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BANK COMPETITION IN HUNGARY*

É. VÁRHEGYI

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The Hungarian banking system underwent significant transformation during the last ten years. The early opening of the market, the fairly liberal legislation and the privatisation strategy preferring professional investors brought many foreign banks into the country. Due to the entry of capital-abundant banks, former monopolistic positions eroded rapidly, concentration decreased and the size distribution of the banking system became more even. Beginning from the mid-90s, the effects of cross-border competition also began to show up, especially in corporate markets, where foreign credits became more and more dominant. Do these factors imply that the Hungarian banking sector can be characterised by features of a competitive market?

Keywords: banks, competition, market structure, concentration, collusion, interest rates, Hungary

JEL classification index: G21, L11, L13

INTRODUCTION

Quite many signs indicate that competition in the Hungarian banking sector has been increasing over the past decade. The high number of players, the ever more balanced market structure, the fading of market segmentation together with the subsequent erosion of oligopolies, the advent of cross-border financial services, and the strengthening non-banking competition could have all contributed to making competition fiercer. However, other factors point out the sustained opportunity to gain an oligopolistic rent in certain market segments. Indicated by the excessive profitability of the industry as a whole and also by the profitability of individual banks, the interest margin that continues to be high by international standards, coupled with weak cost efficiency, it seems that the majority of banks are able to pass on their high costs to their customers.

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Correspondence: É. Várhegyi, Financial Research Ltd., Felhévizi út 24, H-1023 Budapest, Hungary. E-mail: evavarhegyi@axelero.hu

The article will examine bank competition according to the traditional definition of competition. In this approach, increasing competition is desirable among banks because it ensures the minimisation of costs and the setting of such prices that guarantee an efficient allocation of funds. Neither the criticism of bank competition appearing in the information economics literature (Allen et al. 2001; Canoy et al. 2001), nor the possible trade-off between competition and stability (Carletti – Hartmann 2002) will be addressed here, because we believe that these phenomena cannot be assessed until bank competition has been clearly described. However, competition in the Hungarian banking sector has so far been a rather neglected area of research (Világi – Vincze 1996; Ábel – Polivka 1998; Árvai 1999; Tóth 2000; NBH 2003).

Bank competition in Hungary will be examined using a structural approach on the one hand, and behavioural models on the other. The structural approach assumes that competition can be best increased by influencing the market structure or, conversely, competition can be protected by forestalling the emergence of market dominance. According to the Structure–Conduct–Performance (SCP) hypothesis, which establishes a potential relationship between market structure and competition, a concentrated market structure permits collusive behaviour, which transforms concentration into market dominance. This, in turn, provides the banks with oligopolistic incomes.

Several empirical studies have tested the SCP hypothesis, but not all of them could confirm the relationship between market structure and profitability. The hypothesis was corroborated by the model estimation of Corvoisier and Gropp (2002), which, through an examination of the European banking systems of the 1990s, showed that banks can earn higher margins on the more concentrated markets than on the less concentrated ones. However, Scholtens (2000) did not find a significant correlation between average profitability and the degree of concentration, which means that market concentration does not necessarily produce monopolistic profits at the national level. Bikker and Haaf (2001) argued that although the elasticity of interest income against input prices does, in theory, diminish the opportunity of gaining monopolistic profits, competition that is weakened by concentration does not necessarily lead to a monopolistic rent.

These conflicting findings should not come as a surprise. Indeed, two alternative theories can refute the SCP hypothesis. One is the hypothesis of efficient structure, which states that higher profits on concentrated markets can be attributed to higher efficiency, rather than to market dominance (Bikker – Groeneveld 1998). The other alternative theory is based on contestability. If the barriers of entry are low enough, a concentrated market may behave similarly to a competitive market since the threat of potential new entrants may force banks with a large mar-

ket share to apply competitive prices. The empirical existence of the theory of contestability has been supported by several model estimations (Molyneaux 1999; Demirgüc-Kunt et al. 2003; Claessens – Laeven 2003).

The controversial findings of the structural approach to competition tacitly support the non-structural view of bank competition which examines bank behaviours in isolation from the market structure. Behavioural models most often used to measure the degree of competition are based on the PR model characterising monopolistic, oligopolistic and competitive bank markets, and aim to determine the *H*-statistics, which summarises the elasticity coefficients of the banks' interest margin against input prices (Panzar – Rosse 1987; Bikker – Haaf 2001). This is comprised of three elements: the sum of the elasticity coefficients of interest expenses, staff expenses, and the cost of physical capital and fixed assets against interest income. The PR model assumes that

– if $H \leq 0$, a monopoly balance is emerging: each bank is operating separately as if they were maximising their profits in a monopolistic situation or in a perfect cartel (the latter being more likely in a multi-player market);
– if $0 < H < 1$, the market is characterised by monopolistic competition, with free entry (H is increasing as a function of the elasticity of demand);
– if $H = 1$, the market operates in a perfect competition.

Since different estimations seem to agree that the overwhelming majority of modern banking systems is characterised by monopolistic competition, more sophisticated versions of the PR model have been developed for the study of the deeper-level nature of bank competition, which attempt to explore collusive behaviour (Bresnahan 1982; Coccorose 2002). The absence or existence of collusion, and the degree of coordination can be verified by the coordination parameter produced from the conjectural variation oligopoly. (The model will be dealt with in more detail in the section on the loan market, where the estimation results for the Hungarian bank market will also be analysed.)

