

## IMPACT OF BANK CONCENTRATION ON VOLATILITY – THE CASE OF EUROPEAN ECONOMIES

**Sasho Arsov**

*Ss. Cyril and Methodius University in Skopje, Faculty of Economics – Skopje*  
[sarsov@eccf.ukim.edu.mk](mailto:sarsov@eccf.ukim.edu.mk)

**Aleksandar Naumoski**

*Ss. Cyril and Methodius University in Skopje, Faculty of Economics – Skopje*  
[aleksandar.naumoski@eccf.ukim.edu.mk](mailto:aleksandar.naumoski@eccf.ukim.edu.mk)

### ABSTRACT

*The goal of this paper is to investigate the impact of concentration in the banking sector on the economic and financial stability. Having in mind that the European countries are predominantly bank-centered, we begin with the assumption that too much power concentrated in a small number of financial institutions could have a significant impact on the entire economy. Therefore, our aim is to examine the impact of concentration in the banking sector on the stability of both the financial system and the economy.*

*For the purpose of the study, we have created a sample of 44 European countries, with data covering the period 2000-2021. The methodology involves two econometric techniques: logistic regression and the Generalized Method of Moments procedure to address the problem of possible endogeneity of the data.*

*Using a set of independent variables representing the level of concentration and competition, as well as a set of controlling variables, the results show that the higher concentration of assets among the largest banks has a negative impact on economic stability, while the impact on financial stability is undetermined. The remaining variables show that the countries with higher growth rates and higher capital investments exhibit more stable growth, while the impact of inflation is generally negative.*

**Keywords:** *financial sector, banks, competition, economic stability, financial stability.*

**JEL Classification:** *D40, E44, G01, G21*

### 1. INTRODUCTION

In the current economic settings, one cannot overlook the importance of the level of financial development for the overall economic development of a country (Schumpeter, 1912; Goldsmith, 1969; Levine and Zervos, 1998). However, the financial sector itself has sometimes been the source of strong headaches for the government officials, when it, as a result of its structure and characteristics, brings volatility into the economy and becomes more a problem instead of a solution.

The first issue of importance is the level of development of the financial system. In many countries, especially in Europe, which is in the center of our interest, it comes down to the development of the banking sector, since most of continental Europe has the characteristics of being bank centered. The second important issue is the structure of the banking sector, i.e., the

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level of concentration of banking activity, which determines the conduct and the performance of the banks, with inevitable consequences for the entire economy.

The developed financial sector is said to have a positive impact on the overall economic activity through the provision of financial support, setting the cost of capital which serves as a benchmark for the adoption of investment projects, allocation of capital to the most efficient sectors of the economy, etc. On the other hand, the development of the financial sector above a certain threshold is seen as an obstacle to the economy as it drives away resources from the rest of the economy or its size and importance become a source of economic instability. The role the financial or the banking sector will have in the economy depends not only on the size of the sector, but also on its structure (banking, vs. stock market) and concentration (number of players in the sector).

In this paper we want to explore the impact of the structure of the financial sector on the stability of the economy and the banking sector in the case of the European economies. For that purpose, we have constructed a sample of 44 European countries and gathered data for the period 1998-2021. Using a set of independent and control variables, our basic goal is to investigate the importance of the structure of the banking sector for the stability of the banking sector and the overall volatility of the economy. The focus is on the banking sector, as it represents by far the most dominant part of the financial sectors of the European economies. Due to the nature of the problem, we apply two econometric procedures: Logistic regression (Logit) and Generalized Method of Moments (GMM). We include several widely used variables to represent the structure of the banking sector, which also limits the potential of the study as not all of them are available in sufficiently long time series of data.

The expected contribution of this paper to the existing literature is to shed more light on the nexus between the financial sector composition and the economic and financial stability in Europe. Most of the reviewed literature on this topic covers different parts of the world and various groups of countries, some of the papers refer to the European Union economies, but the whole of Europe has not been the subject of study, to the best of our knowledge. Bearing in mind the specifics of our continent, we find it important that the policymakers are provided with the relevant knowledge on this topic, so that they could adjust their policies accordingly.

The results of the GMM model indicate that higher concentration in the banking sector negatively affects the economic stability of a country, while the logit results related to the financial sector crises are not conclusive. A possibly unexpected finding is that the higher level of financial development contributes to the economic volatility. The remaining variables are pretty much in line with the expectations.

After the introduction, the first section contains a review of the existing literature in this field. The second section describes the research methodology and the sources of data used in the regression. The next section includes the regression results and their interpretation. The final part of the paper covers the conclusions of the study.

