The structure of the Central Eastern European countries' banking market as an element of European financial integration

Ion LAPTEACRU[1]
LARE-EFI, Université Montesquieu Bordeaux IV

This text presents a general analysis of the banking industries of the Central Eastern European countries, taking as examples the Romanian, Bulgarian, Polish and Czech banking markets. In this study we measure the degree of competition in these banking sectors, using the empirical approach developed by Rosse and Panzar, and Bresnahan and Lau, respectively. We show that the Romanian and Bulgarian banks have a market power and that, in spite of the intense process of banking consolidation, the Polish and Czech banks compete fiercely among them, what is, in our opinion, an important step towards financial European integration.

Keywords: banking, market structure, Central Eastern European countries.

[1] LARE-efi, Université Montesquieu – Bordeaux IV, Avenue Léon Duguit, 33608 Pessac Cedex.
Email : ion.lapteacru@u-bordeaux4.fr.

Introduction

Since ’90, the European banking industry is submitted to an important and perhaps durable restructuring process. The deregulation, the technological progress and the development of the capital markets are the most important factors of this reorganisation, characterised by a strong consolidation of the banking industry (DeBandt and Davis [1999]). According to a report of the BIS [2001], the consolidation of the European banking system is due to or was intensified by the gain of the efficiency followed by banks. Moreover, the Euro accelerated the European financial market integration process and so encouraged the activities among EU member-countries. In consequence, the national and cross-border competitions have been amplified and thus an important weave of mergers and acquisitions of banks is produced in the European banking industry (ECB [1999]).

The mergers and acquisitions of European banks have contributed to the consolidation of the banking industries of the transition economies by the mergers of their branches in these countries. Moreover, the single licence principle creates the same conditions for the banking industries of the new EU members implying the same consolidation factors.

In these circumstances, the question is if this consolidation has any impact on the concentration and respectively on the banking market structure of the Central and Eastern European countries. This is important for two reasons. Firstly, an imperfect competition on the banking market has negative repercussions on the transmission channels of the monetary policies and on the real sector via the interest rates. In the first case, a banking sector with a market power is able to obtain a greater interest margin, which makes more difficult the transmission of the monetary policy. As for the impact on the real sector, it is also expressed by the excessive interest margin generated by the banks with market power. Or, this inhibits the investors’ incentives or induces them to finance riskier projects[2].

Secondly, significant divergences among the structures of the banking markets will imply a heterogeneous transmission of the monetary policy among the candidates to entry in the EMU with respectively divergent results. According to Molyneux, Lloyd-Williams and Thornton [1994], even within the EMU the banking systems are not completely integrated. Using the Rosse and Panzar approach, the authors find that compared to France, Germany and Spain, where there is a monopolistic banking competition, in Italy the banks have a monopoly power. More recently, De Bandt and Davis [2000] show that, as in Germany and France, the Italian banking sector has a monopolistic structure too, but its market power is more important. Nevertheless, Molyneux, Lloyd-Williams and Thornton [1994] and De Bandt and

[2] The implication of the banking competition on the real sector is often discussed. At the theoretical and empirical levels, Petersen et Rajan [1995] show that on the monopolistic banking market the new firms have more chances to obtain a cheaper credit, since the old firms incur more important costs. On the other hand, according to Shaffer [1998], in the less concentrated banking industry the problem of “winner’s curse” can be avoided.

Davis [2000] support the idea that the European banking industry will undergo more transformations with the convergence towards a more homogeneous structure

Or, following the consolidation process of the nineties, the competition of the Central and Eastern European banking markets could be affected. Thus, the objective of our paper is to estimate the structure of the banking market in the new Member States of the EU (we analyse only two examples: Czech Republic and Poland), and in Bulgaria and Romania, as candidates for 2007. A more exactly vision on the structure of the banking industry of these countries will also permit us to evaluate the integration capacity of these banking industries in the European banking system.

The paper is composed by five sections. The first section describes briefly the features of the Romanian, Bulgarian, Polish and Czech banking systems. In the second section, we present the theoretical aspects of the empirical approaches used for the determination of the market structure, the Rosse&Panzar and Bresnahan&Lau methodologies. The first approach is used to determine the competition level on the Romanian and Bulgarian banking markets (section 3) and Bresnahan&Lau approach is applied to determine the structure of the Polish and Czech banking markets (section 4). The conclusions are made in the fifth section.

1. The features of the banking systems

The Central and Eastern European countries made considerable efforts to reform their financial systems, which are expressed notably by the transition from a monobank to a two tier system, by the privatisation of the big state-owned banks, by the opening of the banking market.

In the first transition period about forty banks have entered on the Romanian baking market. In fact, this was the objective of the National Bank of Romania to encourage the entry of new banks in order to promote competition and the modernization of the system. As a result, there has been a notable entry of new banks since 1993, some from among the best known world wide (ING, AMRO and Citibank) (OECD [1996]). In 1997 there were 43 banks, from among 23 were the foreign banks (Table 1).