The study will first examine competition in the Hungarian banking system in the past decade applying a structural approach. Next, bank competition in the period of 1995–2002 will be described with the help of behavioural models, using individual statistics of major market players. Separate sections will be devoted to the loan market, where banks have a price-setting role, and to the deposit market, where a price-accepting behaviour is more likely to exist on account of non-banking competition. Finally, we shall attempt to draw conclusions that reflect reality accurately on the basis of the rather controversial estimation results.

STRUCTURE, EFFICIENCY AND COMPETITION IN THE HUNGARIAN BANKING SECTOR

In our investigation of bank competition in Hungary we first analyse the market structure and the ratios of profitability and efficiency; in other words, we attempt to grasp bank competition within the framework of the SCP paradigm. On the one hand, we shall examine how structural features of the bank market (size structure, contestability) have recently changed in the market as a whole and also within major market segments, and what assumptions can be formulated with respect to competition. On the other hand, we shall explore the relationship between market structure and efficiency, based on the logical assumption that if the structural changes have influenced competition they could have repercussions in efficiency as well.

Market structure and contestability

In the 1990s the degree of concentration diminished in the Hungarian banking sector and, after a slight increase in 2001, the tendency continued in 2002 *(Table 1)*. Market entries played the central role in this process, which began back in the late 1980s following the liberalisation of bank establishment, and picked up in the first half of the 1990s. While the entries potentially strengthening competition were typical in the early 1990s, exits and mergers as signs of competition began to proliferate in the second half of the decade (Majnoni et al. 2003).

The degree of concentration also dropped in the major market segments. In the private deposit market the Herfindhal index (HI) fell to about 1600 in 2002 from 5000 in 1992. However, a clear sign of an imbalanced market was that while the

Table 1

Concentration on the Hungarian bank market*

	1991	1993	1995	1997	1999	2000	2001	2002
Number of banks	37	42	44	43	39	38	37	35
Market share of the largest 3 banks (%)	58	54	47	45	38	38	46	45
Market share of the largest 5 banks (%)	76	69	62	58	52	52	60	59
Herfindahl index (HI)**	1565	1461	1313	1113	1012	993	1024	986

Notes: * Without savings co-operatives, building societies, Hungarian Development Bank and Eximbank.

** HI is equal to the sum of squares of market shares. According to the US competition rules, the market is not concentrated under HI value of 1000, moderately concentrated between 1000 and 1800, and highly concentrated above 1800.

Source: Own calculations on the basis of banks' reports.

two largest banks controlled half of the market between them, even the most powerful behind them had as little as 3–6%. The different types of loans show a significant variance. Although the concentration index of home loans fell from 10,000 in the first half of the 1990s, it still stood at above 3000 in 2002, which is an extremely high degree of concentration. The main reason for this is that half of such loans have been extended by the OTP, Hungary's largest bank. The concentration index of consumption and other loans decreased to about 1000 in 2002 from about 2000 in the mid-1990s. The HI on the corporate loan market went down to 626 from 1050 between 1992 and 1999, and then picked up in 2001 (as a result of two bank mergers), reaching 962 by the end of 2002, which does not qualify as a concentrated market. The same applies to the market of corporate deposits. The situation on the corporate markets is much more balanced than in the retail sector: three banks have an 11–13% share each, followed by three others with market shares of 7–9%.

Consequently, size structure has improved in most market segments, or has not reached a degree of strong concentration in segments where it has deteriorated. Equally important is the finding that the market power of leading banks (in each market segment) has decreased, while "runners-up" with the potential of gradually catching up with the top-ranking organisations have appeared.[1] On the other hand, the overpowering position of the largest bank decreased, but did not disappear. Vulnerability increased basically only on the corporate bank markets, where not only the number and the position of the domestic rivals was growing, but also cross-border (international) competition had an impact (Várhegyi 2002).

STRUCTURE AND EFFICIENCY

It may safely be assumed that the fiercer the competition, the less able banks are to raise their incomes through high margins, whereas weak competition allows them to pass on their operating costs. The question is whether, given the more balanced market structure and the emergence of contestability, the industry has reached a level of competition that forces banks to operate more efficiently.

Except for 1999, which reflected the impact of the Russian crisis, return on assets (ROA) in the industry was above the EU average level between 1994 and 2002. Return on equity (ROE) in real terms was often negative in the 1990s, but has been favourable since 2000 (*Table 2*).

[1] Molyneaux (1999) asserts that decreasing the distance between the market leader and the "second" bank is more important in terms of competition than the degree of concentration on the whole market.

Table 2

Profitability and efficiency in the Hungarian banking sector (%)*

	1995	1997	1999	2000	2001	2002	EU 2001
Profitability:							
ROA	1.44	1.17	0.49	1.32	1.43	1.49	0.57
ROE	22.2	14.8	5.8	17.5	16.8	20.2	13.2
Net interest income/assets	5.1	4.2	3.9	3.8	3.8	3.4	1.6
Efficiency:							
Gross income/assets	7.2	5.9	5.1	5.6	5.8	5.4	2.6
Operating cost/assets	3.4	3.7	3.8	3.6	3.3	3.2	1.7
Operating cost/gross income	47.9	61.8	74.4	64.4	57.5	58.6	65.3

* Without savings cooperatives, building societies, Hungarian Development Bank and Eximbank.
Source: Hungarian Financial Supervisory Authority (PSZÁF), ECB and own calculations on the basis of banks' reports.

