

Level of Concentration in Banking Markets and Length of EU Membership

Ivan Pavic, Fran Galetic and Tomislava Pavic Kramaric

Abstract—The purpose of this article is to analyze the degree of concentration in the banking market in EU member states as well as to determine the impact of the length of EU membership on the degree of concentration. In that sense several analysis were conducted, specifically, panel analysis, calculation of correlation coefficient and regression analysis of the impact of the length of EU membership on the degree of concentration. Panel analysis was conducted to determine whether there is a similar trend of concentration in three groups of countries - countries with a low, moderate and high level of concentration. The conducted panel analysis showed that in EU countries with a moderate level of concentration, the level of concentration decreases. The calculation of correlation showed that, to some extent, with other influential factors, the length of EU membership negatively affects the market concentration of the banking market. Using the regression analysis for investigation of the influence of the length of EU membership on the level of concentration in the banking sector in a particular country, the results reveal that there is a negative effect of the length in EU membership on market concentration, although it is not significantly influential variable.

Keywords—Banking sector, concentration, EU

I. INTRODUCTION

THE European Union as a geo-political entity was founded in 1957 by six countries. Since then, five successive enlargements have followed, taking it from six to 27 member states in its 54-year-long history. The emergence of the EU, as well as every later expansion, provided a new framework for market entities encouraging them to various adjustments. In this sense it is considered that many economic entities have taken advantage of the possibility of expanding their operations to countries that have recently become EU members. The entry of new members should be equally interesting for different economic sectors or markets in different goods and services, including the banking sector as well.

Ivan Pavic, PhD is with the Faculty of Economics, University of Split, 21000 Split, Croatia (phone: +385(0)21470121; fax: +385(0)21470121; e-mail: pavic@efst.hr).

Fran Galetic, MBA is with Faculty of Economics, University of Zagreb, 10000 Zagreb, Croatia (e-mail: fgaletic@efzg.hr).

Tomislava Pavic Kramaric, PhD is with the University of Split, Center for professional studies, Croatia (e-mail: tpavic@hotmail.com)

This paper presents the results of the analysis based on the hypothesis that there is a negative relationship between the level of concentration in the banking market and number of years spent as an EU member country. In other words, the assumption that lower concentration level should be expected in banking markets in older EU member countries is tested. The paper is organized as follows. After the introduction, review of the literature follows. Section III gives a brief description of the EU history. Section IV deals with measures of market concentration. In the fifth part of this paper we present and explain the values of concentration obtained by the analysis for the banking sector in EU member states. Sections VI and VII deal with the analysis of the trend of concentration and correlation between the length of EU membership and HHI, and are followed with the concluding remarks.

II. LITERATURE REVIEW

Many authors have studied the European banking systems and concentration of the banking market in European countries. Special significance in the analysis is usually given to the EU member states, which are compared with each other, but also with the other non-member countries. Generally, the articles that analyze changes in the concentration of the banking market can be divided into two basic groups. The first group consists of works by the authors who believe that the concentration of the banking system brings stability to the overall system, and thus contributes to macroeconomic stability. The other group consists of those papers that argue that increase in concentration of the banking market leads to system instability. Based on economic theory and empirical evidence, a number of articles are trying to predict and describe the effect of increasing concentration of the banking market to financial stability ([1] - [3]). Reference [4] shows that large banks in markets with a high concentration have monopolistic behavior, and thus increase their profits. When banks' profits begin to grow and when they become large enough, the banks are no longer willing to accept risky investments, because it could threaten the future profits that the bank will achieve ([5] - [7]). The authors that think that instability is a characteristic of banking markets with higher levels of concentration or the authors who believe that the emergence of large banks contribute to creating instability in the banking system alert to the fact that large banks are significantly more likely to receive state guarantees and subsidies for well-known doctrine of "too big to fail" ([8], [9]). As a result, a problem of moral hazard may occur because the banks under the guise of security provided by the state can begin to enter into risky investments.