During 1991-1997 the intermediation function of the banks was seriously affected by the rapid erosion of the state-owned enterprises' financial positions, by the growing inflation rates and by delayed progress of economic real sector transformation. Consequently, many banks went to bankrupt. Nevertheless, the foreign banks continued to enter on the local market, which attenuated the fall of the confidence in the banking system. This was caused by the bankruptcy of the certain important banks[3].

[3] Excepting the bankruptcy of the banks Dacia Felix and Credit Bank, a big resonance was the quasi-bankruptcy of the biggest Romanian bank, Bancorex. If in 1996 it was considered the most stable Romanian bank, then in 1999 the Romanian authorities took measures for merger with Romanian Commercial Bank.

The transformation of the Romanian banking system was delayed. Consequently, the concentration of the banking market is important and did not diminish with the entry of new banks on the market: the HHI index diminished from 0.18 to 0.13 during four years and the concentration ratio of the five biggest banks (RC5) is reduced from 75% to 65% (Table 1). The fact that certain banks had implicit[4] or explicit[5] deposit guaranties makes a question on the competition on the Romanian banking market, in the conditions where this is a moderate concentration market level.

At the beginning of the nineties, the foreign banks were reticent to enter on the Bulgarian banking market. According to Bonin, Mizsei, Székely and Wachtel [1998], there were at least three reasons which explain the reticence of the foreign banks. Firstly, the authorities have not articulated a policy which would have encouraged the foreign investments in the banking sector. Secondly, the Bulgarian banking system had important amounts of non performing loans. Moreover, the systemic risk was too important. The situation was deteriorated during the banking crisis in 1995-1996.

Thanks to the efforts made by the authorities in order to regain the confidence in the banking system, after this crisis the situation suddenly changed. A deposit guaranty fund was established[6]. This fund guaranteed the repayment at 100% for households and 50% for corporative sector[7].

The situation was more redressed with the adoption of the currency board. Certain banks were liquidated and, with a fixed exchange regime, the inflation and the exchange rate were controlled. During 1996-1999, the number of banks diminished from 41 to 34, but the number of foreign banks augmented from 3 to 22 (Barisitz [2001] and Table 1). As for the concentration level, the HHI index shows a decreasing trend for both deposit and credit markets. Even if RC5 index decreases slowly, the concentration indices show that, compared to Romania, the Bulgarian banking industry is less concentrated.

Thanks to prudential banking privatisation process, the reorganization of the Polish banking structure implied a relatively low fiscal cost (IMF [2001]). Initially, the Polish authorities favoured consortia of investors rather than single strategic investors resulting in a class of owners that may not have the right incentives or powers to adequately restructure these banks. Direct foreign bank entry through branches was also not permitted. Gradually, foreign investors increased their stakes as state ownership in the banks was decreased through public offerings or stock market sales. This strategic choice protected the local market from direct

[4] For example, in the Dacia Felix case, the depositors and the banks knew that the authorities will save this bank. Consequently, it borrowed on the interbank market at the interest rates which were threefold compared to the market rate.
[5] The deposits from Savings Bank are always guarantied by authorities at 100%.
[6] Before the crisis, only the deposits held by the Savings Bank (DSK) were 100% guaranteed.
[7] In 1999 another system to guaranty deposits was set up. It is less generous and offers to the depositors more responsibilities to supervise “their” banks.

foreign competition and eased the adjustment of the local banks[8]. Nevertheless, the presence of the foreign banks becomes increasingly important (Table 1). The proportion of foreign capital increased from 24% in 1997 to 73.7% in 2004. In 2004, 67.7% of bank assets, 66.8% of the credit market and 62.7% of the deposit market belong to the foreign banks.

The massive entry of the international banks weakened the profitability of the domestic banks and their power on the price strategies. Certain banks were obliged to merge and others were liquidated. Another consolidation factor was the interdiction of the direct entry on the market obliging foreign banks to acquire the local banks with their branch network (Havrylchyk [2004] and Mero and Endresz Valentinyi [2003]). Thus, the international consolidation amplified the local market consolidation[9].

As a result, the number of domestic banks diminished in seven years from 53 to 13 (Table 1). On the other hand, we can observe that the number of branches increased twofold in the same period, which represents an indicator of banking concentration. Or, the evolution of the concentration indices was stable during this period. The values of the HHI index do not exceed the limits of a weak concentration, excepting for deposit market, which is always more concentrated than other segment of banking sector due to the important effects which influence the decisions of depositors, as the size effect of the financial institution.

The ratio RC5 confirms that the concentration of the Polish banks on the deposit market is higher and varies around 60%. Nevertheless, the concentration registered a little amplification in the period 1999-2001. This amplification is a consequence of a wave of mergers and acquisitions which carried out 27% of banking assets during this period.

Table 1. Structure of the Romanian, Bulgarian, Polish and Czech banking systems.