The continuous decrease in net interest income and gross income divided by assets shows that today banks are able to raise their income by introducing wide margins to a smaller extent than in the mid-1990s, which phenomenon can also be attributed to increased competition. Still, the interest margin was more than double the Community average in 2002, and besides, similar difference exists in terms of gross income divided by assets. This figure, combined with operating costs amounts to about twice the EU average, indicating that at a lower level of efficiency higher profits can be reached in Hungary than in the Community, which is also a consequence of weak competition.

The role of competition in profitability is also confirmed by the fact that the gap between deposit and lending rates is smaller on the corporate market exposed to international competition than in the EU, while it is much higher than the corresponding EU figure on the "secluded" retail bank market. At the end of 2002, the lending/deposit margin was 2.3% on the Hungarian corporate bank market against the EU average of 3.4%, while the margin stood at 12.8% with consumption loans against the corresponding 7% in the Community. This raises the suspicion that because of the limited competition some Hungarian banks still enjoy the opportunity to gain an oligopolistic rent on the retail market.

Thus, the market structure and the profitability/efficiency ratios paint a controversial picture about competition in the Hungarian banking sector. On the one hand, increasing competition is signalled by the facts that a more balanced distribution of market power and a greater threat of contestability have improved cost efficiency and reduced the costs of financial intermediation. On the other hand, in an international comparison, high interest margins and profitability, and low efficiency indicate that competition is still insufficient in Hungarian banking, at least

on the retail markets where banks can pass on their high unit costs to their customers.

Further research is needed to ascertain whether this is really the case. In the following two sections, the price competition on the Hungarian banking market will be described with behavioural models. First, statistical figures available on individual banks will be used to estimate the degree of competition and cooperation between banks. Since these models can only be applied to the loan market, and even there a "one-product" abstraction must be used, we shall conduct further investigation to explore competition on different market segments.

COMPETITION ON THE HUNGARIAN LOAN MARKET

How strong is bank competition in Hungary, and how has it changed recently? To answer these questions, we first have to describe the loan market. In pricing deposits banks are assumed to be essentially price-accepting, in other words deposit rates are primarily determined by the money markets. In theory the assumption could be valid since an increasing share of financial savings (two-thirds in 2001–2002) goes into non-bank instruments.

According to this approach, price competition between banks can be observed on the loan market. Here, customers choose between lending products of particular banks (the condition of product differentiation applies), and their choices are mainly determined by lending rates. Banks' deposit rates appear as input costs, similarly to costs of other factors that are necessary for the bank's operation (labour, capital, tangible assets). The existence or absence of bank competition can be assessed by examining how lending rates respond to changes in the input costs. We shall investigate three questions:

(1) How strong is the competition, and has this changed over the past eight years?
(2) How typical is the banks' collusive behaviour?
(3) What are the main features of the key market segments?

Degree of competition

First, we estimate the so-called *H*-statistics, the most widely applied method in the literature to test the competitive behaviour of banks, in order to be able to decide what the degree of competition is in Hungary today, and whether it has increased over the past years. The latter assumption is justified not only by decreasing market concentration but also by the research findings that have established a positive

correlation between rising foreign ownership and increasing competition in the banking systems of the emerging economies (Gelos – Roldós 2002).

In the Panzar–Rosse model (1987), market power is measured by the extent to which a unit change in input prices is reflected in the given bank's equilibrium income. The coefficients required to compute the *H*-statistics can be estimated from the following reduced equation of net interest income (Bikker – Groeneveld 1998; Bikker – Haaf 2001; Belaisch 2003):

$$\ln IR = a + \Sigma\, b_k \ln FP_{\mathrm{k}} + c \ln OI + \Sigma d_j \ln BSF_{\mathrm{j}} + j \qquad (1)$$

from which: $H = \Sigma\, b_k$.

The equation uses the following notations: *IR* for interest revenue as a percentage of interest-bearing assets (margin), *FP* for factor prices, *OI* for other (non-interest) income divided by assets, and *BSF* for bank-specific factors influencing interest income. The classical model distinguishes between three factor prices: interest expenses, staff expenses, and the cost of physical capital and materials. However, since profit and loss accounts disclosed by Hungarian banks indicate interest expenses and total operating costs only, we have to use a model with two factor prices for the computation of *H*. In the light of the published estimation results this approach will not modify the estimation for *H* significantly, since from among elasticity coefficients interest expense has a decisive role, followed by staff expenses, while the cost of capital carries little, mostly insignificant weight. The published estimations lead us to the assumption that the combined elasticity coefficient of labour and capital costs bears the same sign as operating costs, and its magnitude is also similar.

The Panzar–Rosse model assumes that observations in a given banking system reflect a long-term equilibrium; in other words, after the deduction of risk factors (for instance gross income divided by assets or equity) the profitability ratios will level off between the banks. An equilibrium condition exists if upon the substitution of these profitability ratios for the dependent variable in equation (1), the input price coefficients give a total of 0. In our case, the equilibrium hypothesis cannot be falsified for the equation written up for gross income divided by equity at a 99% (OLS estimation) and a 92% (GLS estimation) level of significance, or for the equation for gross income divided by assets at 89 and 93% levels of significance, therefore the model can be applied for the investigation of competition in the Hungarian banking system.

