Concentration of the commercial banking market in Hungary[53]

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ABSTRACT The most commonly applied model for measuring the intensity of competition in the banking market is the Panzar-Rosse (PR) model. This model helps to determine whether the market competition on a given market is monopolistic, oligopolistic or fair. The Panzar-Rosse model tends to determine *H-statistic* that summarizes the specific bank interest income (margin) on input price elasticity coefficients. *H* measures the degree of competition and it is the sum of the elasticity coefficients on factor prices of equilibrium interest income. The main advantage of H-statistic is that the indicator whose value lies between 0 and 1 reflects the degree of competition as a continuous variable. The closer the value is to 1, the stronger the competition is and vice versa. H-statistic's data requirement is minor, its estimation is simple. These relationships were examined between 2005 and 2010 in Hungary.

KEYWORDS: bank, competition, degree of concentration

Introduction

In Hungary a two-tier banking system exists, which means that aside the central bank (National Bank of Hungary) subordinated commercial banks, specialized credit institutions and other financial institutions can be found. Banks located on the lower level of the banking system keep direct contact with the business entities; they manage companies' and households' accounts (Szente 2007).

In Hungary, commercial banks are privatized; most of them are in foreign ownership, which ensures the banking system not being too dependent on the central bank. The central bank does not induce excessive careless lending, but helps distressed banks if there is a "real" crisis in the system (Árvai – Vincze 1998).

The banking sector plays an important role in the performance of the economy as a whole. On one hand, their contribution to GDP is significant and on the other hand, efficient market economy would not exist without banks' efficient financial intermediary role. (www.bankszovetseg.hu 2008) Commercial banks' development processes imply concentration, the examination of which may lead to drawing important conclusions.

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Hungarian banks and the competitive situations

Two disputant views prevail in the professional literature of banking competition. The first is the projection of conventional approach (analytical framework formed to industrial organizations focusing on efficient production) on the banking market too, meaning that the stronger competition is also desirable among banks, as it allows to minimize costs, as well as to promote prices of banking services that facilitate the efficient allocation of resources. The other view is that if banks have market power they will use it to charge higher lending rates and pay lower deposit interest rates, hereby increasing transaction costs and distorting consumers' and producers' savings and investment decisions.

First of all, it shall be clear what is meant by bank competitiveness at the assessment of competition among banks. According to Ábel - Polivka (1997), banks' performances need to be evaluated primarily from the consumers' point of view. Nowadays, when banks symbolize the economy, the wealth and the huge failures customers are particularly inspired by the price and the quality of services when choosing a bank. The condition of the banks' effective participation in the competition is thus to meet clients' (consumers') needs as widely as possible.

Previously, a variety of theoretical and empirical studies were carried out to assess bank competition and stability, however, these investigations could not reach a unanimous conclusion. There were studies specifically assessing the impacts of bank mergers, some of which confirmed that the increased market power caused by the mergers reduces risk-taking and also increases profitability. However, other examinations showed just the opposite, according to which increasing diversification due to mergers does not reduce but - on the basis of the "too big to fail" principle - it may also increase risk-taking propensity. Homolya (2011) says that larger institutions tend to apply more advanced operational risk management methods, despite of the fact that there is no significant difference between profitability and risk-taking.

For measuring the degree of competition among the examined banks for the investigated period I also applied the determination of this field's most commonly used H-statistic based on the Panzar-Rosse model[55].

The Panzar-Rosse's H-statistic model

According to models published in professional literature that can be used to describe competition in banking markets two main groups exist: *structural and non-structural approaches*.

55 "Molyneaux (1999), a pioneer in researching banking competition states that in terms of competition it is more important to decrease the distance between the market leader and the second largest bank than the indicators describing overall market concentration degree, since the strengthening position plays an important motivating factor to market players". (Várhegyi, 2010b)

The structural approach in a broader sense includes the examination of hypotheses explaining the relationship between market structure and banks' performances, such as the structure - conduct - performance (SCP) paradigm and the relative market power (RMP) hypothesis.

The SCP hypothesis assumes that higher concentration increases the risk of collusion between banks that enables to achieve greater profit through the use of higher prices. (Móré-Nagy 2003)

The RMP hypothesis assumes that only those banks are able to exercise market power in pricing and thus realizing extra profit that own large market shares and offer well-differentiated products (Farkas 2010).