	1997	***1998***	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
Romania								
Number of commercial banks, including	43	45	41	41	41	39	38	39
Number of foreign banks and their branches[10]	23	25	26	29	32	32	29	30
HHI indicator								
for assets	-	-	-	-	0.1793	0.1589	0.1525	0.1349
for deposits	-	-	-	-	0.1801	0.1489	0.1477	0.1324
for credits								
RC5, %								
for assets	-	-	-	-	74.60	66.24	65.41	63.08
for deposits	-	-	-	-	77.00	68.83	69.33	67.26
for deposits	-	-	-	-	74.88	67.68	67.34	64.56

[8] On the privatisation of the Central and Eastern European countries' banks see Bonin, Mizsei, Székely, Wachtel [1998].

[9] As examples, we can mention the fusion of the banks Bank Austria and Creditanstalt, Vereinsbank and Hypo-Bank, Bank Austria Creditanstalt and Hypovereinsbank, and recently the fusion of the banks Unicredit Bank and Hypovereinsbank. All these fusions had consequences on the Romanian, Bulgarian, Polish and Czech banking markets.

[10] including the banks where the foreigners hold more than 50% of interest.

Bulgaria								
Number of commercial banks, including	-	-	34	35	35	34	35	35
Number of foreign banks and their branches	-	-	22	25	26	26	25	25
HHI indicator								
for deposits	-	-	0.12	0.13	0.11	0.10	0.09	0.08
for credits	-	-	0.11	0.11	0.09	0.08	0.07	0.07
RC5, %								
for assets	-	-	0.62	0.52	0.57	0.55	0.53	0.52
for deposits	-	-	0.67	0.68	0.55	0.58	0.57	0.55
for credits	-	-	0.59	0.59	0.49	0.52	0.51	0.50
Poland								
Number of commercial banks, including	81	83	77	73	69	59	58	57
Number of foreign banks and their branches	28	31	39	46	46	45	46	44
Number of branches of the commercial banks	1634	1868	2235	2449	2879	3040	3119	3705
HHI indicator								
for deposits	0.12	0.13	0.12	0.1017	0.1052	0.1065	0.1005	0.0912
for credits	0.06	0.06	0.07	0.0648	0.0723	0.0671	0.0628	0.0628
RC5, %								
for assets	46.2	42.9	47.7	46.5	54.7	53.4	52.3	50.2
for deposits	51.9	51.0	55.4	54.7	59.8	60.2	59.0	56.7
for credits	41.4	35.7	46.1	46.1	52.1	48.6	46.5	45.4
Czech Republic								
Number of commercial banks, including	50	45	42	40	38	37	35	35
Number of foreign banks and their branches	23	28	23	21	21	20	20	20
Number of branches of the commercial banks	1162	2236	2006	1809	1751	1722	1670	1785
HHI indicator								
for deposits	0.17	0.15	0.13	0.12	0.18	0.16	0.15	0.13
for credits	0.13	0.12	0.10	0.09	0.13	0.12	0.11	0.11
RC5, %								
for assets	-	-	-	66.09	68.38	65.75	65.77	63.97
for deposits	-	-	-	77.06	76.86	72.29	73.55	70.54
for credits	-	-	-	68.46	70.66	65.48	64.45	64.05

Source: National Bank of Romania, National Bank of Bulgaria, National Bank of Poland, National Bank of Czech Republic and Havrylchyk [2004].

Note: - non available data.

Thanks to the smaller inflation implication on the banking balances, the Czech banking system became the most important in the region in terms of ratio of banking sector assets to GDP (IMF [2001 b]). This indicator is 149% in 2004 (in Romania it is 68.1%, in Bulgaria – 65.5% and in Poland – 60.9%). It was higher at the beginning of transition period: 360% in 1994 and 171% in 1996. In spite of this, there are a fewer banks on the market, which is the

result of an important consolidation process during the nineties (the number of banks diminished from 55 in 1995 to 40 in 2000).

The Czech authorities created favourable conditions for foreign investors (foreign banks) in order to facilitate their entry on the local market. Compared to Poland, the Czech legal framework was favouring the entry of foreign banks on the local market via the extension of their branch network. Thanks to these legal advantages, the foreign banks' strategies were more offensive than in Poland, for example. Only in two years, from 2000 to 2002, the foreign banks augmented their capital from 54.5% to 81.9%.

One similarity of these banking industries is that did not carry away the fortification of the sector's concentration. Nevertheless, the values of the concentration indicators are still high.

2. Theoretical aspects of the used empirical methods

We use the revenue test of Rosse and Panzar [1977] to estimate the competition level on the Romanian and Bulgarian banking markets, and the markup test of Bresnahan [1982] and Lau [1982] to determine the degree of competition among the Polish and Czech banks.

In the both approaches, the bank's production function uses labour and physical capital to attract deposits, which are used to finance the banking activities. The prices of the production factors are determined as follows: the deposit interest rate is measured as the ratio of total interest expenses to the total interest-bearing liabilities; the price of labour (the wage rate) – as a ratio of wage expenses to the number of employees; and the price of physical capital – as a ratio of total expenses for fix assets to the total value of this assets.