We also wanted to find out whether the *H*-statistics, which measures the degree of competition, varied in the period surveyed, that is between 1995 and 2002, when the market structure and the ownership in the Hungarian banking system underwent major changes. Therefore, using the specification of Bikker and Haaf

(2001), an exponential time variable was also incorporated into the income equation. This gives the following equation and *H*-statistics:

$$\ln IR = a + (b_1 \ln IE + b_2 \ln OC)\, e^{cT} + d \ln OI + f \ln FM + g \ln LA + h \ln OC + \varphi \quad (2)$$

where $H = (b_1 + b_2)\, e^{cT}$.

In addition to the notations defined for equation (1), here *IE* stands for interest expenses as a percentage of interest-bearing assets, *OC* for own capital to total assets and *T* for time. A preliminary screening of the potential variables led us to employ the following bank-specific factors: *FM* is the funds managed, which reflects the bank's income-generating ability and also represents the bank's size; *LA* is total lending balances to total assets, and *EA* is equity divided by total assets. The last two factors measure the effect of the bank's counterparty risk exposure on the income.

The estimation was carried out on the basis of the annual statistics of 18 banks between 1995 and 2002, a panel of data that included a total of 140 observations.[2] In 1995 these banks, selected on the basis of their market role, accounted for 79% of total assets, 83% of lending balances, and 84% of the funds managed. The same proportions stood at 77, 75 and 81%, respectively, in 2002. The sample may be regarded as providing an adequate representation of competition in the Hungarian banking system, since the dozen or so banks not included in the sample controlled some 20% of the market, and none had a higher than 2% market share in the period surveyed.

We estimated four models. In order to be able to test the sensitivity of H, insignificant or less significant explanatory variables (Models 2 and 4) were deleted from both basic models (Models 1 and 3). Our findings show that this did not significantly influence the estimated values of *H (Table 3)*.

A total of the estimated coefficients of the factor prices that affect interest income, *H,* shows a highly significant deviation from 0 as well as 1 in either model; consequently, one can safely assert that neither a cartel, nor a perfect competition existed in the Hungarian banking system in the given period. The models without the time variable produced *H* at the levels of 0.58 and 0.56. In the models with the time variable, *T*'s coefficients is significantly positive, and *H* increased from 0.65 to 0.67, and from 0.58 to 0.62 in the 1995–2002 period. Thus, our estimations reflect medium or stronger monopolistic competition, and confirm our earlier hypothesis that increasing competition had a role in falling interest margins.

[2] In each year in the 1995–2002 period the sample included 16 banks. They were: ÁÉB, BB, CIB, Citibank, Erste, HVB, IEB, ING, K&H, Konzumbank, MKB, OTP, Postabank, Raiffeisen Bank, Volksbank, WestLB. In addition, two banks ABN Amro and Hypobank were in the sample up to 2000, when they merged with other banks that had already been in the sample.

Table 3

Empirical results of the reduced-form revenue model

Estimation method	Without time variable (panel estimation with random effect and OLS)		With time variable (instrumental estimation, iterative WLS)	
Variables	Model 1	Model 2	Model 3	Model 4
Time (T)	–	–	0.003* (1.6)	0.010*** (4.9)
Interest Expenses (ln IE)	0.669*** (28.3)	0.666*** (25.4)	0.656*** (31.4)	0.628*** (33.1)
Operating Cost (ln OC)	–0.090***(–2.6)	–0.107*** (–2.9)	–0.005 (–0.2)	–0.052* (–1.8)
Other Income (ln OI)	0.021 (1.2)	–	0.047*** (3.9)	–
Funds Managed (ln FM)	0.029* (1.9)	–	–0.075*** (–3.4)	–
Loan/Assets (ln LA)	–0.824* (–1.8)	–0.799*** (–13.4)	–0.880*** (–22.5)	–0.933*** (–32.6)
Equity/Assets (ln EA)	–0.028* (–1.9)	0.024* (1.8)	0.011 (1.0)	0.083*** (6.3)
adjR^2	0.95	0.95	–	–
D-W	1.49	1.53	–	–
Number of observations	140	140	140	140
H-value[a]	0.58	0.56	0.65–0.67	0.58–0.62

Notes:
Dependent variable: Interest Revenue (ln IR).
t-values for the parameter estimates in parentheses.
* significant at 10 % level, ** significant at 5% level, *** significant at 1% level.

Of the factor prices that affect the interest margin, the interest expense coefficient takes on a highly significant positive value in both models, and is less sensitive to the model specification, while the operating cost coefficient is of a less significantly negative value, and exerts a much weaker impact on the interest income.

Other (non-interest) income is significant in the time variable models, and has a positive sign, which indicates that fees and commission complement rather than replace interest income in the Hungarian banking system. Of the bank-specific explanatory variables, the coefficient of funds managed *(FM),* which represents bank size, is positive in one model but negative in the other. Consequently, the assumption of the SCP hypothesis that market power is converted into a monopolistic rent has not been fully confirmed. The coefficient of lending balances to assets *(LA)* is significantly negative and extremely stable, which reflects a rather surprising situation: a larger role (and risk exposure) in banking intermediation did not increase the interest income, but rather reduced it.

Is collusive behaviour typical in the Hungarian banks?