III. THE LENGTH OF EU MEMBERSHIP

In 1957, when the EU, i.e. the association which preceded it, was found, there were six member countries (Belgium, France, Italy, Luxembourg, the Netherlands and Germany). Those six countries signed the Treaty of Rome which led to the founding of the European Economic Community [10]. In 1973, Denmark, Ireland and the United Kingdom joined the European Union. In 1981, Greece became a member state, while in 1986 Spain and Portugal joined the EU. In 1995 the EU expanded to three additional countries: Austria, Finland and Sweden. The year 2004 saw the accession of Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia and Slovenia (mainly former socialist countries of the Central and Eastern Europe) joined. It was a historic enlargement which signified the reunification of Europe after decades of division. In 2007, the fifth enlargement was completed with the accession of Romania and Bulgaria on 1 January 2007.

IV. MEASURES OF MARKET CONCENTRATION

As a measure of market concentration different indicators are used. Among those which are most commonly used are certainly the Concentration Ratio (CR), Herfindahl-Hirschman Index (HHI), the Gini Coefficient, the Lerner Index, Hall-Tideman and Rosenbluth Index as well as a measure of entropy [11]. Among these indicators CR and HHI are the most popular ones [12]. CR measures market concentration in the form of shares of a number of the largest companies, usually four, eight or twelve companies in the market in certain products. A higher value of concentration ratio indicates a lower degree of competitiveness, i. e. a higher degree of industrial concentration.

Unlike concentration ratios, HHI does not only show the distribution of market shares of n leading companies, but also market shares of other companies as well [13]. In order to achieve a relevant degree of industrial concentration, HHI squares market shares of *all* the companies operating in a market giving larger significance to market shares of the leading companies. For the purpose of concentration calculation the following formula has been used:

$$HHI = \sum_{i=1}^n MS_i^2 \quad (1)$$

where MS_i represents the market share of the i^{th} company and n is the total number of the companies in the banking sector.

The value of the index can vary from 0 (in case of perfect competition) to 10 000 (monopoly). The lower the index, the more competitive the market, and vice versa, the higher the index, the more concentrated the market [14]. Table I shows the classification of the market according to the value of HHI index.

TABLE I
INTERPRETING THE HERFINDAHL-HIRSCHMAN INDEX

| Value of HH index | Level of market concentration |
|-------------------|-------------------------------|
| 0 - 1000 | Low concentrated market |

| | |
|----------------|--------------------------------|
| 1 000 - 1 800 | Moderately concentrated market |
| 1 800 - 10 000 | Highly concentrated market |

Source: [14]

The principal difference between these two indicators is the number of companies that are included in measurement. CR, as pointed out, only takes into account a certain number of major companies, so the problem arises if this is not the final number. This lack of involvement is eliminated by the use of HHI, which takes into consideration all companies, with their market shares squared and then added together, giving greater importance to market shares of the leading companies [15], [16]. This means that a greater concentration will be on duopoly market where two firms have unequal market shares, compared to such a market in which the two companies have the same market shares. For example, in a market where one player has 80% and another 20% of the market HHI amounts to 6.800, while in a market where two players share market into two equal parts, the HHI accounts for 5.000. Given the nature of the banking market, the HHI is used in this paper as a measure of market concentration.

V. CONCENTRATION OF BANKING MARKETS IN THE EU MEMBER STATES

Values of HHI in the EU member states are shown in Table II. The displayed values represent, in fact, the average value for the 2001-2008 period. Even a superficial analysis suggests that banking markets in the EU countries are very differently concentrated. Specifically, the HHI ranges from 175, as in the example of Germany, up to 3761, as measured for Estonia. An equally cursory analysis suggests that some members which have recently joined the Union have a low HHI, such as, for example, Bulgaria, while some states with a long run in the membership of the EU, have a relatively high HHI, as in the Netherlands.

TABLE II
VALUES OF HHI IN BANKING MARKETS OF EU MEMBER COUNTRIES

| Member country | HHI | Date of accession | Number of years of EU membership |
|-----------------|------|-------------------|----------------------------------|
| Austria | 545 | 1995 | 15 |
| Belgium | 1971 | 1957 | 53 |
| Bulgaria | 759 | 2007 | 3 |
| Cyprus | 1199 | 2004 | 6 |
| Czech Rep. | 1139 | 2004 | 6 |
| Denmark | 1132 | 1973 | 37 |
| Estonia | 3761 | 2004 | 6 |
| Finland | 2548 | 1995 | 15 |
| France | 653 | 1957 | 53 |
| Greece | 1118 | 1981 | 29 |
| Ireland | 598 | 1973 | 37 |
| Italy | 266 | 1957 | 53 |
| Latvia | 1135 | 2004 | 6 |
| Lithuania | 1995 | 2004 | 6 |
| Luxembourg | 294 | 1957 | 53 |
| Hungary | 826 | 2004 | 6 |
| Malta | 1712 | 2004 | 6 |
| The Netherlands | 1842 | 1957 | 53 |

