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LIMITATIONS IN THE APPLICATION OF CONCENTRATION INDICATORS – EXAMPLE OF INSURANCE MARKET IN SERBIA, CROATIA, SLOVENIA, ROMANIA AND AUSTRIA

Ograničenja u primeni pokazatelja koncentracije -
primer tržišta osiguranja Srbije, Hrvatske, Slovenije,
Rumunije i Austrije

Abstract

Contemporary competition policy is characterized by the application of economic principles and economic analysis in its legal framework in order to measure companies' anti-competitive behavior. The aim of the paper is to show the possibilities and limitations of indicator application as an instrument for the assessment of companies' non-competitive behavior concentration on the example of the insurance market of the selected countries (Serbia, Croatia, Slovenia, Romania and Austria). The paper analyses the following indicators: Concentration ratio of the four largest companies, Herfindahl-Hirschman index, Lorenz curve, Gini coefficient and Entropy index.

The analysis showed that independent application of indicator concentration is not sufficient and should be supplemented with qualitative data on: market characteristics, industry tradition, the height of entry barriers, manager behavior and the like. Only then one can expect that the market concentration analysis is complete and useful for the implementation of anti-monopolistic measures.

Key words: *competition policy, concentration indicators, limitations, analysis of market characteristics.*

Sažetak

Savremenu politiku zaštite konkurencije karakteriše primena ekonomskih principa i ekonomske analize u njen pravni okvir sa ciljem da se izmeri antikonkurentsko ponašanje kompanija. Cilj rada je da se na primeru tržišta osiguranja odabranih zemlja (Srbija, Hrvatska, Slovenija, Rumunija i Austrija) pokažu mogućnosti i ograničenja primene pokazatelja koncentracije kao instrumenta procene nekonkurentskog ponašanja kompanija. U radu su analizirani sledeći pokazatelji: Racio koncentracije četiri najveće kompanije, Herfindal-Hiršmanov indeks, Lorencova kriva, Gini koeficijent i Indeks entropije.

Analiza je pokazala da samostalna primene pokazatelja koncentracije nije dovoljna i da je treba dopuniti i kvalitativnim podacima o: karakteristikama tržišta, industrijskoj tradiciji, visini ulaznih barijera, ponašanju menadžera i sl. Tek tada se može očekivati da analiza koncentrisanosti tržišta bude kompletna i korisna za sprovođenje antimonopolskih mera.

Ključne reči: *politika zaštite konkurencije, pokazatelji koncentracije, ograničenja, analiza karakteristika tržišta.*

Introduction

Competition policy has a long history. The first country which has developed a set of laws on competition protection in order to prevent competition limitations is the USA. European countries, until the 90's of the twentieth century, had weak, and some conflicting anti-monopoly laws. The formation of the European Union and unique economic area in Europe has imposed the introduction of a unique competition policy (Article 85 and 86 of the Treaty of Rome, Article 81 and 82 Treaty of Amsterdam).

The USA anti-monopoly legislation has some differences in relation to competition policy in the EU. However, common feature of anti-monopoly policy in the USA and EU is the implementation of economic principles and economic analysis in the legal framework

of regulation which should measure the anticompetitive behavior of companies. So, the standard practice of the USA and EU is the definition of relevant market using the SSNIP (Small but Significant and Non-transitory Increase in Price, or test of Hypothetical Monopolist) test and measurement of supply concentration through Herfindahl-Hirschman index. Guidelines of Federal Trade Commission (FTC) and the European Commission develop the regulatory procedures and methods by which to determine competition violation.

Continuous improvement area of the regulatory analysis is a more precise definition of market size (relevant product market and relevant geographic market). The importance of this approach lies in the fact that the result of market defining is identification of companies (that are subject to regulation) in accordance with their spatial location and product characteristics.

Firms tend to advocate wider market definition than those advocated by competition authorities. Therefore, besides SSNIP test, anti-monopoly authorities use the cross-price elasticity of demand in defining the relevant product market. A number of economists have suggested using price correlations in order to define product or geographic markets, or Elzinga-Hogarty test that shows the percentage of total consumption that goes to goods produced in the region and the percentage of total production that is consumed in the region where it is produced [6, p. 315].

The development of anti-monopoly policy will certainly be in the direction of giving guidelines for the implementation of a number of tests for the relevant market definition and application of various concentration indices. This paper should contribute to the elucidation of significance and limitations of certain indicators of market structure limitation, on the example of insurance market.

Concentration indicators on the example of the insurance market of Serbia, Croatia, Slovenia, Romania and Austria

The research on the market limitation degree, using different concentration indicators, was performed on the example of the insurance market of some countries of Southeast and Central Europe. The countries were

selected to represent a wide range of countries from the standpoint of development level, and thus there are Austria as a developed country and a longtime member of the European Union, followed by Slovenia as a country that has concluded the transition process and nearly ten-year member of the EU, Romania that is at the end of the transition process and a recent EU member, Croatia that is on its way to transition completion and accession to the EU and Serbia, which is in the middle of transition process and away from the EU membership.