The result that *H,* which measures the combined elasticity of interest income with respect to input prices, falls significantly between 0 and 1 can lead us to conclude nothing more than that there is neither a perfect cartel nor a perfect competition on the bank loan market. However, a medium-strong monopolistic competition does not at all exclude the possible cooperation of banks when pricing loans. The potential collusion of banks may be verified through the examination of what is referred to as conjectural variation oligopoly in game theory. This describes a kind of corporate behaviour where expected responses of competitors are also considered when making strategic decisions. With respect to the bank market, this would mean that when a bank prices its loan products it also takes into account the interest rates charged by other banks. This assumption seems reasonable on the Hungarian loan market since the field is relatively level, as it was shown in the structural analysis. Consequently, hardly any bank could afford to disregard prices of the competition.

Coccorese's (2002) model will be used to investigate the existence of collusive behaviour. The model assumes that the banks have differentiated products, and that there is a price competition. The demand for loans of a particular bank depends on the lending rate it applies, the interest rates of the competition, and other exogenous factors. The model views the loan market as a duopolistic one, where each bank is confronted with a single rival described by the average of the other banks; in other words, the demand for its loans depends, in addition to its own lending rates, on the average interest rate the other banks charge. Provided the de-

mand for loans is elastic against the interest rates, a rise in own interest rates decreases the demand for the particular bank's loans, while a rise in the interest rates of the others increases this demand. Thus, in the demand function, the own price elasticity has a negative sign, and the cross-price elasticity has a positive sign. In the model the cost function of a given bank depends on the loan balances it extends and the price of the input factors.

Measuring the degree of coordination, the parameter of conjectural variation (λ) reflects the elasticity of a given bank's lending rate with respect to the interest rate of the other banks. A positive value of λ indicates that the given bank expects rival banks to adjust to its own price, and through this collaboration they can achieve a level of interest income that generates adequate profits. In the case of perfect collusion $\lambda = 1$. If $\lambda = 0$, the bank does not at all take into account the interest rates of the competition when establishing its own. Finally, a negative value of λ reflects the bank's expectation that if it raises the price (interest rate), the rivals, acting upon the logic of a competition market, will decrease theirs. In theory, an infinite negative value of λ denotes perfect competition, because in this case the price equals the marginal cost.

Adapting Coccorese's two-factor price model, λ will be estimated from the following reduced system of equations:

$$\ln LB = a + b \cdot \ln BIR + c \cdot \ln OIR + d \cdot \ln MAKRO + e \cdot \ln BN + \varepsilon$$

$$\ln TC = f + g \cdot \ln LB + \cdot\frac{h}{2} \ln^2 LB + i \cdot \ln IE + j \cdot \ln OC + \ln LB \cdot \cdot (k \cdot \ln IE + l \cdot \ln OC) + m \cdot \ln^2 IE + n \cdot \ln^2 OC + o \cdot \ln IE \cdot \ln OC + \varphi \quad (3)$$

$$BIR = AC \cdot (g + h \cdot \ln LB + k \cdot \ln IE + l \cdot \ln OC) - \frac{1}{\left(\frac{b}{BIR} + \lambda \cdot \frac{c}{OIR}\right)} + \gamma$$

LB denotes the given bank's lending balances, which represents the demand for loans in the model. *BIR* stands for bank's own interest rate, and *OIR* for the average of the lending rates applied by other banks (the interest rates are represented by interest income in relation to interest-bearing assets). In one specification (Model 1) the macroeconomic variable affecting the demand for loans *(MACRO)* will be GDP at constant prices, while the deposit balances (DB) in the banking system (at constant prices) is included in another (Model 2). The latter reflects the expansion of banking intermediation, and under the Hungarian circumstances it

has a more significant influence on the demand for loans than *GDP*, which describes general growth. The relative weight of the bank's branch network *(BN)* will be used as the bank-specific variable affecting the demand for a given bank's loans. New variables in the cost function explaining total costs *(TC)* are interest expense in relation to assets *(IE)* and operating costs in relation to assets *(OC)*. In the price function, *AC* will be the given bank's average cost, that is, total costs divided by assets. λ denotes the degree of coordination in bank pricing. The time variable turned out to be insignificant in the model, and was therefore deleted.

The simultaneous estimation of the non-linear equation (3) raised limitations as to what banks may be included in the sample. Finally, eight-year time series of 14 banks (a total of 112 observations) constituted the panel of data. The banks in the sample accounted for 75–80% of the market in 1995–2002. On account of the high number of variables the sample size allowed us to estimate the coordination coefficient (λ) only for the nine largest organisations.

The estimation results *(Table 4)* lead us to the highly probable conclusion that collusive behaviour was not typical on the loan market in the Hungarian banking system in 1995–2002. The coordination coefficient λ significantly deviates from 1 in both models, and even from 0, with the exception of one bank. Reflecting the degree of banking intermediation, deposit balances turned out to be a better macroeconomic explanatory variable for the demand for loans than GDP; therefore, the estimations of Model 2 can be considered more relevant for the description of the behaviour of the Hungarian banks. In this model, λ ranges from –4 to –9. The zero hypothesis formulated for their equality can be discarded at a 5% level of significance, consequently the degree of coordination in the different banks is very likely to be different.

The other important finding of the model estimations is the values for the own-price and the cross-price elasticity coefficients. The demand equation assumes that the demand for a particular bank's loans depends on the bank's own interest rate *(BIR)* and the interest rate of the other banks *(OIR)*. In both models estimated elasticity coefficients are highly significant, and their sign confirms the theoretical assumption arising from the logic of competition market. Notably, the demand for loans responds to changes in own interest with elasticity of a negative sign, and to changes in the average rate of other banks with elasticity of a positive sign, because the attraction of a given bank's loans is reduced by a rise in its own interest rates, and enhanced by an increase in the interest rate of rival banks.

