	3386	1082	YES

levels, causing the sector to be considered very concentrated, even though we cannot be certain at this time if this result is mostly negative. Next, based on the HHI index, we test the possible merger scenarios for the year 2019 for the four systemic banks in Greece representing more than 90% (EBF, 2020) of the sector's market share.

As we can see from Table 5, the results for each merger go far beyond the limits set by the ECB, i.e., $H > 2000$ in conjunction with $\Delta HHI > 150$. Thus, based on this

indicator and the limits set, we can conclude that for reasons of creating a monopoly, or price cartel conditions, none of the above scenarios can be realized. However, as mentioned, this index and its yearly change act as guidelines. So, if the sector needs to be further consolidated (as recently stated by the ECB), due to the benefits of integration within EU banking, those other factors might play a much more important role than the index and foster M&As of systemic banks. If this is the case and the merger scenarios illustrated in Table 4 could be realized, based only on the above results, we can propose that the most preferable ones are those of Alpha Bank – Eurobank and Piraeus Bank – Eurobank, as they raise the overall sector's Concentration index less, compared to the other scenarios. This is a sign that they are less probable to create a monopoly in the Greek sector, with whatever drawbacks this situation might cause.

5 Econometric Models

In our econometric study, we examine separately the relationships of Concentration-Competition (Market Power) and Concentration and Competition-Stability based on the models mentioned in Sect. 3.

5.1 Concentration-Competition

We estimating model (2) using the GMM, considering the HHI index as the basic variable. The results are summarized in Table 6:

As we see above the variable HHI is not significant to our model. This leads us to rule in favor of the theory of effective structure as it is more possible to explain the competitive conditions within the Greek banking industry. These results agree with the ones found by Claessens and Laeven (2004) [8], Casu and Girardone (2006) [9], Carbo and Rodriguez-Fernandez (2007) [7], Yeyati and Micco (2007) [10], Efthyvoulou and Yildirim (2014) [11], and Rakshit and Bardhan (2019) [12].

On the other hand, we have control variables that are significant to the model. Initially, we see the paradox that there is a positive relationship with the 'Provisions for Losses' from 'Loans to Total Assets', whereas we would expect there to be a negative relationship with market power.

Another variable is inefficient. As we see, it has a negative relationship, which seems perfectly reasonable. As banks do not enjoy market power, this negative element may affect the dependent variable this way.

The 'Fee Based Activities' variable is also negative. In this case, it makes sense as the more banks specialize in their primary activities, the more they will gain a competitive advantage, since they become more efficient and consequently gain more market power.

Table 6 GMM regression results for Eq. (2)

Variable	Coefficient	Std.Error	t-Stat.	Prob.
Lerner $_{-1}$	−0,434,157	0,190,977	−2,273,346	0,0283
HHI	−566,899	6,468,742	−0,876,367	0,3859
LLP	5,594,816	2,308,396	2,423,681	0,0199
Interest rate risk	−479,904	13,83,778	−0,346,807	0,7305
Inefficiency	−1,518,091	0,523,648	−2,899,071	0,006
Liquidity risk	−0,57,804	3,169,756	−0,182,361	0,8562
Capital to assets	−0,72,641	2,576,925	−0,28,189	0,7794
Lending/tot. assets	−3,537,447	2,994,225	−1,181,423	0,2442
Deposits/tot. liabilities	247,783	1,620,892	1,528,683	0,134
Other earning assets/tot. assets	2,564,012	3,155,856	0,812,462	0,4212
Fee-based activities	−1,04E-10	4,71E-11	−2,204,215	0,0332
ATMs/branches	−0,131,112	0,303,287	−0,432,304	0,6678
GDP	−6,74E-13	5,58E-12	−0,120,806	0,9044
Const.	0,065709	0,103,166	0,636,924	0,5277
R-squared	0.303239			
J-statistic	6.722881			
Prob (J-statistic)	0.875370			

Finally, the only other important variable is the 'lag of the dependent'. This states the importance of considering previous index values. But the fact that it is negative shows us that the previous results affect the index in reverse, which means that we will have constant ups and downs.

5.2 Concentration-Competition-Stability

In the second analysis, we consider the effect of two variables on stability. For the first, we consider the relationship between competition and stability, and for the second, the effect of concentration. Using again a GMM estimation on model (3) and having as basic explanatory variables, the Lerner and HHI indices, we gain the following results (Table 7):

For the first basic variable, the Lerner index, we see that it has a marginal significance to our model. Nonetheless, in our investigation, we accept it to extract conclusions. Thus, we see that it has a positive relationship with the stability index. This makes us lean toward the Competition-Fragility view (consistent with, among others: Yeyati & Micco, 2007 [10], Turk-Ariss, 2010 [29], Leroy & Lucotte, 2017 [37]). This means that the increase in the market power of banks (within reasonable limits) is expected to bring greater stability.

