EMPIRICAL ANALYSIS OF THE HUNGARIAN INSURANCE MARKET[1]

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Abstract: This paper focuses on the market structure of the Hungarian insurance market. After the change of regime, the monopoly situation of the Hungarian insurance market started to develop rapidly. The sector still has a strong oligopolistic character, so it worth examining how close the market is to a state of perfect competition. From the estimated elasticity of total revenues with respect to changes in input prices, we can deduce the market structure based on the methodology of Panzar and Rosse (1987). We estimate the input price elasticity with a static and a dynamic panel model. Our research shows that the structure of the Hungarian insurance market significantly differs from the perfect competition case between 2010 and 2019. The knowledge of the market structure is important for modelling phenomena and new regulations effectively in the sector, which is important for the supervision to be able to protect the costumers.

Keywords: Hungarian insurance market, market structure, Panzar—Rosse model, dynamic panel model.

1 INTRODUCTION

Modelling a sector plays a crucial role in the preparation of new regulations and supervisor decisions. Knowledge of the market structure has a critical role in the maintenance of modelling Systematically Important Financial Institutions. Insurance market is a large and risky sector with a lot of clients all over the world. When market competition rises, the situation of consumers improved as well. On the other end of the spectrum, in case of a monopoly, the costumers are completely vulnerable. Thus, it is an important factor that how strong the competition observed in the market can be.

This research addresses the question about the market structure of the Hungarian insurance sector. Studying the participants of the Hungarian insurance market, the answer is not clear, so it is worth examining the problem more thoroughly. The objective of the study is to determine whether the monopoly or the perfect competition case fits better for the balance sheet data between 2010 and 2019.

The history of Hungarian insurance dates back a long time. In the 1800s, many domestic and foreign insurance companies operated in the country. However, most of them were destroyed during the World War II. In socialism, like in several Eastern European countries [16], insurance has operated as a state monopoly in Hungary since 1952. In 1986, the only insurer company split into the new State Insurer and the Hungária Insurer, and it became allowed to establish new companies. The market started to develop rapidly, foreign companies

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appeared in the market, in parallel the supervisor authority has also evolved. Therefore, after the change of regime, the market has undergone significant transformation.

The structure of the current Hungarian insurance market cannot be clearly defined. According to the Association of Hungarian Insurers in 2019 not less than 31 insurance companies were in the market [10]. Breaking out of the monopoly position, the market has now undergone a major transformation towards perfect competition. On the other hand, in terms of premium income, the top 10 companies cover more than 80% of the market. The position of the market-leading insurers is stable, and their order has changed only slightly in recent years, which does not confirm the hypothesis of perfect competition.

Previous researchers have established several methods, which can be used at empirical analyses of the market structure, see Panzar and Rosse model [13] or Iwata model [7]. The Panzar and Rosse method uses the sum of the factor price elasticities of the reduced form revenue equation to create testable hypothesis about the market structure. Studies over the past decades have provided important information on market structures mainly in the bank industry based on this method in Canada [12], in Italy [5], or in a general way [3],[14]. The method can be used in other markets for instance in cigarette market [15], and the Panzar—Rosse model is often used in the insurance sector also, see [11], [1], [18], or the case study of the Turkish non-life insurance market [9], Italian car insurance [6], Chinese [8], Bulgarian [17] markets or the analyses of the insurance market of Ecuador [4].

The Hungarian insurance market structure is studied empirically indeed rarely, this article fills in this gap by using the Panzar—Rosse method in the case of Hungarian insurance market.

2 THEORETICAL BACKGROUND

The analysis of the insurance market is based on the Panzar—Rosse model [13], which gives testable implications of profit maximizing companies in different market structures. Its great advantage is that the amount of data required for the analysis is relatively small, only the revenues and factor prices of the companies. There is no need for explicit information about the structure of the market. The reduced form revenue equation is the following:

$$\pi = R(y, z) - C(y, w, t) \tag{1}$$

Where $R(y, z)$ is the reduced form revenue function, y is the decision variable and z are further exogenous variables, which influence the revenue function. $\mathrm{C(y, w, t)}$ is the cost function, where w is the vector of exogenous factor prices and t is the vector of additional exogenous variables, that influence the costs.

This simple method assumes profit maximizing companies. The testable expression is the sum of the factor price elasticities of the reduced form revenue equation:

$$H = \sum_i \frac{\partial R^*}{\partial w_i} \frac{w_i}{R^*} \tag{2}$$

Where * means the profit maximizing values.

The paper of Pazar and Rosse [13] gives different theorems about the value of H for competitive and monopolistic markets to be able to distinguish these models. In the case of monopoly, the elasticity is nonpositive ($H \leq 0$). Here monopoly means that the revenue function does not depend on the decision of the rivals. A further assumption is that in the case of perfect competition and monopolistic competition the companies are observed in the long run equilibrium and entry and exit are free in the market. In monopolistic competition $H \leq 1$. In the long run competitive equilibrium the elasticity is unique ($H = 1$). To test the long run

equilibrium the same equation is fitted but the dependent variable is the ROA, which is a proxy of the company's return.