Thus, the model describing the homogeneous loan market revealed a massive price competition in the Hungarian banking system, where banks took the prices of the others into account in their pricing behaviour, as is dictated by the logic of a competitive market. The demand for loans was sensitive to the relative changes in

Table 4

System estimation results: WLS (n = 112)

	Model 1		Model 2	
Demand equation				
(dependent variable: loan balances, ln LB)				
Bank' interest rate (ln BIR)	–0.539***	(–7.82)	–0.345***	(–7.96)
Other banks' interest rate (ln OIR)	0.429**	(2.25)	0.274***	(5.13)
GDP (ln GDP)	0.840	(1.39)	–	
Deposit balances (ln DB)		–	0.964***	(30.90)
Branch network (ln BN)	0.408***	(12.19)	0.010	(0.45)
Cost equation				
(dependent variable: total cost, ln TC)				
Loan balances (ln LB)	1.183***	(4.45)	1.133***	(4.20)
$(\ln LB)^2$	–0.004	(–0.17)	0.002	(0.08)
Interest expenses (ln IE)	1.526***	(2.93)	1.508***	(2.88)
Operating cost (ln OC)	–1.650***	(–3.88)	–1.598***	(–3.75)
(ln LB) (ln IE)	0.098***	(5.04)	0.096***	(4.95)
(ln LB) (ln OC)	–0.032	(–1.40)	0.032	(–1.39)
$(\ln IE)^2$	0.004	(–0.14)	0.008	(0.23)
$(\ln OC)^2$	0.108***	(4.08)	0.104***	(3.95)
(ln IE) (ln OC)	–0.237***	(–3.85)	–0.231***	(–3.76)
Price-cost margin equation				
(dependent variable: bank's interest rate, BIR)				
Value of λ_i:				
OTP	–2.087**	(–2.15)	–4.018***	(–4.11)
K&H	–3.177**	(–2.11)	–6.040***	(–3.83)
MKB	–3.480**	(–2.15)	–6.725***	(–4.03)
CIB	–3.514**	(–2.09)	–7.008***	(–3.70)
HVB	–4.801**	(–2.19)	–8.938***	(–4.33)
Raiffeisen Bank	–2.592**	(–2.19)	–4.853***	(–4.34)
Postabank	–4.252*	(–1.97)	–8.102***	(–3.14)
Budapest Bank	–3.222**	(–2.18)	–5.947***	(–4.26)
ÁÉB	–1.871*	(–1.93)	–4.276***	(–4.26)
Other banks (common l)	–4.134**	(–2.17)	–8.376***	(–3.17)

Notes: t-values for the parameter estimates in parentheses.
* significant at 10 % level, ** significant at 5% level, *** significant at 1% level.

interest rates, which also confirms the presence of price competition. Although competition-distorting positions and behaviours could be observed in some market segments, these were not sufficiently intense to undermine the competitive nature of the whole of the loan market.

Competition on the market segments

The models that have been applied above are all based on the simplistic assumption that the loan market was homogeneous. In reality, however, banks' pricing behaviour may vary on different lending product markets. The analysis of the market structure has already identified differences between the corporate and the retail loan markets. Whereas quite balanced power relations had developed on the former market by the mid-1990s, no similar situation has evolved on the latter. Therefore, it seems reasonable to investigate deviations in the pricing behaviour on the different customer and product markets.

For the testing of pricing behaviour on particular market segments, we shall estimate the elasticity of given lending rates to changes in the money market rates.[3] If the competition is strong on a particular loan market, the lending rate is assumed to respond elastically to changes in the inter-bank rates, which represent an alternative return for banks. For the period between January 2000 and July 2003, we examined the elasticity of the monthly average interest rate of three loan products to simultaneous and delayed changes in the two-week inter-bank average rates *(IBR):* under-one-year corporate loans *(CLR),* retail consumption (overdrafts, hire purchase, personal and other) loans *(RLR),* and home loans (HLR).[4]

The estimation results included in *Table 5* reveal that changes in corporate lending rates can be well explained by money market rates, and the simultaneous

Table 5

Elasticity of lending rates to interbank rates

Dependent variable			
	Changes in corporate lending rates: d(CLR)	Changes in home lending rates d(HLR)	Changes in retail consumption lending rates: d(RLR)
Independent variables			
d(IBR)	0.64*** (10.8)	0.45*** (3.5)	0.03 (0.2)
$d(IBR_{-1})$	0.15** (2.5)	0.20 (1.5)	0.25* (1.7)
adj R^2	0.79	0.27	0.05
D-W	2.1	1.3	2.3
F-statistics	154***	16***	3*

Notes: *t*-values for the parameter estimates in parentheses.
* significant at 10 % level, ** significant at 5% level, *** significant at 1% level.

[3] The lack of relevant figures means that we cannot split the earlier models into products. In their examination of the bank competition in Hungary, Világi and Vincze (1996) and Ábel and Polivka (1998) used money market returns in the elasticity estimations.

[4] Data extracted from NBH statistics.

effect is rather strong. Therefore, banks' pricing behaviour on the corporate loan market confirms the positive picture about the competition that has emerged in the previous section. On the other hand, money market changes can hardly be considered an explanation for changes in interest rates on the retail markets. This particularly applies to consumption loans, whose rates seem completely unrelated to money market movements.