## **2. LITERATURE REVIEW**

The importance of the financial sector development in the overall economic development of a country has been researched thoroughly (Schumpeter, 1912; Goldsmith, 1969; King and Levine, 1993; Levine and Zervos, 1998; Rajan and Zingales, 1998; Fisman and Love, 2004). The general conclusion is that up to a certain level, the financial sector development has a positive influence on economic growth. These benefits arise from several sources. The larger size of the financial

sector increases the amount of capital in the economy available for investments (McKinnon 1973; Greenwood and Jovanovic, 1990). The higher supply of capital lowers the cost of capital for the prospective investors (Rajan and Zingales, 1998), the more developed financial market provides allocation of capital to its most efficient uses (King and Levine, 1993; Mishkin, 2002); the financial system provides efficient and innovative payment services (Kindleberger, 1993), etc. However, in spite of the aforementioned studies supporting the premise, economic science is not unambiguous about the impact of financial development on the level of economic development. More recent studies indicate a weakening of the relationship between a country's financial and economic development (Nili and Rastad 2007, Barajas, Chami and Yousefi 2013). According to Rousseau and Wachtel (2011), the oversized banking sector is often a reason for the occurrence of banking crises, which often serve as a trigger for economic recessions. Other negative consequences of the intensive financial development of a country are the concentration of professional staff in the financial sector and the extraction of that intellectual potential from other economic sectors (Cecchetti and Kharroubi, 2015), as well as the fact that the oversizing of the financial sector brings with it itself great complexity and increases the sources of risk for the economy (Gennaioli, Shleifer and Vishny, 2012). In a recent study of the EU and OECD economies, Prochniak and Wasiak (2017) conclude that the excessive size of the stock market or the banking sector (excessive lending) has a detrimental impact on economic growth.

Another issue that attracted research interest has been the structure of the banking sector and its impact on the efficiency of the sector and the economic growth. According to the basic economic postulates, less concentration and more competition should be favourable for the economy. The “too big to fail” argument from the past financial crisis (2008-2009) provided empirical support for this concern. However, the findings of researchers with respect to this issue are not straightforward. Demirgüç-Kunt and Levine (2000) find no significant relationship between bank concentration and the efficiency of the banking sector, as well as with the level of financial development. Ratti et al. (2008) use a sample of firm-level data from European companies, to explore the impact of banking sector concentration. Their conclusions are somewhat unexpected, as they find that in more concentrated systems, the firms are less financially constrained. Their explanation is linked to the information theory, as the higher the market power exhibited by banks, the more able they are to obtain borrower-related information. Similar findings are reached by Liu and Mirzaei (2013). Ricky-Okine et al. (2020) use a sample of 37 Sub-Saharan countries and find that the presence of larger banks is supportive to economic growth, but this is more emphasized in the countries with more competitiveness in the sector, which is characteristic for the Anglophone compared to the Francophone countries. Owen and Pereira (2018) differentiate between banking sector concentration and the level of competitiveness in the sector. Their research on a sample of 83 countries shows that greater concentration in the banking sector has a positive impact on the financial inclusion, provided that a sufficient level of competitiveness is present. Similar are the results of Arsov and Naumoski (2020) who analyze a sample of 22 post-socialist economies and conclude that the higher concentration of assets among the five largest banks has a positive impact on the level of financial development.

Another stream of research investigates the relationship between the banking sector concentration and the stability of the financial system and the overall economic stability. The results of these studies are no less surprising than those about the relationship between banking concentration and growth. Beck, Demirgüç-Kunt and Levine (2003) conclude that concentration in the banking sector has a stabilizing effect on the overall sector. On the other hand, they differentiate between concentration and competition, so that better institutions and policies

promoting competition have a positive impact on the prevention of banking crises. Similar are the findings of Beck et al. (2003), who study a sample of 89 countries in the period 1980-1997 and conclude that the higher concentration of the banking sector has a positive impact on economic stability. Căpraru and Andrieș (2015) find that a higher degree of competition could promote the financial stability in EU countries, but its role diminishes in the case of crises. Ben Ali et al. (2018) conclude that the concentration in the banking sector has a positive impact on financial stability during crisis periods, but no effect during normal periods. Smolo (2022) explores a sample of 49 Islamic countries and concludes that the concentration in the banking sector has no significant impact on economic volatility.

### 3. METHODOLOGY AND DATA

Having in mind the basic goal of the paper, it is the **economic and financial stability which is to be taken as a dependent variable**. Therefore, we will have at least two regression equations. However, the problem is to find appropriate proxies for these variables.