For the indicator analysis we used the data on total premium at the disposal of both, association of insurance supervisors in the field and individual agencies involved in surveillance operations of insurance companies. We used data available to the *International Association of Insurance Supervisors* (IAIS) and some of its members such as *National Bank of Serbia*, *Croatian Agency for Supervision of financial services*, *Slovenian Insurance Supervision Agency*, *the Romanian Insurance Supervisory Commission* and *the Austrian Financial Market Authority* (FMA) [9, 10, 11, 12, 13].

Selection of the total premium as a variable for concentration measurement has been made for the following reasons: premium is the most important component of the insurance company income and as such is the result of its core activity. The data on the premium is easy to reach because we are regularly informed about it by the publications of regulatory agencies responsible for supervision and control of insurance company operations. Also, it is consistent with the production defined limits of the relevant market, because behind the paid premium is the sale of insurance services. As for the selection of spatial dimension (relevant geographic market), for the assessment are taken the entire territories of the countries, as required by the very nature of business and available data. In fact, insurance of every company operating in a particular country is available on the entire territory of the country [3, p. 61].

The data used include 6 consecutive years (from 2004 until 2009). Using the collected data, corresponding values of concentration indicator were obtained, which were used for comparative analysis of the concentration degree of insurance markets of the countries.

Concentration ratio of the four largest companies (CR_4)

Concentrations ratio of the four largest companies is the sum of market shares of the four leading companies [8, p. 95]:

$$CR = \sum_{i=1}^n s_i$$

where s_i is the market share of i company.

Using the given concentration indicator on the example of the insurance market in the five selected countries, the following results were obtained:

Table 1: Comparative analysis of CR_4 index between the selected countries in the period 2004-2009

	Serbia	Croatia	Slovenia	Romania	Austria
2004	89,91	67,65	83,60	53,63	38,01
2005	79,02	67,54	85,81	51,05	38,09
2006	81,15	65,49	82,18	46,93	39,46
2007	81,15	63,96	78,99	46,08	38,97
2008	77,98	63,34	78,30	44,58	38,84
2009	74,20	60,81	78,09	43,47	37,38

Given the standards for assessing the market limitation with CR_4 indicator, which is used in anti-monopoly practice of the USA and EU, we can say that Serbia, Croatia and Slovenia have a high degree of market concentration, while that is not the case with Romania and Austria.

The EU believes that the high degree of market concentration exists when the CR_4 index exceeds the value of 25, while the limit in the USA is 50. The market where the index is above 50 is considered highly concentrated, where the value is 25 to 50 is medium concentrated, and where the value is below 25 is non-concentrated market [3, p. 65]. In the literature there are interpretations that if the value of the index is above 40 it talks about an oligopolistic, and value above 90 about monopoly market.

As can be seen from Table 1, for the Romanian insurance market in most of the observed years (except 2004 and 2005) can be said to belong to medium concentrated market, while for the Austrian insurance market that can be said for all the observed years. Other countries have high concentration level in the observed period. Slovenia and Serbia stand out with the highest degree of concentration as follows: Serbia in 2004 and 2007, and Slovenia in 2005, 2006, 2008 and 2009.

Table 2: The change of the CR_4 index where the base is previous year (ΔCR_4)

	Serbia	Croatia	Slovenia	Romania	Austria
2005	-10,89	-0,11	2,21	-2,58	0,08
2006	2,13	-2,05	-3,63	-4,12	1,37
2007	0,00	-1,53	-3,19	-0,85	-0,49
2008	-3,17	-0,62	-0,69	-1,50	-0,13
2009	-3,78	-2,53	-0,21	-1,11	-1,46

Table 2 shows the change of the CR_4 index where previous year is used as the base of comparison. As we can see in Table 2 in all the observed countries there is a trend toward reduction of concentration degree measured by the index. The following years are exceptions: for Serbia 2006 and 2007, for Slovenia 2005 and Austria 2005 and 2006.

Herfindahl-Hirschman index

Herfindahl-Hirschman index is a convex function of the analyzed companies' market shares, and is therefore sensitive to inequality in the distribution of the market shares. The importance assigned to each company corresponds to the value of its market share ($w_i = s_i$), which implies that the index is determined as the sum of market share squares of individual companies [5, p. 336].

$$HHI = \sum_{i=1}^n w_i s_i = \sum_{i=1}^n (s_i^2)$$

where s_i is the market share of i company.

This index gives a more accurate image of market concentration because the squaring of market shares contributes to the importance of the firms with larger market share.