This raises the question how models exploring the degree of competition and collusive behaviour could generate a favourable picture about competition in the entire loan market if no or only few signs of competition are observable in some market segments. The most plausible explanation is that retail loans carried a marginal weight (less than 10%) relative to corporate loans, and they only began to grow in importance in 2001. Consequently, models estimated for the 1995–2002 period have essentially evaluated the corporate loan market. The retail markets were far from having a price competition of a similar magnitude; as a matter of fact, the inelasticity of consumption-type loan rates indicates that the banks had the possibility to gain an oligopolistic rent on this market.

IS THE DEPOSIT MARKET PRICE-ACCEPTING?

The models established for measuring the strength of competition and the collusive behaviour included a premise that has only limited validity on the Hungarian banking market. Banks are presumably not price-accepting in setting their deposit rates, even though both models had the pivotal assumption that banks compete only in loan prices. This is the reason why we cannot forbear from an examination of competition on the deposit market.

The same procedure will be applied for the description of the deposit market competition as for the particular loan products. The existence or absence of competition will be deducted from the elasticity that the banks' deposit rates show with respect to the risk-free money market rates that represent the marginal cost. If banks' pricing behaviour is found to be quite elastic, it will confirm the hypothesis of the former model, i.e. that banks are price-accepting on the deposit market, which means that the banks' behaviour on the loan market is an appropriate representation of bank competition. Contrarily, if the deposit and money market rates show a weak correlation, the banks (or a significant majority of them) can gain an oligopolistic rent through pricing deposits, even if the competition on the loan market does not permit this.

We shal examine two questions:

(1) How elastically did the deposit rates respond to changes in the money market rates in the past two or three years?

(2) Is there any deviation in price elasticity among banks with different market positions?

We shall explore the price elasticity of deposits with an essentially saving motive, for which other possible forms of money market savings do indeed pose a competition. Another criterion in selecting the deposit products was that they should carry a large weight in the banks' funds. Relatively short-term deposits satisfy these two conditions, because neither businesses, nor private customers tend to deposit funds for longer terms.

First, let us examine the question of how the average deposit rates responded to changes in the inter-bank rate, which can be interpreted as the marginal cost. The period to be surveyed lasts from January 2000 to July 2003 (43 months), because the distorting effect of the reserve requirement had drastically reduced in comparison to earlier years. We examined the elasticity of two products – retail deposits for a term of 1–3 months and under-one-year corporate deposits – to simultaneous and delayed values of changes in the two-week inter-bank rates *(IBR),* using monthly average figures.[5] The regression analysis indicates that while changes in the corporate deposit rates *(CDR)* can be well explained by those in the money market rates, and are relatively elastic to simultaneous changes in inter-bank rates, the relationship with the retail deposit rates *(RDR)* is much looser, and the delayed effect is almost as strong as the simultaneous one, that is the interest rates are sticky *(Table 6)*.

The calculations seem to support the hypothesis formulated on the basis of the bank market structure, notably that competition is much stronger on the corporate

Table 6

Elasticity of deposit rates to inter-bank rates

	Dependent variables	
	Changes in corporate deposit rates: d(CDR)	Changes in retail deposit rates: d(RDR)
Independent variables		
d(IBR)	0.71*** (20.0)	0.30*** (7.9)
$d(IBR_{-1})$	0.13*** (3.7)	0.24*** (6.2)
$adjR^2$	0.93	0.78
D-W	2.4	2.1
F-statistics	509***	142***

Notes: t-values for the parameter estimates in parentheses.
* significant at 10 % level, ** significant at 5% level, *** significant at 1% level.

[5] The weighted average interest rates were collected from NBH statistics.

deposit market than on retail markets. We may infer from the findings that banks' pricing behaviour is equally elastic on the market of corporate loans, while they behave differently on the retail deposit market, some players abusing their market power that stems from their market position. The pricing elasticity of the major market players will now be examined to test this hypothesis. The examination used the interest rates announced by the 11 banks most active in collecting retail savings (accounting for a total of three-quarters of this market) for amounts of HUF 1–5 million deposited for a 3-month term, at 35 points of time between 2001 and September 2003 (a panel of 316 data).[6]

Based on the correlation coefficients between changes in individual bank and money market interest rates *(Table 7),* the sample was divided into groups of "flexible" and "inflexible" banks.[7] The reason for such a division is that correlation coefficients show that in their pricing policy only six of the 11 banks follow parallel changes in inter-bank rates rather closely. The interest rates in four banks (including K&H and Postabank, each with a substantial share in this market) show a weak-medium strong correlation, while OTP's correlation coefficient is practically zero. In the latter group, a delayed rather than a simultaneous influence can be observed in OTP, K&H and Citibank, which means that the deposit rates in these banks are "sticky".

Table 7

Correlation between changes in retail deposit rates and the interbank rates

	OTP	KH	MKB	CIB	HVB	RB	PB	ERS	BB	CIT	IEB
d(IBR)	-0.03	0.36	0.66	0.71	0.67	0.62	0.40	0.48	0.70	0.43	0.68
$d(IBR_{-1})$	0.49	0.43	0.44	0.39	0.36	0.37	0.13	0.30	0.40	0.50	0.38

After the division of the sample, we first examined the extent to which the current and delayed values of the inter-bank rates, and the delayed values of the deposit rates determine the current deposit rate levels (Model 1, upper part of *Table 8*). The coefficient of the simultaneous inter-bank rate *(IBR)* measures elasticity, while that of the delayed variables (RDR_{-1}, IBR_{-1}) can be used to observe "stickiness". Calculations show that even in the group of the so-called flexible banks the deposit rate at the previous point of time exerts a significantly greater impact on the current rate than the current inter-bank rate, which in turn indicates a high degree of stickiness. Stickiness is even stronger in the group of the inflexible banks.