One of the best options to represent *economic stability* (or volatility) is the standard deviation of economic growth (we apply the 3-year standard deviation of the annual growth rate of real GDP per capita). The source of data for GDP is the World Bank World Development Indicators Database (WBWD).

For the *financial sector stability*, we use a banking crisis dummy (taking values of 1 or 0). The banking crisis variable is also found in the WBWD.

The basic independent variable is the level of **banking sector concentration or competition**.

The WBGFD database provides sufficiently long series of the 3-bank and 5-bank ratios, which is the percentage of banking assets held by the three or five largest banks in the country, respectively.

However, as mentioned above, it is not only concentration of assets that matters, but the level of competition (or collusion) among the banks, as well. For this purpose, the H-statistic, the Lerner index and the Boone indicators are suggested. The H-statistic represents the link between the sales price and the cost of the inputs. Under perfect competition, the companies respond linearly to the increase in input prices by increasing the output prices. The Lerner index measures the level of monopolistic power through the difference between the output price and marginal costs. The Boone indicator is a measure of the competition and is calculated as the elasticity of profits to changes in marginal costs. These indicators are available at country level in the World Bank Global Financial Development database, but unfortunately not all of them cover the entire analyzed period, so that some of our regressions suffer from the limited length of the time series. Due to the insufficient coverage of the H-statistic, it is excluded from our analysis.

In addition, the model includes several **control variables**, to capture the effects of other factors which also influence the level of economic or financial stability. Among them, we use variables that represent the specifics of the banking sector and general economic variables.

The bank-specific control variables are:

- The level of financial development, which is usually represented by the size of the banking activity, proxied by the amount of **credit extended by banks to the private sector** divided by GDP.
- Net-interest margin, which is the average annual difference between the active and passive interest rates for the banking sector.

The general economic variables are those related to the general national or global economy, as they also have impact on the dependent variable. In this paper, we include:

- Level of economic development (represented by the annual GDP per capita);
- Rate of inflation (represented by the GDP deflator);
- Trade openness of the economy (proxied by the sum of exports and imports divided by GDP);
- Gross capital formation (annual gross capital formation divided by GDP);
- Global financial crisis dummy. We use this variable in the Logistic regression as it is compatible with the dependent variable. We put 1 for the years 2008 and 2009 and 0 for the rest of the analyzed years and we expect this to serve as a kind of a test for the model's validity.
- Adoption of EURO (dummy variable representing if the country has become a member of the Eurozone, not adopted the EURO as a currency, like Montenegro). The variable takes value of 1 for the years the country became a member of the EURO area onwards and 0 otherwise). This is a variable we have not met in the existing literature and our expectation is that the membership in the Eurozone has an impact on the banking sectors, through the special regulations it imposes on the member countries.

Our sample consists of 44 European countries, which is actually all of Europe (Turkey, Azerbaijan and Georgia included), except for the smallest several states. Data for all the numerical variables above are taken from the WBWD and WBGFD databases. The dataset covers the period 2000-2021, while data for the 2 prior years are used to derive the necessary averages. All the variables, except those representing the bank concentration measures and the dummy variables are used in their log forms.

The basic model of interest is the following:

$$Stability_{i,t} = \alpha CONC_{i,t} + \beta B_{i,t} + \gamma C_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where:

- $Stability_{i,t}$  is a measure of economic stability or financial crisis in country  $i$  in period  $t$
- $CONC_{i,t}$  is a measure of concentration/competitiveness in the banking sector for country  $i$  in period  $t$
- $B_{i,t}$  is a vector of bank-specific control variables
- $C_{i,t}$  is a vector of general economic control variables
- $\varepsilon_{i,t}$  is a residual value

In the regression where the dummy variable *banking crisis* is used as a dependent variable, we apply Logistic regression (logit) and probit as a robustness check.

In the other regression, with the *volatility of growth* as a dependent variable, the first choice is to use a panel regression. However, there is a possible endogeneity among the variables in the model, i.e., the explanatory variables might also be affected by the dependent variable. Namely, there could be a bi-directional causality among the economic and financial stability on one side and the economic growth and financial development on the other. In order to overcome this problem, we apply the dynamic panel GMM econometric tool, first described by Arrelano and Bond (1991) and further developed in Arrelano and Bover (1995) and Blundell and Bond (1998). The basic equation is thus transformed to:

$$Stability_{i,t-1} = \alpha Stability_{i,t-1} + \beta CONC_{i,t} + \gamma B_{i,t} + \delta C_{i,t} + \eta_i + \mu_t + \varepsilon_{i,t} \quad (2)$$

Where  $\eta_i$  are unobserved and country-specific fixed effects,  $\mu_t$  are unobserved time-specific effects and  $\varepsilon_{i,t}$  is the error term.