The structural approach is rarely used to model competition among banks due to its contradictory results; instead, *non-structural* models start to spread that investigate banks' behaviour separate from the market structure. These include the Panzar-Rosse (PR) model, which is the most commonly applied model for measuring the intensity of competition in the banking market. This model helps to determine whether the market competition on a given market is monopolistic, oligopolistic or fair.

The Panzar-Rosse model tends to determine *H-statistic* that summarizes the specific bank interest income (margin) on input price elasticity coefficients. (Bikker–Spierdijk-Finnie 2007) *H* measures the degree of competition and it is the sum of the elasticity coefficients on factor prices (FP) of equilibrium interest income (II), which can be expressed by the following formula:

$$H =_{\Sigma}(\partial II / \partial FP)(FP / II)$$

Panzar-Rosse model states:

- if $H \leq 0$ monopoly equilibrium evolves: each bank operates independently as it would maximize its profit in a monopoly environment or in a perfect cartel (this is more likely in a multiplayer market),
- if $0 < H < 1$ there is monopolistic competition on the market with free entry (the value of H increases with respect to demand elasticity),
- if $H = 1$ perfect competition characterises the market (Várhegyi 2004)

The main advantage of H-statistic estimated with Panzar-Rosse model is that the indicator whose value lies between 0 and 1 reflects the degree of competition as a continuous variable. The closer the value is to 1, the stronger the competition is and vice versa. H-statistic's data requirement is minor, its estimation is simple (Pénzügykutató 2008).

The determination of H-statistic

All commercial banks were involved in the study, which continuously operated during the investigated period (2005-2010) in Hungary. Banks included in the study are as follows in alphabetical order:

1) Banco Popolare Hungary Zrt.
2) Bank of China (Hungary) Close Ltd.
3) Budapest Hitel- és Fejlesztési Bank Rt.
4) CIB Közép-Európai Nemzetközi Bank Ltd.
5) Commerzbank Zrt.
6) Deutsche Bank Zrt.
7) Erste Bank Hungary Rt.
8) Gránit Bank Zrt.
9) Hanwha Bank Hungary Co. Ltd.
10) KDB Bank (Hungary) Ltd.
11) Kereskedelmi és Hitelbank Rt.
12) Magyar Takarékszövetkezeti Bank Rt.
13) Volksbank Hungary Ltd.
14) Merkantil Váltó- és Vagyonbefektető Bank Rt.
15) MKB Bank Nyrt.
16) Országos Takarékpénztár és Kereskedelmi Bank Plc.
17) Porsche Bank Hungária Zrt.
18) Raiffeisen Bank Zrt.
19) Sopron Bank Burgenland Zrt.
20) UniCredit Bank Hungary Zrt.

Table 1. shows the development of the Hungarian banking market's concentration for the investigated period.

Table 1. The development of the Hungarian banking market's concentration

Year	Number of banks	The proportion of large banks (%)	HI - all banks	HI - large banks
a)	b)	c)	d)	e)
2005	20	91.45	1 343	1 333
2006	20	92.13	1 368	1 359
2007	20	91.81	1 352	1 342
2008	20	91.67	1 292	1 281
2009	20	92.60	1 383	1 374
2010	20	92.22	1 363	1 353

Source: Own calculation based on the banks' annual reports

Herfindahl index (HI) - also known as Herfindahl-Hirschman Index (HHI) - is a measure of market concentration. It is defined as the sum of the squares of the market shares expressed in percentage, a concentration index for measuring banks' size structure.

The value of HHI ranges from 0 to 1. Values close to 0 mean that there is a huge number of players in the market with low market shares, whereas values close to 1 reflect a monopolistic or at least an oligopolistic situation.

It can also be expressed as a percentage (HI); in this case the index ranges from 0 to 10.000. This is actually the sum of squares of market share percentages[56].

Herfindahl index (HI) in the table is determined by analysing all the examined banks' market shares, results are shown in column d). HI was further examined in relation to the large banks[57], it is included in column e).

By determining the value of the index I examined each bank's market share separately and the percentage of their annual balance sheet total out of all banks' balance sheet total. The market shares in percentages were squared, and then summed.

It can be seen that HI values have not been significantly changed between 2005 and 2010 neither in case of all banks nor in case of large banks. The concentration of the banking market slightly reduced only in 2008 during the investigated period.