Table 3: Comparative analysis of the HH index between the selected countries for the period 2004-2009

	Serbia	Croatia	Slovenia	Romania	Austria
2004	2831.92	2052.52	2490.54	984.22	594.22
2005	2270.29	1882.98	2488.81	937.00	592.82
2006	2236.47	1721.32	2291.90	869.37	616.67
2007	2050.62	1601.23	2128.22	835.17	615.22
2008	1820.38	1551.44	2118.98	784.28	607.70
2009	1640.99	1447.31	2054.77	743.91	576.02

Table 4: Referent values of the HH index

HH index value	Supply concentration level
$HHI < 1.000$	Non-concentrated (low concentrated) supply
$1.000 \leq HHI < 1.800$	Medium concentrated supply
$1.800 \leq HHI < 2.600$	Highly concentrated supply
$2.600 \leq HHI < 10.000$	Very high supply concentration
$HHI = 10.000$	Monopoly concentrated supply

Source: Begović, B., Bukvić, R., Mijatović, B., Paunović, M., Sepi, R. i Hiber, D., (2002), *Antimonopolska politika u SR Jugoslaviji*, Centar za liberalno-demokratske studije, Beograd, str. 35.

Looking at Tables 3 and 4 we can reach the following conclusion about the degree of market concentration: the insurance markets of Austria and Romania belong to low concentrated markets; Croatian insurance market belongs to medium concentrated markets (except in 2004 when it was highly concentrated); the market in Serbia transformed into a highly concentrated market in 2004 and in 2009 it become medium concentrated market; in Slovenia, the degree of concentration in the whole period was high.

Table 5: Change of the HH index where the base is previous year (ΔHHI)

	Serbia	Croatia	Slovenia	Romania	Austria
2005	-561,63	-1,73	-169,54	-47,22	-1,40
2006	-33,82	-196,91	-161,66	-67,63	23,85
2007	-185,85	-163,68	-120,09	-34,20	-1,45
2008	-230,24	-9,24	-49,79	-50,89	-7,52
2009	-179,39	-64,21	-104,13	-40,37	-31,68

As for the change of the HH index it can be seen that in all the observed countries (except in Austria in 2006) there is a trend to reduce the market limitation degree.

Lorenz curve

Lorenz curve is an indicator of inequality in the distribution of market shares between individual subjects. Inequality is estimated by deviation of Lorenz curve from the curve of absolute equality (45° curve), which shows a hypothetical situation in which all companies have equal market share.

Figure 1 Comparative description of Lorenz curves for the selected countries in the period 2004-2009

As we can see in Figure 1 there is a general tendency to reduce inequality in the distribution of market shares of companies in the insurance sector in all countries. As for individual countries it can be noted that Romania is leading in the inequality of market shares between companies, because the distance of Lorenz curve from the curve of absolute equality during the observed years is the highest.

We will check the results obtained by using the Lorenz curve with Gini coefficient.

Gini coefficient

Gini coefficient is an indicator of inequality in the distribution of market share among companies that operate in a market. This coefficient is based on the logic of the Lorenz curve and shows the deviation of the Lorenz curve from the curve of absolute equality. A value of 0 indicates that all firms are equal in size, while the value that approaches unity indicates that there is a huge disproportion between the distributions of companies' size. If the value is equal to unity it implies that the entire supply goes to a single company. The value of the Gini coefficient is determined through the following formula [4, p. 205]:

$$G = \left\{ \frac{\sum_{n=1}^N \sum_{i=1}^n x_i}{0,5(N+1) \sum_{i=1}^N x_i} \right\} - 1$$

where N is the rank of firms sorted in descending order from largest to smallest, n is the number of firms included in the calculation, and x_i the firm size measured by the sale value or the total premium.

Table 6: Comparative analysis of the Gini coefficient between the selected countries in the period 2004-2009

	Serbia	Croatia	Slovenia	Romania	Austria
2004	0,7225	0,6746	0,6171	0,7078	0,6369
2005	0,6449	0,6593	0,5820	0,7122	0,6407
2006	0,5949	0,5925	0,5668	0,6840	0,6417
2007	0,6261	0,6086	0,5620	0,6959	0,6290
2008	0,6770	0,6358	0,5623	0,6866	0,6213
2009	0,6610	0,6374	0,6938	0,6772	0,6152

Looking at Table 6, one can conclude that by the inequality of market share distribution the Romanian insurance market stands out, and that Serbia is a leading country according to the inequality of market share distribution in 2004 and Croatia in 2009.

Table 7: Change of the Gini coefficient where the base is previous year (ΔG)

	Serbia	Croatia	Slovenia	Romania	Austria
2005	-0,0776	-0,0153	-0,0351	0,0044	0,0038
2006	-0,0500	-0,0668	-0,0152	-0,0282	0,0010
2007	0,0312	0,0161	-0,0048	0,0119	-0,0127
2008	0,0509	0,0272	0,0003	-0,0093	-0,0077
2009	-0,0160	0,0016	0,1315	-0,0094	-0,0061

Change in the indicator value distinguishes Croatia as a country in which this indicator increases in 2007, 2008 and 2009, and Slovenia where the same process takes place in 2008 and 2009.