The revenue test

Rosse and Panzar [1977] show that the sum of the elasticities of revenue with respect to each input price (denoted by *H*-statistic) is negative for a monopoly and collusive oligopoly. This sum is 1 for a competitive price-taking bank in log-run equilibrium and it takes values between 0 and 1 for a monopolistic competitor.

The explications are straightforward for the polar cases of competition and monopoly. Because cost functions must be homogeneous of degree 1 in the input prices, any percentage increase in input prices generates an equal percentage increase in costs. A competitive bank, constrained to zero economic profit at the initial price vector, must adjust its output prices to just cover the cost augmentation. (If costs decrease, competition forces the output prices down to eliminate excess profit.) Hence, in long-term equilibrium, such a bank's revenue must change by the same percentage as its costs, and so by the same percentage as its input prices ($H=1$) (Shaffer [2004]).

For a monopoly or collusive oligopoly, the first order condition for profit maximisation requires that the marginal cost is equal to the marginal revenue. Since marginal cost is positive, marginal revenue must be positive in equilibrium. But, if a bank's marginal revenue

is positive initially, its total revenue must fall if it tries to pass along higher input prices as higher output prices, so $H \leq 0$.

The markup test

The basis of the markup test is the principle that profit maximisation banks in equilibrium will choose prices and quantities such that marginal cost equals their perceived marginal revenue, which coincides with the demand price under perfect competition but with the industry's marginal revenue under perfect collusion. Formally, we can represent the marginal revenue function as $P + h(Q, Y, \alpha)$, where P is the banking industry price, Q is the industry's aggregate output quantity, Y is a vector of exogenous variables, α is a vector of demand system parameters, and $h(\cdot)$ is the semi-elasticity of the market demand $Q/(\partial Q/\partial P)$, where $\partial Q/\partial P$ is the derivation of the demand function of the market (Bresnahan [1982]). The average bank receives a marginal revenue which is equal to $P + \lambda h(Q, Y, \alpha)$, where λ is a parameter which indicates the degree of market power of the average bank. For λ=0, the outcome is competitive with price equal to marginal cost, which is described by a competitive behaviour. For other extreme case, λ=1, the banks choose the outcome or the price, corresponding to the perfectly collusive behaviour. Values of λ between 0 and 1 describe varying degrees of imperfect competition or market power.

The structural model of this approach consists in confronting the supply and demand functions, which implies the specification of the functional forms for each equation. The model can be estimated using the aggregate values of the industry, as Shaffer [1993, 2001, 2004] used in his papers, as well as the specific values of firms (Shaffer and DiSalvo [1994], among others). The aggregate data provide estimations which are interpreted as weighted averages of the respective bank parameters.

Shaffer [1993] shows that -λ estimated from aggregate data also constitutes a local approximation of the percentage deviation of the industrial output from its competitive level, which corresponds to the efficient static allocation. In this sense, -λ provides a measure of aggregate excess capacity. If λ is positive, reflecting the market power, aggregate output will be less than the competitive level; if λ is negative, reflecting probably an unsustainable deviation from the long-run equilibrium, characterised by pricing below marginal cost, aggregate output will exceed its competitive level, which is interpreted as an "excessive" output.

Note that, even if banks follow a different strategy that profit maximisation (such as cost-plus pricing, growth maximisation, for example), or if regulations constrain banks' behaviour, the test just described remains a valid technique for characterising the outcome relative to the competitive optimal benchmark; λ needs be assigned a "conjenctural". Thus, any form of oligopoly behaviour can be represented by this parameterisation (Tirole [1995, tome II, p. 86, footnote 1], Friedman and Mezetti [2002]).

A necessary and sufficient condition for econometric identification of λ is that the demand function must not be separable in at least one exogenous variable that is included in the demand function but excluded from the marginal cost function (Lau [1982]). Most empirical studies have used a functional form of marginal cost derived from the commonly used translog total cost function. Unlike linear or quadratic forms, the translog form has the advantage of being directly compatible with theoretically required homogeneity conditions, without employing additional parameters.

By contrast, most empirical implementations have used a demand function similar in form to that proposed by Bresnahan [1982]. The most important is that the estimated parameters must be consistent with theoretical requirements or expectations (*i.e.*, that the estimated demand curve is downward sloping, the banking output is a normal good, etc.).

3. Determination of the Romanian and Bulgarian banking industry structure

3.1. Model

The competitive level on the Romanian and Bulgarian banking markets will be determined using the Panzar and Rosse methodology. Different specifications are presented in the banking literature. Essentially, Molyneux, Lloyd-Williams and Thornton [1994] use the ratio of interest revenue to the banking assets as an endogenous variable. On the other hand, De Band and Davis [2000] use the logarithm of interest revenue. They explain that this approach is more appropriated from economic point of view, because the ratio of interest revenue to the banking assets provides a price equation. According to these authors, the logarithmic specification can also reduce the possible simultaneity bias.