In terms of market power it is important to note that the HI values of large banks are almost the same as it is for all the examined banks each year. In my opinion, this is mainly due to that - as it is shown in column c) of the table - large banks' balance sheet total exceeds 90 percent of the banking sector's balance sheet total.

"According to the competition rules of the United States of America Herfindahl index below 1000 indicates an unconcentrated market, values between 1000 and 1800 indicates moderate concentration while values above 1800 indicates high market concentration". (Várhegyi 2003, p. 1032) On the basis of the above, I concluded that the banking market in Hungary was moderately concentrated in the investigated period.

Following the definition of the banking market's concentration, I searched to find an answer for the intensity of competition in Hungary in a balanced market structure and how it changed between 2005 and 2010. During my research I analysed the lending market competition[58]. Basically, the main source of banking income is interest income which is largely dependent on what margin banks can

56 In Hungary, the HFSA and the central bank have been monitoring the Herfindahl index of our banking system since 1990. In 2005 Hungary's Herfindahl index was 795, in 2010 it was 1007. (Kis, 2011)

57 Large banks: BB, CIB, Erste, K&H, MKB, OTP, Raiffeisen, UniCredit

58 The banking market can not only be characterized on the basis of the credit market competition. Banks have some quality characteristics, which can not be measured and they have other measurable factors besides interest, on which banking market can also be characterized, such as fees, commissions, and other associated costs.

apply between loan and deposit interest rates. In the Panzar-Rosse model market power is measured by how a unit change in input prices is reflected in the equilibrium income of a given bank (Várhegyi 2003).

To determine *H-statistic* in the period of 2005-2010 altogether 120 panel data were used for the total of 20 banks. The parameters of the linear regression model were determined by SPSS 16.00 statistical software package. The model was run by the ENTER procedure, in which all independent variables are simultaneously included in the model and their combined effect is examined. The test model's independent variables were as follows:

x_1 = interest payables (million HUF)

x_2 = general administrative cost (million HUF)

x_3 = income on other (non-interest rate) assets (equity capital plus interest-bearing assets (securities held for trading + securities held for investment + bank and interbank deposits + loans)) (million HUF)

x_4 = bank-specific factor affecting interest income - the ratio of loans to total assets (%)

x_5 = bank-specific factor affecting interest income - equity on assets (%)

The dependent variable of the model is y_1 = interest income (also called interest margin or interest spread).

The results

The classic Panzar-Rosse model distinguishes three factor prices: the interest expense, personnel expenses and the costs of physical capital and materials. *In my research I differentiated only two factor prices as in the Hungarian banks' public profit and loss statements only the general administrative expenses summarizing other costs can be extracted besides interest payables.*

Table 2. Interest income equation's estimated results for all investigated banks - ENTER procedure

Model	R	$\mathbf{R^2}$	Adjusted R-squared	Standard error of the estimate
1	0.974a	***0.949***	0.947	0.41177

Source: Own calculation

Two significant variables can be identified by having the model evaluated by the ENTER procedure: the general administrative costs and the ratio of loans to total assets (Table 3.).

Table 3. Significant variables of the interest income equation's estimated results for all investigated banks

Model		Un-standar-dized coeffi-cients		Standar-dized co-efficients	t	The t-test's empirical significance level	Measurement of multicollinearity	
			Standard error	Beta			Tolerance index	VIF
1	(Constant)	-5.251	0.663		-7.919	0		
	ln (general administra-tive cost)	0.221	0.093	0.209	2.379	0.019	0.058	17.184
	ln (interest payables)	-0.015	0.069	-0.019	-0.219	0.827	0.062	16.091
	ln (income on other (non-interest rate) assets)	0.839	0.124	0.847	6.752	0	0.029	35.055
	ln (the ratio of loans to total assets)	0.211	0.065	0.079	3.264	0.001	0.772	1.295
	ln (equity on assets)	0.44	0.094	0.148	4.666	0	0.449	2.227
a. Depen-dent variab-le: ln (II)								
	Number of panel data:	120						
	Value of H-statistic	0.221						

Source: Own calculation

In the determination of the value of H-statistic the model's explanatory power (r^2) is 94.9%. This means that the independent variables of Table 3. anticipate a change in the value of H-statistic with 94.9% probability.