3 METHODOLOGY

To test whether the market is competitive or monopolistic we built empirical models. From the Hungarian insurance market we chose the ten biggest companies and collected the required information about them between 2010 and 2019. In this way we had the opportunity to build a balanced panel dataset with 10 cross-section observations and 10 time periods.
The following equation is estimated with a panel dataset:

$$lnTR = \alpha + \beta_1 lnPL + \beta_2 lnPBS + \beta_3 lnPFK + \gamma LTA + \delta \mathrm{ROA} + \epsilon Life + \zeta \qquad (3)$$

where TR: total revenue, PL: unit price of labor, PBS: unit price of business services, PFK: unit price of financial capital, LTA: ratio of losses paid to total assets, ROA: Return on Assets, Life: ratio of life insurance in portfolio. ROA was omitted from the model as a selection step, because of serious collinearity issue.

These values can be calculated with the financial report of the companies. To see the market structure, we should test the hypothesis about the factor price elasticity (H), that can be calculated as the sum of the coefficients of the factor prices ($\beta_1 + \beta_2 + \beta_3$). Taking the logarithm of the dependent variable and the main three explanatory variables is feasible.[2]

We use two approach of panel modelling, static and dynamic. The static way means that we do not use any autoregressive, lagged variables. The easiest way to estimate a pooled OLS model. It is a simple OLS for panel data. There could be one serious problem, the unobserved effect which hurts the exogeneity assumption. In that case the goal of the estimation is to eliminate the unobserved effect. We can make a within or fixed effects transformation in that case. It means that we take the average of cross-section observations over time and then subtract it from the original equation. In this way all the time constant effects disappear (unobserved effect and all explanatory variables which are constant over time) [19].

The dynamic way uses autoregressive approach, the lag of the dependent variable as explanatory variable. In that case several problems occur during estimation. When the lagged value of dependent variable correlates with the error term, the fixed effect estimation could not solve the problem of endogeneity. Arellano and Bond [2] use Generalized Method of Moments (GMM) estimation, in which they use first differencing to eliminate individual effect. They solve the endogeneity problem by using all the lagged values of dependent variable as instruments. The method is also called one-step GMM in case of panel modelling. The hypothesis about the factor price elasticity (H) could be tested in this specification because the lag of dependent variable and the instruments belong to control variables.

4 RESULTS

We conclude the results of static and dynamic panel models below (see Tab. 1).

[2] To provide positiveness in case of taking logarithm we shifted the values of PBS and PFK with an epsylon above zero. The parameters did not show significant difference after this change-over. The result seems robust.

Table 1: Results of fixed effects and GMM model

	Fixed effect model			***GMM model***		
	Coefficient	*Standard error*	*P-value*	*Coefficient*	*Standard error*	*P-value*
Constant	25.597	0.425	0.000	0.059	0.009	0.000
lnPL	0.002	0.018	0.907	0.005	0.012	0.658
lnPBS	0.042	0.061	0.496	-0.036	0.074	0.622
lnPFK	0.037	0.043	0.390	0.025	0.018	0.162
LTA	-4.536	3.621	0.214	13.129	2.880	0.000
Life	-0.802	0.467	0.090	1.035	0.342	0.003
lnY(t-1)				0.698	0.198	0.000
n	100			80		
t	10			10		
Instruments	-			42		
Sargan test	-			χ^2=53.561 and p-value=0.023		
AR(2) test	-			z=0.211 and p-value=0.833		
$\beta_1+\beta_2+\beta_3=0$	F=1.049 and p-value=0.308			F=0,006 and p-value=0.937		
$\beta_1+\beta_2+\beta_3=1$	F=136.349 and p-value=0.000			F=177.729 and p-value=0.000		

The first model is the fixed effects panel model. The first thing what is obvious is that none of the variables is significant in the model (alfa=1%). It is not a strange phenomenon, multicollinearity could be the reason, which is common in panel models due to the data structure. Below the results of the model we report the two parameter tests. These are simple linear parameter restriction, so we could implement an F test for the sum of coefficients.
In the case of monopoly, the elasticity is nonpositive ($H\leq 0$). In this case that means that the revenue function does not depend on the decision of the rivals. The value of the appropriate test is 1.049 with 30.8% p-value. It means that, we cannot reject the null hypothesis, we accept monopoly market.

In monopolistic competition $H\leq 1$. In the long run competitive equilibrium, the elasticity is unique ($H=1$). The value of the second appropriate test is 136.349 and the p-value is near 0. It means that we reject the null hypothesis, so there is no perfect competition. The result of the two tests shows that the insurance market is a monopoly or a monopolistic competition.