The following equation will be used in the Panel model with Fix Effects:

$$\ln R_{it} = c_i + \mu_t + \alpha_1 \ln w_{1,it} + \alpha_2 \ln w_{2,it} + \alpha_3 \ln w_{3,it} + \alpha_4 \ln FA_{it} + \alpha_5 Cr_{it} + \alpha_6 Dep_{it} + \varepsilon_{it} \qquad (1)$$

where:

$t=1,\ldots,T$, T being the number of observed periods. The analysed period is 2001Q4 – 2005Q1 (T=14) for Romania and 1999Q4 – 2005Q3 for Bulgaria;

$i=1,\ldots,n$ is the number of banks. We took the 21 largest banks of Romania, which cover 95% of the banking sector assets, and the total number of Bulgarian banks, that is 34;

R is the interest revenue;

w_1 is the price paid for the attracted resources, measured as the ratio of interest expenses to the amount of interest-bearing liabilities. w_2 is the labour price, measured as the ratio of wage expenses to the total amount of credits and deposits. w_3 is the price of fix assets, which is measured as the ratio of fix assets expenses to the stock of fix assets. The sum of their coefficients constitutes the H-statistic of Panzar and Rosse.

FA is a scale variable measuring the capacity level at which the bank operates and represent the logarithm of fix assets.

Cr and *Dep* are exogenous and bank specific variables (business mix) that may shift the cost and revenue schedule. *Cr* is the ratio of the credit amount to the stock of fix assets and *Dep* is measured as the ratio of deposits to the total amount of deposits and money funding market.

All series are expressed in real terms.

3.2. Results

The choice of Fix Effects is explained by the used banking samples: for Bulgaria we use all banks and for Romania we use the biggest banks which cover 95% of banking assets. Moreover, for the two countries the Chow test rejects the null hypothesis of a pooled model against the cross sectional effect (19.17>F(20 ;264)=1.61 [for Romania] and 32.95>F(32 ;751)=1.46 [for Bulgaria]). This test can not reject for Romania this null hypothesis against the hypothesis of cross period effect (1.18<F(13 ;271)=1.76). On the other hand, it rejects the hypothesis of pooled model for Bulgaria (3.02>F(23 ;760)=1.54). For the two countries the Chow test rejects the hypothesis of cross sectional effect against the hypothesis of cross sectional and cross period effect (3.20>F(13 ;251)=1.76 [for Romania] and 6.94>F(23 ;728)=1.54 [for Bulgaria]), which explains the presence of the cross sectional and cross period effects in equation (1). The unit roots test of the panel shows that globally the series are not integrated.

The estimation results (Table 2) show that the competition on the Romanian and Bulgarian market is a monopolistic one ($0<H<1$); that is, in average the banks have a market power. The Wald test reject significantly the hypothesis of perfect competitive market ($H=0$) and of collusive oligopoly market ($H=1$).

Table 2. Estimation results of the model (1).

Coefficient	**Romania**		**Bulgaria**	
	Value	***t-stat***	***Value***	***t-stat***
C	*4.33**	*5.32*	*-0.84**	*-2.81*
w_1	*0.20**	*4.13*	*0.38**	*15.36*
w_2	*-0.14***	*-2.25*	*-0.80**	*-29.93*
w_3	*0.29**	*3.65*	*0.92**	*31.63*
FA	*0.51**	*5.29*	*0.89**	*39.33*
Cr	*0.10*	*1.05*	*-0.22**	*-2.47*
Dep	*-0.26****	*-1.71*	*0.12****	*1.74*
H	***0.35****	***3.93***	***0.50****	***12.97***
Test Wald pour H=1	F(1 ;267)=54.7(0.0)		F(1 ;780)=164.5(0.0)	
Test Wald pour H=0	F(1 ;267)=15.5(0.0)		F(1 ;780)=168.3(0.0)	

Note: *, ** and *** signify that the coefficients are significant at 1%, 5% and 10% statistic significance, respectively. The values into parentheses from the Wald-test are the p-values.

According to the results, the price for the attracted resources has an important positive impact on the banking interest revenue. On the other hand, the personnel expenses have a negative

impact, notably for Bulgaria. The interest revenue increases much with the augmentation of the fix assets expenses and so with the augmentation of the stock of fix assets. The effect of business mix variables is different for both countries.

The critical feature of the *H*-statistic is that the test must be undertaken under conditions of long-run equilibrium. As suggested by Molyneux, Lloyd-Williams and Thornton [1994], Shaffer [2004] and others, one should verify that input prices are not correlated with industry returns. The long-run equilibrium test for the value of *H* is performed by running the same equation, however, using the return on assets (ROA) (or the return on equity (ROE)) as the dependent variable instead of interest revenue. In that framework, *H=0* indicates that the banking system is in long run equilibrium. This does not signify that the equilibrium conditions can not be modified, but rather that this changing must be gradually. The test with the ROA indicator shows that the Romanian banking market is far from equilibrium, even if the hypothesis *H=0* can not be rejected. On the other hand, the banking market of Bulgaria is more or less equilibrated, but the test rejects the hypothesis *H=0* (Table 3).