Entropy index

Entropy index is another indicator of inequality in the distribution of market shares. It is obtained as the product of market share and the reciprocal values of its natural logarithms, that is via formula [2, p. 15]:

$$E = \sum_{i=1}^n s_i \log_e \left(\frac{1}{s_i} \right)$$

where s_i is the market share of i firm. The value of the index can range from 0 which indicates the existence of monopoly to $E = \log_e(n)$, when there is n company of the same size in the branch. The degree to which a market is concentrated is estimated based on the position of determined value between these two extremes.

The coefficient itself is taken from the information theory to show the degree of decision certainty. If there was only one company in the market, the uncertainty of

customer retention for a monopolist is minimal, because customers practically have no choice. The opposite situation is when there are a number of companies, because then customers can choose and uncertainty of choice increases.

For comparability of the index between the branches and various time moments, its relative value is used in the analysis. Because of the unevenly defined high threshold, the results can be incomparable between the market structures that contain in itself different numbers of companies, so it is necessary to find a comparable indicator, and it can only be the index of relative entropy [4, p. 203].

$$RE = \frac{E}{\log_e(n)} = \left[\frac{1}{\log_e(n)} \right] \sum_{i=1}^n s_i \log_e \left(\frac{1}{s_i} \right)$$

As we can see from the table, the largest index of entropy and relative entropy has Austria, which is logical because in this country there is the greatest uncertainty in the selection of some insurance companies. Insurance companies, because of the more noticeable competition, are not sure about the choice of consumers.

Conclusion and research limitations

Concentration indicators are very useful tool in analyzing the degree of market limitation. They give exact assessment of concentration degree and inequality of market share among companies that operate in a market, based on data. As such they are able to give a relatively clear image of companies' potential to use market power in pricing, in determining volume and quality of products and services. However, they are not immune to some problems and limitations.

First, and perhaps most important, is the problem of defining the relevant market or market scope in

production and spatial terms within which to assess market limitations. In the case of market insurance this problem is related to various types of insurance and levels of their substitutability, and the degree of consumers' obligation to use a certain type of insurance. It follows that we can observe the entire insurance market as the relevant product market, and we can specifically distinguish life insurance market and non-life insurance market. Also, it is possible to single out motor vehicle insurance market as a separate market. In this paper, we opted for a complete insurance market. The framework for the analysis was identical for all countries so that data is comparable.

The second problem is related to the inability of indicators to acknowledge certain qualitative characteristics of the market, such as market structure stability, the level of product differentiation, the height of entry barriers, operating cost, etc. Also, these indexes do not include industrial tradition, as well as features and objectives of managers who run the market that is being analyzed. Without consideration of these characteristics the assessment of market limitation, based solely on numbers, can not be complete.

The third problem is related to the size of economy and specific market. Same value of the indicator will not have the same meaning for "small" and "large" economy. In small economy it is normal that because of the small space and low purchasing power there is a higher level of tolerance to high value of concentration indicator. In such economies, a small number of companies operate and market is limited.

Some authors suggest that most of the indicators are correlated and that they alone are not able to show the true nature of a market. The reason for this lies in the fact that no indicator takes into account some of the

Table 8: Comparative analysis of the Entropy index between the selected countries in the period 2004-2009

	Serbia		Croatia		Slovenia		Romania		Austria	
	E	RE	E	RE	E	RE	E	RE	E	RE
2004	1,7240	0,5755	2,1688	0,6824	1,7403	0,6785	2,7269	0,7296	3,1739	0,8072
2005	1,9067	0,6730	2,2017	0,7022	1,7402	0,7003	2,7017	0,7275	3,1837	0,8057
2006	1,8712	0,7091	2,2532	0,7522	1,8537	0,7227	2,7702	0,7510	3,1739	0,8033
2007	1,9281	0,6954	2,3152	0,7490	1,9476	0,7380	2,7842	0,7449	3,1662	0,8094
2008	2,0282	0,6770	2,3711	0,7366	1,9536	0,7403	2,8428	0,7558	3,1825	0,8135
2009	2,1413	0,7033	2,4490	0,7430	1,9669	0,7263	2,8735	0,7640	3,2044	0,8191

important characteristics of the analyzed market, such as market size and coalition potential that exists on it [7, p. 1].

Regardless of the disadvantages faced by concentration indices, they are nevertheless important indicator of market limitation. In order to completely fulfill this role they need to be supplemented with qualitative data on analyzed market characteristics. Only the combination of quantitative and, based on the ingenuity of researchers, qualitative data the degree of market limitation can be well assessed.

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