| | | | |
|---------------|------|------|----|
| Germany | 175 | 1957 | 53 |
| Poland | 689 | 2004 | 6 |
| Portugal | 1074 | 1986 | 24 |
| Romania | 1101 | 2007 | 3 |
| Slovakia | 1161 | 2004 | 6 |
| Slovenia | 1416 | 2004 | 6 |
| Spain | 496 | 1986 | 24 |
| Sweden | 845 | 1995 | 15 |
| Great Britain | 371 | 1973 | 37 |

Source: Authors' calculation and [17] - [19].

According to the values of HHI, the EU countries can be classified into three groups. In one group there are members with a low value of HHI ($HHI < 1000$) which are shown in Table III.

TABLE III
EU MEMBER STATES WITH LOW VALUES OF HHI
Member states with a low concentration
($HHI < 1000$)

| |
|---------------|
| Austria |
| Bulgaria |
| France |
| Ireland |
| Italy |
| Hungary |
| Germany |
| Poland |
| Spain |
| Sweden |
| Great Britain |

Source: Authors' calculation

In the second group there are member countries with moderate values of HHI ($1000 < HHI < 1800$) which are shown in Table IV.

TABLE IV
EU MEMBER STATES WITH MODERATE VALUES OF HHI
Member states with a moderate
concentration ($1000 > HHI < 1800$)

| |
|----------------|
| Cyprus |
| Czech Republic |
| Denmark |
| Greece |
| Latvia |
| Malta |
| Portugal |
| Romania |
| Slovakia |
| Slovenia |

Source: Authors' calculation

The third group is classified as a group of states with a relatively high level of concentration ($HHI > 1800$) [20], [21] and these are shown in Table V.

TABLE IV
EU MEMBER STATES WITH HIGH VALUES OF HHI
Member states with high
concentration ($HHI > 1800$)

| |
|-----------------|
| Belgium |
| Estonia |
| Finland |
| Lithuania |
| Luxembourg |
| The Netherlands |

Source: Authors' calculation

Based on the average length of membership in the EU it is possible to conclude how the affiliation to a particular group is determined by the length of membership. In the first group, the length of EU membership is 27.5 years, in the second group 12.9 years, while in the third group, the average membership was as long as 31 years. Thus, the group with the longest average membership has the highest concentration, which could lead to the conclusion that the length of membership does not affect the degree of market concentration in the EU banking market.

VI. ANALYSIS OF THE TREND OF CONCENTRATION

Another important question when it comes to the observed three groups of states according to the level of market concentration, is the concentration trend, i.e. whether there is a similar trend in each group. The answer to this question will be found using the panel analysis [22], [23]. The implementation of the Hausman test [24] showed that for the group of countries with a low concentration the method of random effects should be used. Therefore, the panel analysis is carried out using this method. The results of the analysis are contained in Table VI.

TABLE VI
PANEL ANALYSIS OF THE TREND OF MEMBER STATES ACCORDING TO THE
LEVEL OF CONCENTRATION

| | Member states with a low concentration ($HHI < 1000$) | Member states with a moderate concentration ($1000 > HHI < 1800$) | Member states with a high concentration ($HHI > 1800$) |
|--|---|---|--|
| Dependent variable | HHI | HHI | HHI |
| Observations | 96 | 88 | 32 |
| Periods included | 8 | 8 | 8 |
| Cross-sections included | 12 | 11 | 4 |
| Constant estimated value | 522.12 (66.34) | 1412.00 (99.62) | 2609.80 (446.68) |
| Regression coefficient estimated value | 4.47 (2.66) | -27.20 (8.59) | -16.34 (22.14) |

| | | | |
|--------------------|--------|--------|---------|
| Adjusted R-squared | 0.0195 | 0.0968 | -0.0149 |
|--------------------|--------|--------|---------|

Source: Authors' calculation

For the group of member countries with a low level of concentration, panel analysis was conducted using random effects methods. The results of this analysis are shown in Table VI. Given the insignificance of the regression coefficient and low R-squared value we can conclude that the model is not good, that states making up this group do not have a unique direction of concentration.