Table 3. Long-run equilibrium test (ROA).

	H	***t-stat***	***Test de Wald pour H=0***
Roumanie	-8.6	-1.08	F(1 ;267)=1.17(0.28)
Bulgarie	-0.76	-3.1	F(1 ;778)=9.61(0.00)

Note: The values into parentheses are the p-values from the Wald-test.

4. Determination of the Polish and Czech banking industry structure

For Poland and Czech Republic we use the mark-up test to determine the competitive level on the banking market.

4.1. Model

The form of the demand function is taken to be linear, as proposed by Bresnahan [1982].

$$Q = a + a_P P + a_Y Y + a_Z Z + a_{PY} PY + a_{PZ} PZ\,, \qquad (2)$$

where Q is the output of the banking industry; P is the average industry's price; Y is an exogenous variable as revenue; and Z is another exogenous variable as the price of the banking substitute. The interaction terms PZ and PY allow the rotation of the demand function, which is necessary for the identification of λ. According to Bresnahan [1982, p. 91], without these interaction terms the demand variation will have any distinct impact on the competitive equilibrium and monopoly one. Generalising the Bresnahan [1982] idea, Lau [1982, p. 97-98] shows that the necessary and sufficient condition for λ identification is that the demand function must not be separable in at least one exogenous variable that is included in the demand function but excluded from the marginal cost function. Mathematically, for any demand function $Q = f(P, z_1)$, where z_1 is the vector of exogenous variables which is not

included in the marginal cost function, the necessary and sufficient condition of Lau [1982] to determine λ is $\frac{\partial}{\partial P}\left(\frac{\partial f/\partial z_{1i}}{\partial f/\partial z_{1j}}\right) \neq 0$ $(i \neq j)$, which is satisfied by the linear form (2).

For the cost function, we will accept the translog form, which is also explained by Shaffer [1993, p. 52] as being the most realistic for the credit institutions and it is also used by Gruben and McComb [2003].

$$\ln C = \beta_0 + \ln Q\left(\beta_1 + \sum_{i=1}^{n} \alpha_i \ln w_i\right) + \sum_{\substack{i,j=1 \\ i \leq j}}^{n} \gamma_{ij} \ln w_i \ln w_j \tag{3}$$

where C is the total cost and w_i are the input prices of n inputs. In consequence, the marginal cost function takes the form:

$$Cm = \frac{C}{Q}\left[b_1 + b_2 \ln Q + \sum_{i=1}^{n} b_{2+i} \ln w_i\right] \tag{4}$$

The supply function is derived from the marginal cost function:

$$P = Cm - \lambda h(Q, Y, \alpha) = Cm - \lambda \frac{Q}{\partial Q/\partial P}$$

With the help of equations (2) and (3), the supply function takes the form

$$P = \frac{C}{Q}\left[b_1 + b_2 \ln Q + \sum_{i=1}^{n} b_{2+i} \ln w_i\right] - \lambda \frac{Q}{a_P + a_{PY} Y + a_{PZ} Z} \tag{5}$$

Thus, the conduct parameter λ is defined by the system of equations {(2), (5)}.

4.2. Data analyses

We use the quarterly frequency data which cover the period 1997Q1-2005Q2 for Poland and 1996Q1-2005Q4 for Czech Republic. The variables from the demand function are taken as in similar empirical literature: Q is represented by the banking assets, P is calculated as the ratio of interest revenue to the total assets, the GDP is taken as proxy for Y and Z represents the interest rate of T-Bills.

The variables which appear in the supply function are the same as for Romanian and Bulgarian cases, excepting the wage rate w_2 that is measured as the ratio of personnel expenses to the number of employees.

Certain data for Poland are available only in annual or semi-annual frequency. These series were transformed into quarterly frequency with the quadratic-match sum method. The nominal series are adjusted with the consumer price index.

One of the most important problems in the econometric determination of the banking conduct parameter of Bresnahan and Lau is the strong collinearity among the exogenous variables,

notably for the demand function. This problem can not be resolved by the elimination of the certain explicative series due to the structural form of the model.

We will test the collinearity for three different models: 1) the model with the *PY* series; 2) the model with *PZ* series; and 3) the equation (2a).

$$Q_t = a + a_P P_t + a_Y Y_t + a_Z Z_t + a_{PY} PY_t + a_{PZ} PZ_t + e_t \qquad (2a)$$

Table 4. Correlations among the explicative variables of the demand function.

	P	***Y***	***Z***	***PY***	***PZ***
P	1.00	-0.57	0.66	0.97	0.87
Y	-0.77	1.00	-0.44	-0.36	-0.49
Z	0.57	-0.55	1.00	0.64	0.92
PY	0.99	-0.66	0.55	1.00	0.86
PZ	0.74	-0.57	0.95	0.73	1.00

Note: the values above the diagonal are for Poland and those below the diagonal are for Czech Republic.