We apply the first-difference GMM model, by using lagged values of explanatory variables as instruments. Period effects can be solved by using time-specific dummy variables. The instruments should be variables that are correlated with the endogenous variables, but not directly with the dependent variable. For simplicity, lagged values of the independent variables are often used as instruments.

#### 4. RESULTS AND DISCUSSION

First, we present the descriptive statistics to provide some basic insight into the sample used.

*Table 1: Descriptive statistics*

	Standard deviation of growth	Assets owned by 5 largest banks	Lerner index	Boone indicator	Credit to private sector by banks ratio	Net interest margin	GDP growth	Trade openness	Gross Capital Formation	Inflation
Mean	0.0198	81.19	0.230	-0.082	84.52	3.547	0.026	102.12	24.26	5.15
Median	0.0134	83.43	0.242	-0.057	64.00	2.990	0.023	89.394	23.22	2.65
Maximum	0.1206	100.00	0.709	2.177	525.64	21.358	0.285	351.13	57.99	86.82
Minimum	0.0003	29.93	-1.746	-1.572	5.188	0.180	-0.159	45.418	12.65	-18.84
Std. Dev.	0.0190	15.57	0.168	0.279	76.74	2.636	0.044	48.973	5.570	8.740

*Source: Authors*

Table 1 contains the basic statistical data about all the variables in the regression, except for the dummy variables. For some of the variables, it is obvious that there are large variation margins. The relatively high concentration of assets among the largest banks is obvious from the mean and median in the second column, indicating that, on average, the 5 largest banks own more than 80% of the entire banking sector assets per country. The average GDP growth rates are slightly above 2%, while inflation rates have been modest around 2.6%, excluding outliers.

Table 2 contains the results of the first regression, i.e., the logit model and the robustness check with the probit model.

*Table 2: Regression results – logit and probit (Banking crisis as a dependent variable)*

	Logit			Probit		
<b>Constant</b>	3.953 (0.197)	3.4604 (0.371)	4.5520 (0.212)	1.6662 (0.305)	1.0933 (0.593)	1.8475 (0.344)
<b>Bank concentration (5 largest banks)</b>	-0.0040 (0.655)			-0.0017 (0.703)		
<b>Lerner index</b>		-0.2158 (0.814)			-0.0750 (0.884)	
<b>Boone indicator</b>			-1.0545* (0.096)			-0.5234 (0.130)
<b>Financial development</b>	0.5069** (0.047)	0.5228* (0.065)	0.4326 (0.111)	0.2147 (0.100)	0.2518* (0.096)	0.1935 (0.182)
<b>Net-interest margin</b>	-0.0117 (0.965)	-0.1554 (0.606)	-0.2741 (0.354)	0.0219 (0.879)	-0.0707 (0.664)	-0.1257 (0.436)
<b>GDP growth</b>	-10.950*** (0.003)	-15.553*** (0.003)	-17.753*** (0.000)	-6.0604*** (0.002)	-8.5842*** (0.002)	-9.8143*** (0.000)
<b>Trade openness</b>	0.4251 (0.156)	0.6636* (0.067)	0.6800** (0.039)	0.2739* (0.086)	0.4134** (0.031)	0.4092** (0.022)
<b>Gross Capital</b>	-3.5698***	-3.7730***	-3.9759***	-1.7722***	-1.8279***	-1.9569***

<b>Formation</b>	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
<b>Inflation</b>	0.3632** (0.027)	0.3435* (0.055)	0.3709** (0.034)	0.1759** (0.036)	0.1725* (0.067)	0.1845** (0.045)
<b>Adoption of Euro</b>	0.4430 (0.242)	0.7173* (0.086)	0.5281 (0.177)	0.1967 (0.312)	0.3457 (0.116)	0.2426 (0.245)
<b>Global Financial Crisis</b>	3.0605*** (0.000)	2.7551*** (0.000)	2.6229*** (0.000)	1.6513*** (0.000)	1.4778*** (0.000)	1.4075*** (0.000)
<b>Log likelihood</b>	-181.81	-131.431	-147.276	-183.281	-132.675	-148.771
<b>Wald Chi<sup>2</sup> (9)</b>	266.58	165.06	176.845	393.263	234.318	250.818
<b>Prob Chi<sup>2</sup></b>	0.000	0.000	0.000	0.000	0.000	0.000
<b>McFadden R<sup>2</sup></b>	0.3156	0.377	0.358	0.310	0.3707	0.352
<b>No. of countries</b>	44	44	44	44	44	44
<b>Observations</b>	855	855	855	855	855	855

Standard errors in parentheses.