It is rational and realistic to make the model dynamic. In the one-step GMM model we use the lag of dependent variable as an explanatory variable. It is significant, our choice seems appropriate. The model should meet some requirements. The first is the AR(2) test. It is testing the lags' number and model specification. The null hypothesis says that the first lag of Y is enough. The p-value of the test is 83%, so more lags are not needed in the model. The second requirement is the Sargan over-identification test. Due to instruments over-identification could occur in the model. In our model the p-value of the test is 2.3%. This is not unambiguous, it is on the edge of acceptance and rejection. Thus, it could be a limitation here.

The parameter tests ($H\leq 1$ and $H\leq 0$) provide the same result as in the fixed effects panel model. It seems a quite robust result in this way. In the static and dynamic panel estimation we got the same decisions in the hypothesis testing.

5 SUMMARY

We examined the market structure of the Hungarian insurance sector with the help of empirical analysis. Based on the Panzar and Rosse model, we tested input price elasticity. Using a static and dynamic panel model we got the same results. The Hungarian insurance sector is a monopoly or monopolistic competition market. We reject the following null hypothesis: sum

of the parameters of unit price of labour, unit price of business services and unit price of financial capital is one, thus the market is not a perfect competition.

The scope of this study was limited in terms of the time period and the number of companies. Greater efforts are needed to work with a larger sample. Further interesting research question could be the examination of the insurance sector at regional or even European level. Understanding the market structure of Systematically Important Financial Institutions has importance, so a similar study is worthwhile for the banking sector, which would allow a comparison of the two sectors.

References

[1] Alhassan,A. L. Biekpe, N. 2017. Liberalization Outcomes and Competitive Behaviour in an Emerging Insurance Market, African Development Review, Vol. 29, No. 2, 2017, 122—138.

[2] Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The review of economic studies, 58(2), 277-297.

[3] Bikker, J. A., Haaf, K. 2002. Competition, concentration and their relationship: An empirical analysis of the banking industry. Journal of Banking & Finance 26, 2191-2214.

[4] Camino-Mogro, S., Armijos-Bravo, G., Cornejo-Marcos, G. 2019. Competition in the insurance industry in Ecuador: An econometric analysis in life and non-life markets. The Quarterly Review of Economics and Finance, 71, 291–302.

[5] Coccorese, P. 1998. Assessing the Competitive Conditions in the Italian Banking System: Some Empirical Evidence. BNL Quarterly Review, no. 205, 171-191.

[6] Coccorese, P. 2010. Information Exchange as a Means of Collusion: The Case of the Italian Car Insurance Market. Journal of Industry Competition and Trade, 10, 55–70.

[7] Iwata, G. 1974. Measurement of Conjectural Variations in Oligopoly. Econometrica, Vol. 42, No. 5 (Sep., 1974), pp. 947-966.

[8] Jeng, V. S. C. 2015. Competition and Its Variation Over Time: An Empirical Analysis of the Chinese Insurance Industry. The Geneva Papers on Risk and Insurance - Issues and Practice, 40(4), 632–652.

[9] Kasman, A., Turgutlu, E. 2008. Competitive Conditions in the Turkish Non-Life Insurance Industry. Review of Middle East Economics and Finance, 4(1), 1-16.

[10] MABISZ. 2019. Magyar Biztosítók Szövetsége/ Association of Hungarian Insurers. http://www.mabisz.hu [Accessed 20/10/2019].

[11] Murat, G., Tonkin, R.S., Jüttner, D.J. 2002, Competition in the General Insurance Industry, German Journal of Risk and Insurance, Vol. 91, No. 3, pp. 453—81.

[12] Nathan, A., Neave, E. H. 1989. Competition and contestability in Canada's financial system: empirical results. The Canadian Journal of Economics / Revue canadienne d'Economique , Aug., 1989, Vol. 22, No. 3, 576-594.

[13] Panzar, J. C., és Rosse, J. N. 1987. Testing For 'Monopoly' Equilibrium. The Journal of Industrial Economics, 35(4), 443—456.

[14] Shaffer, S. 1983. NON-STRUCTURAL MEASURES OF COMPETITION Toward a Synthesis of Alternatives . Economics Letters 12, 349-353.

[15] Sullivan, D. 1985. Testing Hypotheses about Firm Behavior in the Cigarette Industry. Journal of Political Economy, 1985, vol. 93, no. 3, 586-598.

[16] Tipuric, D., Bach, M. P., Pavic, T. 2008. Concentration of the insurance industry in selected transition countries of Central and Eastern Europe. 1998--2006. Post-Communist Economies, 20(1), 97-118.

[17] Todorov, A. B. 2016. Assessing Competition in the Bulgarian Insurance Industry: A Panzar-Rosse Approach International Journal of Economics and Financial Issues, 2016, 6(3), 872—879.

[18] Uddin, G., Oserei, K., Oladipo, O., Ajayi, D. 2018. Industry Competitiveness Using Firm-Level Data: A Case Study of the Nigerian Insurance Sector pp. 473–492.

[19] Wooldridge, J. M. (2012). Introductory Econometrics a modern approach 5th Edition.