The correlation coefficients are very important for the two countries (Table 4). To test the multicollinearity problem we apply the Farrar and Glauber test, which calculates the empirical χ^2 according to the expression $\chi^2_{emp} = -\left[n - 1 - 1/6\left(2K + 5\right)\right]\ln D$, where n is the number of observations, K is the number of explicative variables (the constant term included), and D is the determinant of the correlation coefficients matrix. If these empirical values are greater than the values of $\chi^2\left[1/2\,K\left(K-1\right)\right]$, then it is a multicollinearity presumption. According to the test results (Table 5), the three models for the two countries are subject to multicollinearity.

Table 5. Multicollinearity test for the demand function.

	Farrar and Glauber, χ^2 *emp.*	
	Poland	***Czech Republic***
Model 1	189.3*	251.3*
Model 2	142.6*	178.7*
Model 3	307.6*	378.7*

Note: * indicates that it is a presumption of multicollinearity. The values for χ^2 with the degree of freedom 10 and 15 are, respectively, 18.31 and 25 for the 5% statistic significance.

Thus, we will determine the banking conduct parameter λ for the three models.

4.3. Model specification

The form of the supply equation to be regressed is

$$P_t = b_1 cq_t + b_2 cq \ln q_t + b_3 cq \ln w_{1t} + b_4 cq \ln w_{2t} + b_5 cq \ln w_{3t} - \lambda Q_t^* + u_t, \qquad (5a)$$

where $cq = \dfrac{C}{Q}$ and $Q_t^* = \dfrac{Q_t}{a_P + a_{PY} Y_t + a_{PZ} Z_t}$.

In order to avoid the spurious regressions, the series must be stationary. For the demand function all series are I(1) (Table 6) (for the Q and Y series the KPSS tests confirms their I(1) form). The cointegration test shows that the series from the demand equation are cointegrated for two countries and for all models. Or, only the regression for Poland respects the normally distribution condition for residues, but if a VEC (Vector Error Correction) model is applied all short term coefficients are not significant.

Table 6. Unit root test.

	Poland				**Czech Republic**			
	ADF		***Phillips-Perron***		***ADF***		***Phillips-Perron***	
	I(0)	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
Demand								
Q	-1.73	-8.44*	-2.01	-8.66*	-2.88**		-2.70***	-9.75*
P	-1.28	-3.53**	-0.83	-3.54**	-0.62	-7.39*	-0.57	-7.27*
Y	-0.23	-1.93	-4.12*		0.38	-1.29	0.38	-1.29
Z	-1.50	-5.19*	-1.84	-5.22*	-1.93	-6.87*	-2.07	-6.87*
PY	-0.79	-1.85	-1.24	-6.69*	-0.72	-3.26**	-0.71	-7.12*
PZ	-1.68	-4.07*	-1.46	-4.01*	-1.62	-4.35*	-2.02	-8.24*
Supply								
Cq	-3.96*		-4.37*		-0.61	-8.96*	-0.33	-8.70*
Cqlnq	-3.94*		-4.31*		-0.61	-8.96*	-0.33	-8.71*
$Cqlnw_1$	-0.14	-5.23*	-3.64*		-0.25	-10.51*	-0.74	-10.51*
$Cqlnw_2$	-4.07*		-4.39*		-0.74	-8.62*	-0.62	-8.34*
$Cqlnw_3$	-3.70*		-3.92*		-0.80	-7.69*	-0.80	-7.67*

Note: *, ** and *** signify that the coefficients are significant at 1%, 5% and 10% statistic significance, respectively.

4.4. Results

We apply the SUR (*Seemingly Unrelated Regression*) method in order to take into account the correlations between the residues of demand (2a) and supply (5a) equations, which are regressed simultaneously.

The most of the results for the Polish case are significant (Table 7). Moreover, the condition of non collinearity of residues of the same equation is respected (DW is near 2). Even if there is a multicollinearity problem, the three models present similar results and indicate a competition on the banking market, in spite of the rejection of the perfect competition hypotheses ($\lambda=0$). Imposing the homogeneity condition for the cost function, that is $b_3+b_4+b_5=0$, the results remain the same (Table A.1.). The coefficients are also significant indicating a competition among the Polish banks.

Determining the own-price elasticity $\varepsilon_p = \left(a_P + a_{PY}\overline{Y} + a_{PZ}\overline{Z}\right)\overline{P}/\overline{Q}$, the income elasticity $\varepsilon_Y = \left(a_Y + a_{PY}\overline{P}\right)\overline{Y}/\overline{Q}$, and the cross-price elasticity $\varepsilon_Z = \left(a_Z + a_{PZ}\overline{P}\right)\overline{Z}/\overline{Q}$, the results respect the downward sloping form of the demand function and show that the demand for the baking products is inelastic. This is expected case for Poland, because the banking market is

yet underdeveloped and does not cover all the society needs. A confirmation is that in spite of the revenue reduction, the demand for the banking products did not cease increasing. One can also observe that the banking substitutes have a little impact.

Table 7. Estimation results for ***Poland***.