The group of member states with moderate levels of concentration has much better indicators. In this group of countries, the HHI value is reduced by an average of 27.20 per year. Both estimated parameters were significant, and the model explains 10% of the variance.

Panel analysis conducted for the group of countries with high levels of concentration indicates the insignificance of the regression coefficient. R-squared indicates, too, that this model is not appropriate. From this we can conclude that for countries with high levels of concentration a unique direction of concentration levels cannot be determined.

Conducted three panel analysis showed that only the group of countries with moderate levels of concentration could clearly identify the direction of concentration over time. It can be concluded that in the EU countries where the level of concentration in the banking market is moderate, the level of concentration as measured by the HHI decreases. For groups of countries with low or high levels of concentration no conclusions about the unique direction of concentration levels can be made.

VII. THE CORRELATION BETWEEN THE LENGTH OF THE EU MEMBERSHIP AND HHI

The correlation coefficient between the length of membership in the EU and the HHI is -0.32, according to which one can conclude that there is a certain, not too strong, correlation between observed variables. In other words, it is possible to conclude that to some extent, with other influential factors, the length of EU membership affects the market concentration of the banking market.

Given the relatively low correlation between the observed variables, but also because of the need to more precisely define the connection, a regression model is developed:

$$HHI = C(1) + C(2) * DUZ_CL \quad (2)$$

where HHI denotes the value of market concentration and DUZ_CL length of membership in the EU measured by the number of years.

The value of the calculated regression model is: $HHI = 1432.09 - 12.72 * DUZ_CL$.

The value of the regression coefficient is -12.72, which means that during each year of membership in the EU market

concentration in the banking market decreases on the average by 12.72. However, it should be noted that the R-squared is very low and that only 10% of the variance is explained by the model. It is also important to emphasize that the regression coefficient is insignificant at higher levels.

TABLE VII
THE REGRESSION MODEL OF THE INFLUENCE OF THE LENGTH OF MEMBERSHIP IN THE EU ON HHI

| | | | | |
|---------------------------|-------------|-----------------------|-------------|----------|
| Dependent Variable: HHI | | | | |
| Method: Least Squares | | | | |
| Sample: 01 27 | | | | |
| Included observations: 27 | | | | |
| HHI=C(1)+C(2)*DUZ_CL | | | | |
| | Coefficient | Std. Error | t-Statistic | Prob. |
| C(1) | 1432.090 | 227.4756 | 6.295574 | 0.0000 |
| C(2) | -12.71543 | 7.628652 | -1.666799 | 0.1080 |
| R-squared | 0.100014 | Mean dependent var | | 1141.519 |
| Adjusted R-squared | 0.064015 | S.D. dependent var | | 784.8621 |
| S.E. of regression | 759.3252 | Akaike info criterion | | 16.17392 |
| Sum squared resid | 14414370 | Schwarz criterion | | 16.26991 |
| Log likelihood | -216.3480 | Durbin-Watson stat | | 2.383282 |

Source: Authors' calculation

On the basis of the conducted analysis and calculations, it can be seen that the length of membership in the EU is only one of many influential factors on the concentration of banking markets. In other words, for a more complete and accurate explanation of the situation and trends of market concentration in the banking market it is necessary to conduct additional research.

One of the lines of research that could explain why the length of membership in the EU has not significantly influenced the reduction of market concentration in the banking market in the EU member states are mergers and acquisitions of banks. Table VIII a) and Table VIII b) gives an overview of the number of conducted merger and acquisition transactions in the EU member states in the 2001-2008 period.

TABLE VIII-A
THE NUMBER OF MERGERS AND ACQUISITIONS IN EU BANKING MARKETS

| Country/Year | 2001 | 2001 | 2003 | 2004 |
|----------------|------|------|------|------|
| Austria | 0 | 0 | 0 | 2 |
| Belgium | 2 | 4 | 3 | 4 |
| Bulgaria | 0 | 1 | 1 | 1 |
| Cyprus | 1 | 0 | 0 | 0 |
| Czech Republic | 2 | 2 | 2 | 2 |
| Denmark | 3 | 1 | 1 | 2 |
| Estonia | 0 | 0 | 0 | 1 |
| Finland | 1 | 1 | 0 | 2 |
| France | 6 | 8 | 10 | 11 |
| Greece | 1 | 2 | 1 | 2 |
| Ireland | 3 | 0 | 3 | 2 |