The second variable is HHI. For this variable, we see that it is not significant to the model. Therefore, we find no relation with Stability. As a result, we cannot rule in

Table 7 GMM regression results for Eq. (3)

Variable	Coefficient	Std.Error	t-Statist.	Prob.
LnBankZ-1	0,135,644	0,124,842	1,086,524	0,2902
LERNER	0,114,471	0,05717	2,002,304	0,059
HHI	9,113,786	9,124,209	0,998,858	0,3298
RGDP	20,61,677	2,931,706	7,032,344	<0,0001
SIZE	−0,578,229	0,477,173	−1,211,781	0,2397
LLP	−3,981,513	1,215,019	−3,276,914	0,0038
LR	1,194,722	0,886,229	1,348,097	0,1927
CRISIS	1,865,079	0,153,508	12,1497	<0,0001
NIM	−26,82,579	16,94,398	−1,583,205	0,1291
CAPITAL REQ.	0,832,779	0,043131	19,30,833	<0,0001
Const.	−0,376,809	0,053155	−7,088,878	<0,0001
R-squared	0.979992			
J-statistic	8.640407			
Prob(J-statistic)	0.279514			

favor of any of the views Concentration-Stability, or fragility, for which we have not found similar results in the literature.

Of the control variables that are important, initially, GDP's annual growth rate is positively related to the stability variable. The next expected result is the negative relationship of the 'Provisions for Loan Losses' to 'Total Assets' with Stability. However, the unexpected result for which we have not been able to provide a satisfactory explanation is the positive relationship between the indicative variable 'CRISIS' and Stability.

The last significant variable positively affecting stability is the amount of capital requirements.

For a robustness test following Jimenez et al. (2013) [33] and Fu et al. (2014) [35], we also use a quadratic term of the measure of competition, to capture a possible non-linear relationship between competition and risk, as illustrated in model (4). The results are as follows (Table 8):

Because both the Lerner index and its square are not important to the model, we can deduct that the Competition-Stability relationship is linear, which is in line with previous studies including the quadratic term but supporting the linearity.

6 Conclusions

This chapter examined the impact of Systemic Greek Bank M&A on the financial sector's major concepts: Concentration, Competition and Stability, as the subject is highly topical these days given the various reports circulating in financial news sources regarding upcoming systemic bank mergers in Greece.

Table 8 GMM regression results for Eq. (4)

Variable	Coefficient	Std. error	t-Statistic	Prob.
LnBankZ-1	0,129,482	0,133,476	0,970,076	0,3442
LERNER	0,144,587	0,101,608	1,422,989	0,171
$LERNER^2$	0,025094	0,058573	0,428,426	0,6732
HHI	9,281,579	9,398,323	0,987,578	0,3358
RGDP	21,56,667	2,755,268	7,827,433	<0,0001
SIZE	−0,388,827	0,440,332	−0,883,031	0,3883
LLP	−3,604,646	120,143	−3,000,297	0,0074
LR	1,577,162	0,905,025	1,742,674	0,0976
CRISIS	1,835,308	0,158,131	11,60,628	<0,0001
NIM	−30,92,965	18,19,624	−1,699,783	0,1055
CAPITAL REQ.	0,829,995	0,045954	18,06162	<0,0001
Const.	−0,356,842	0,051624	−6,912,338	<0,0001
R-squared	0.979456			
J-statistic	8.638275			
Prob(J-statistic)	0.373723			

For this purpose, we tested the relationships of Concentration-Competition, Concentration-Stability and Competition-Stability.

Thus, as a final view, based on our results, it could be said that while a merger between two Greek systemic banks seems, at first sight, dissuasive, on the contrary, it can have positive effects on the stability of the system.

For the Greek economy, these results mean that measures such as forced mergers and acquisitions to save the banks, and consequently the system, constitute a positive development. As we have observed from our results, the increase in concentration following mergers and acquisitions did not have any major negative impact on the stability and did not lead to the sector becoming a monopoly; on the contrary, the results of these moves by the banks helped reverse the situation and save the banking system. Opposite results would have resulted in bankruptcy for the banks, and consequently the collapse of the economy, as the system's overall money flow relies on the banks. Also, our results cannot explain extreme situations of concentration and competition, but the conclusions are made based on values given to the variables not far exceeding our sample.

Our last limitation concerned our models. The variables within our models were based on previous ones presented in similar studies dependent on a previously developed theoretical framework. Even though the variables used in our model emerged from a thorough study of the existing literature and might not be the optimal ones to test the pertinent relationships without the shadow of a doubt, testing every possible variable for suitability is rather impractical. As a result, we relied on those variables that are most probable and most appropriate for the research conducted.

Closing this chapter, we shall refer to possible expansions of this research. One relevant expansion might be the inclusion of the Covid-19 crisis in the sample,

testing dynamically by modeling and simulating the sample [38–42]. Whether M&A are moves that banks or other kind of businesses might use to gain positive results and cover their losses. Finally, another future research development might be to examine other advantages that mergers and acquisitions might bring considering where most synergies are coming from.

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