\*, \*\*, \*\*\* - denote significance at 10%, 5% and 1% respectively

*Source: Authors*

First, the comparison between the logit and probit regression results confirms the high level of consistency among them, and thus the robustness of the logit regression. With respect to the results of the regression, the results from the logit regression do not provide any conclusive evidence about the concentration-volatility relationship. The remaining variables indicate that the level of financial development has a negative impact on banking stability (the dependent variable is Crisis), while the strongest support is achieved for the variables where it was most expected: the countries exhibiting highest growth rates are less prone to banking crises, inflation has negative impact on stability, and the eurozone countries are not less susceptible to banking crisis. The global financial crisis variable unequivocally confirms the link between the global crisis and the crises in particular countries of Europe, which serves as an additional test for the validity of our model.

*Table 3: Regression results – Generalized Method of Moments (Growth volatility as dependent variable)*

<b>Volatility of growth <math>t-1</math></b>	0.6542** (0.020)	0.4558*** (0.000)	0.4327** (0.032)
<b>Bank concentration (5 largest banks)</b>	0.0005*** (0.000)		
<b>Lerner index</b>		0.0117** (0.023)	
<b>Boone indicator</b>			0.0057** (0.012)
<b>Financial development</b>	0.0167*** (0.000)	0.0216*** (0.007)	0.0230*** (0.000)
<b>Net-interest margin</b>	-0.0122** (0.023)	0.0100 (0.355)	0.0152*** (0.001)
<b>GDP growth</b>	-0.1336*** (0.000)	-0.1565** (0.009)	-0.1456*** (0.000)
<b>Trade openness</b>	-0.0367*** (0.000)	-0.0872*** (0.000)	-0.0941*** (0.000)
<b>Gross Capital Formation</b>	0.0087* (0.057)	0.0034 (0.343)	-0.0035 (0.378)
<b>Inflation</b>	0.0039***	0.0063***	0.0068***

	(0.000)	(0.000)	(0.000)
<b>Adoption of Euro</b>	0.0176*** (0.000)	0.0220* (0.064)	0.0195** (0.031)
<b>Sargan test (p-value)</b>	0.23	0.26	0.31
<b>AR (1)</b>	0.01	0.01	0.02
<b>AR (2)</b>	0.73	0.50	0.72
<b>No. of countries</b>	44	44	44
<b>Observations</b>	467	467	467

Standard errors in parentheses.

\*, \*\*, \*\*\* - denote significance at 10%, 5% and 1% respectively

*Source: Authors*

According to the GMM model, the countries with higher concentration in the banking sector exhibit higher volatility in the growth rates of GDP. Therefore, more concentrated banking sectors are detrimental to the economic stability. This is in line with the results of Boyd et al. (2006) and Berger et al. (2009) who explain this through the higher risk concentrated in the portfolios of large and dominating banks. Also, the higher level of financial development is associated with higher economic volatility, while countries growing at faster rates and more open economies are more economically stable. Higher inflation contributes to economic volatility, while a bit surprising finding is that the eurozone countries exhibit larger oscillations in their growth rates. In this regression, the impact of net-interest margin and gross capital formation are ambiguous and insignificant, respectively.

## 5. CONCLUSION

The goal of the paper was to determine if the concentration in the banking sector has any impact on the economic and financial stability, on the basis of a sample of 44 European countries and a dataset covering the 2000-2021 period. The regression model used required two different procedures to be implemented: a logistic regression and a difference GMM procedure in order to overcome the possible endogeneity among the variables.

Having in mind both regressions, we can conclude that highly concentrated banking sectors lead to greater economic instability, but their effect on the financial sector itself is not conclusive. Also, more financially developed economies are at higher risk of both financial and economic crises, while higher rates of economic growth reduce economic volatility. Inflation contributes to economic instability, while higher rates of capital investment and trade openness of the economy have preventative effect.

The value of this paper is that it analyzes an issue which is not sufficiently explored, and the analysis is based on a sample covering the entire European continent. It provides a piece of advice for the policymakers that they should pay closer attention to the structure of their banking sectors as it might become a source of instability. It also confirms some well-known postulates that higher growth rates, higher levels of investment and trade openness are necessary preconditions for a stable economic progress, while the need to prevent higher rates of inflation is accentuated again.

The limitations related to this paper refer to the possible imperfection of the variables used to represent the concentration in the banking sector. Namely, there are several solutions suggested in the literature, but not all of them are equally useful, nor the data on them are available. The World Bank has even discontinued publishing data on the Lerner and Boone measures. Therefore, this research issue deserves to be revisited again once more convenient data becomes available.



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