6 The bank interest rates are those published in Hungarian periodicals *HVG* and *Világgazdaság*, while the source of the inter-bank rates is the NBH.

7 The group of "flexible" banks included MKB, CIB, HVB, RB, BB and IEB, with the others qualifying as "inflexible".

In the second step, we tried to "explain" changes in the deposit rates with the simultaneous and delayed values of inter-bank rates (Model 2, lower part of *Table 8*). In the light of the above passages, our results are hardly surprising. Changes in the money market rates have a negligible explanatory power with "inflexible" banks, and even "flexible" banks exhibit a medium-strong connection, though the simultaneous effect is more substantial than the delayed one.

In conclusion, the banks can choose not to follow money market changes in pricing retail deposits, and, what is more, the "inflexible" ones, which control some 60% of the savings balances and include OTP with one-third of the market, can afford to essentially cut deposit pricing free from changes in the market. These findings also confirm the validity of the SCP hypothesis, because varying degrees of flexibility are a true reflection of the differences in the banks' positions on the deposit market.

It may be concluded that price-accepting behaviour is not typical on the retail deposit market, which is exactly what has been assumed in the models measuring the degree of competition and the possibility of collusion. Since this market is dominated by retail deposits, in contrast with the loan market, the hypothesis of

Table 8

Elasticity of retail deposit rates

	Whole sample: 11 banks (n = 396)	"Flexible" banks: 6 banks (n = 216)	"Inflexible" banks: 5 banks (n = 180)
Model 1. Dependent variable: retail lending rate, RDR			
Independent variables			
Constant	–0.63*** (–4.5)	–0.64*** (–3.8)	–0.51** (–2.3)
IBR	0.29*** (16.0)	0.37*** (16.2)	0.23*** (8.3)
RDR_{-1}	0.71*** (36.5)	0.62*** (24.4)	0.77*** (26.4)
$adjR^2$	0.89	0.91	0.89
D-W	2.0	1.9	2.1
F-statistics	1665***	1104***	686***
Model 2. Dependent variable: change of retail lending rate, d(RDR)			
Independent variables			
d(IBR)	0.35*** (12.9)	0.46*** (14.6)	0.21*** (4.8)
$d(IBR_{-1})$	0.25*** (9.4)	0.26*** (8.2)	0.24*** (5.7)
$adjR^2$	0,40	0.57	0.24
D-W	2.5	2.5	2.4
F-statistics	257***	283***	55***

Notes: *t*-values for the parameter estimates in parentheses.
* significant at 10 % level, ** significant at 5% level, *** significant at 1% level.

price-accepting must be discarded for the entire deposit market. Therefore, the findings of the models that are used to describe competition allow us to make inferences with regard to the loan market only, or more specifically to the corporate segment, as deviations between the individual segments have been explicitly identified above.

CONCLUSIONS

The favourable changes of the market structure resulted in an improvement of the efficiency of banks and a decrease of the interest margin. Parallel to the equalisation of market power and the intensification of contestability, costs of financial intermediation decreased mainly in corporate markets. Retail markets, however, were still characterised by uneven market positions, and international competition made less of an impact here. This is shown by the wide spreads between retail credits and deposits, which far exceed the EU average. Thus, in spite of favourable changes in the market structure, competition in several segments of the Hungarian banking sector remained limited.

Models estimating the cost elasticity of interests earned show an intermediate degree of monopolistic competition for the time period between 1995 and 2002, which slightly intensifies over time. Our hypothesis that the increase in competitive pressure was a factor in the decline of the interest margin is also confirmed. Another model examining the cooperation between banks strongly suggests that the behaviour of Hungarian banks in the credit market cannot be characterised by collusion. Estimation results indicate a remarkably strong price competition, where credit demand responds to changes in relative interest rates of banks in line with the logic of a competitive market.

Although the model estimates did not unambiguously confirm the presumption that market power converts into monopolistic rents, we still cannot reject the hypothesis because of the pricing behaviour observed in different market segments. The competitive structure documented by behavioural models primarily characterises the corporate market, where the pricing behaviour of banks responds to money market fluctuations. However, in the retail market, which represented a small market share during the period of investigation (1995–2002), lending rates are so inelastic with respect to money market rates that banks may be able to extract oligopolistic rents.

This implies a serious warning for the future, even if we accept the conclusion of empirical models that competition in credit markets was satisfactory in the recent past. In line with international trends, the share of the retail market in total bank credit is expected to increase. Since 2001, this trend has already been appar-

ent in Hungary. Therefore, if the behaviour of banks in retail markets does not change, the overall image of the competitive structure may deteriorate rapidly due to the shifts in the composition of the market.

In the retail market not only the pricing of credit but also the setting of deposit rates offers a scope for oligopolistic rents, which may result in a social welfare loss. The magnitude of the welfare loss caused by inelastic and rigid bank interest rates may be a subject of further investigation.

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