| | | | | |
|-----------------|----|----|----|----|
| Italy | 14 | 16 | 21 | 18 |
| Latvia | 2 | 0 | 0 | 1 |
| Lithuania | 1 | 1 | 0 | 2 |
| Luxembourg | 1 | 0 | 0 | 0 |
| Hungary | 3 | 1 | 3 | 1 |
| Malta | 3 | 1 | 3 | 1 |
| The Netherlands | 2 | 1 | 4 | 12 |
| Germany | 13 | 10 | 19 | 19 |
| Poland | 6 | 3 | 2 | 6 |
| Portugal | 2 | 2 | 3 | 0 |
| Romania | 3 | 2 | 2 | 1 |
| Slovakia | 3 | 3 | 1 | 0 |
| Slovenia | 1 | 3 | 0 | 1 |
| Spain | 5 | 5 | 1 | 2 |
| Sweden | 3 | 1 | 4 | 2 |
| Great Britain | 23 | 9 | 13 | 19 |

TABLE VIII-B

THE NUMBER OF MERGERS AND ACQUISITIONS IN EU BANKING MARKETS

| Country/Year | 2005 | 2006 | 2007 | 2008 |
|-----------------|------|------|------|------|
| Austria | 8 | 3 | 7 | 5 |
| Belgium | 4 | 1 | 1 | 5 |
| Bulgaria | 3 | 2 | 2 | 1 |
| Cyprus | 0 | 2 | 1 | 3 |
| Czech Republic | 0 | 2 | 1 | 2 |
| Denmark | 3 | 3 | 2 | 8 |
| Estonia | 2 | 1 | 2 | 1 |
| Finland | 1 | 0 | 5 | 2 |
| France | 6 | 6 | 5 | 7 |
| Greece | 3 | 9 | 1 | 4 |
| Ireland | 3 | 0 | 3 | 1 |
| Italy | 11 | 31 | 16 | 31 |
| Latvia | 2 | 3 | 2 | 4 |
| Lithuania | 1 | 0 | 2 | 1 |
| Luxembourg | 3 | 2 | 1 | 3 |
| Hungary | 0 | 3 | 2 | 2 |
| Malta | 0 | 3 | 2 | 2 |
| The Netherlands | 7 | 7 | 10 | 5 |
| Germany | 22 | 15 | 16 | 7 |
| Poland | 5 | 4 | 5 | 2 |
| Portugal | 3 | 2 | 0 | 4 |
| Romania | 1 | 8 | 2 | 0 |
| Slovakia | 2 | 0 | 2 | 2 |
| Slovenia | 0 | 0 | 0 | 0 |
| Spain | 2 | 5 | 6 | 5 |
| Sweden | 8 | 0 | 5 | 6 |
| Great Britain | 10 | 25 | 20 | 20 |

As shown in Table VIII a) and Table VIII b) the number of mergers and acquisitions varies from one member state to another and varies during a particular time. The largest number of mergers and acquisitions has been in Italy, then in Great Britain and Germany. Given the size of these countries, this was expected, and these data can serve as a basis for future

studies of the degree of concentration in banking markets of EU member states.

VIII. CONCLUDING REMARKS

The European Union during its 54 years has gradually increased the number of its members. Each expansion has resulted in changes in many spheres of activities in this association, including the economy. In this sense changes occurred in the banking market. One particularly significant change is the change in market concentration in that market.

Starting from the premise that the length of membership in the European Union affects the market concentration, adequate analysis were carried out in this paper including panel analysis, calculation of correlation coefficient and regression analysis of the impact of the length of EU membership on degree of concentration.

In the first part of the analysis the authors attempted to determine the intensity and direction of change of concentration in time and space using a panel analysis. In addition to the group of countries with a moderate market concentration which is characterized by concentration decrease with the passage of time in the membership of the EU, in the other two groups, i.e. groups of countries with a low and a high level of concentration, the change of concentration by changing the length of EU membership was not determined.

A similar conclusion can be found from the analysis of the correlation coefficient, which indicated the existence of certain negative relationship between the length of EU membership and the degree of concentration, but with no particularly high intensity.

We also conducted a regression analysis which showed that the length of membership at the level of concentration is not particularly influential variable, i.e. changes that have occurred are result of many other influences. In other words, additional research is needed to define this relationship more clearly.

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