The H-value summarizing the estimated coefficients of the factor prices affecting interest income is 0.221, which is highly significantly different from 0 and 1, meaning that in the period of 2005-2010 neither cartel, nor perfect competition characterized the Hungarian banking market. *My estimation showed weak oligopolistic competition for all banks.*

It is also worth mentioning that the interest payables are not significant in this case, since the empirical significance level of the T-test is 82.7%.

Continuing the investigation I also determined the value of the H-statistic for size categories whose result can be seen in Table 4. and 5.

Independent and dependent variables of the study are the same as those used at the determination of H-statistic.

Table 4. Interest income equation's estimated results by size categories - ENTER procedure

X3 - Size (large / small and medium)	Model	R	$\mathbf{R^2}$	Adjusted R-squared	Standard error of the estimate
1 small and medium	1	0.896a	***0.802***	0.787	0.49043
2 large	1	0.947b	***0.897***	0.885	0.19492

Source: Own calculation

In the determination of the value of H-statistic the model's explanatory power (r^2) is 80.2% in case of small and medium-sized banks and it equals 89.7% in case of large banks. This means that the independent variables anticipate a change in the value of H-statistic in case of small and medium-sized banks with 80.2% probability and in case of large banks with 89.7% probability.

Table 5. Interest income equation's estimated results' significant variables by size categories

X3 Size (large / small and medium)	Model		Unstandardized coefficients		Standardized coefficients	t	The t-test's empirical significance level	Measurement of multicollinearity	
				Standard error	**Beta**			**Tolerance index**	**VIF**
1 small and medium	1		-5.798	1.376		-4.213	0		
		ln (general administrative cost)	0.122	0.148	0.093	0.823	**0.414**	0.24	4.164
		ln (interest payables)	-0.01	0.102	-0.016	-0.101	**0.92**	0.116	8.649
		ln (income on other (non-interest rate) assets)	0.94	0.183	0.949	5.15	0	0.09	11.149
		ln (the ratio of loans to total assets)	0.215	0.085	0.167	2.523	0.014	0.693	1.443
			0.484	0.137	0.297	3.528	0.001	0.43	2.326
2 large	1	(Constant)	2.612	1.949		1.34	0.187		
		ln (general administrative cost)	0.689	0.126	0.563	5.487	0	0.233	4.3
		ln (interest payables)	-0.139	0.102	-0.18	-1.359	0.181	0.14	7.136
		ln (income on other (non-interest rate) assets)	0.401	0.146	0.375	2.748	0.009	0.132	7.603
		ln (the ratio of loans to total assets)	-0.87	0.226	-0.253	-3.85	0	0.566	1.766
		ln (equity on assets)	0.134	0.107	0.076	1.26	0.215	0.674	1.485
a. Dependent variable: ln (II)			**small and medium**	**large**					
		Adjusted R2	0.787	0.885					
		Number of panel data	72	48					
			0	**0.689**					

Source: Own calculation

The H-value summarizing the estimated coefficients of the factor prices affecting interest income is zero in case of small and medium-sized banks, as neither of the two factor prices (interest payables and general administrative costs) is significant.

In case of large banks H-value is 0.689, which is significantly different from 0 and 1, meaning that in the period of 2005-2010 neither cartel, nor perfect competition characterized the market of large banks. *My estimation reflected medium or slightly stronger monopolistic competition for large banks.*

On the basis of the above investigations I found that in Hungary 8 large banks give more than 90 percent of the banking sector's balance sheet total. In my view, small and medium-sized banks do not play a major role in the banking market competition due to their small proportion, therefore, banking competition can be considered as the competition of large banks.

According to the general view competition improves the banks' efficiency and thus their growth as well. The competitive environment is encouraging to banks' operations and thus their market shares can increase and indirectly their efficiency can be improved. (Northcott 2004) I fully agree with the author on this view.

Conclusions

Hungary's banking system significantly differs from other national economies of the world and even from our own region. It is characterised by a high degree of foreign ownership, while the Hungarian-owned banks play a subordinated role in the system of commercial banks. The number of banking sector players is relatively high compared to the size of the market. The market structure evolution resulted in 5-6 strong universal banks dominating the Hungarian banking market, while the number of medium-sized banks stabilized at around 10-12.

The competition among Hungarian commercial banks is oligopolistic according to its nature, the banking market is moderately concentrated and it is unlikely to change in the coming years. The banking sector's competition is practically the competition of the eight large banks since the eight large banks give the market share of over 90 percent.

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