Coefficient	**Model 1**		**Model 2**		**Model 3**	
	Value	***t-stat***	***Value***	***t-stat***	***Value***	***t-stat***
For the demand function (2a)						
a	5640*	2.86	5879*	2.80	5745*	2.94
a_P	-6546488*	-3.14	-3271834*	-3.02	-6686141**	-2.42
a_Y	-0.47*	-2.51	-0.21***	-1.77	-0.54**	-2.07
a_Z	-341370**	2.05	586354*	2.49	499760	1.47
a_{PY}	13.13***	1.68			15.75	1.39
a_{PZ}			-9805252***	-1.64	-5915060	-0.51
ε_P	-0.17		-0.16		-0.17	
ε_Y	-0.07		-0.08		-0.08	
ε_Z	0.04		0.04		0.04	
R^2	*0.42*		*0.38*		*0.43*	
R^2*-ajust.*	*0.33*		*0.29*		*0.32*	
DW-stat	*2.05*		*2.11*		*2.01*	
For the supply function (5a)						
b_1	5.35	0.92	7.49***	1.68	3.13	0.34
b_2	-0.45	-1.28	-0.55**	-2.07	-0.31	-0.57
b_3	0.24*	7.26	0.26*	9.39	0.26*	4.77
b_4	-0.49***	-1.64	-0.32	-1.41	-0.61	-1.27
b_5	0.13	1.29	0.12	1.55	0.13	0.84
λ	**0.0886***	**3.50**	**0.0798***	**3.08**	**0.0826***	**3.21**
Wald λ=0	$\chi^2(1)$=12.22(0.00)		$\chi^2(1)$=9.52(0.00)		$\chi^2(1)$=10.31(0.00)	
R^2	*0.99*		*0.99*		*0.99*	
R^2*-ajust.*	*0.98*		*0.99*		*0.98*	
DW-stat	*1.34*		*1.23*		*1.59*	

Note: *, ** and *** signify that the coefficients are significant at 1%, 5% and 10% statistic significance, respectively.

The results of simultaneous regression of system {(2a), (5a)} for Czech Republic are significant too (Table 8) and indicate a fiercely competition for the Czech banks. The Wald test can not reject the hypotheses of perfect competition. Imposing the homogeneity condition for the cost function, the results do not change (Table A.2.). For two countries and for all models the DW statistic indicates that the residues are not correlated.

The calculus of the elasticities shows that the demand curve is downward sloping and, as in Poland case, the demand is inelastic. On the other hand, the income modification has a positive impact on the evolution of the banking products. The price of banking substitutes does not influence the demand for banking products.

Table 8. Estimation results for ***Czech Republic***.

Coefficient	Model 1		Model 2		Model 3	
	Value	***t-stat***	***Value***	***t-stat***	***Value***	***t-stat***
For the demand function (2a)						
a	-11496	-0.92	-19084	-1.61	-17536	-1.48
a_P	-79346842	-1.62	-63426010*	-4.98	-1.05E+08**	-2.25
a_Y	0.68	0.49	1.57*	3.70	0.44	0.34
a_Z	1914343	1.51	-9335117**	-2.06	-9391229**	-2.09
a_{PY}	75.47	0.83			78.91	0.93
a_{PZ}			6.68E+08*	2.56	6.70E+08	2.60
ε_P	-0.20		-0.30		-0.28	
ε_Y	0.38		0.35		0.35	
ε_Z	0.012		0.001		0.001	
R^2	*0.46*		*0.53*		*0.54*	
R^2*-ajust.*	*0.40*		*0.47*		*0.47*	
DW-stat	*2.03*		*2.12*		*2.00*	
For the supply function (5a)						
b_1	2.73	1.50	3.25***	1.79	3.17***	1.75
b_2	-0.10	-0.82	-0.13	-1.13	-0.13	-1.08
b_3	0.26*	4.25	0.26*	4.18	0.26*	4.20
b_4	-0.08**	-2.06	-0.08**	-2.06	-0.07**	-2.05
b_5	-0.11*	-3.33	-0.11*	-3.38	-0.11*	-3.39
λ	***0.00047***	***0.49***	**0.00071**	**0.56**	***0.00065***	***0.53***
Wald λ=0	$\chi^2(1)$=0.24(0.62)		$\chi^2(1)$=0.31(0.58)		$\chi^2(1)$=0.29(0.59)	
R^2	*0.91*		*0.91*		*0.91*	
R^2*-ajust.*	*0.89*		*0.89*		*0.89*	
DW-stat	*1.86*		*1.88*		*1.88*	

Note: *, ** and *** signify that the coefficients are significant at 1%, 5% and 10% statistic significance, respectively.

4.5. Comparative analyses

According to Molyneux, Lloyd-Williams and Thornton [1994], the different structure of the European banking markets is a sign of a weak integration. The results of their study show that the Italian banks have collusive oligopoly behaviour and that the banks of France, Germany, Great Britain and Spain compete monopolistically among them (Table 9). This difference leads them to the conclusion that European banking market is not integrated.

Using the same approach of Rosse and Panzar, De Bandt and Davis [2000] confirm that the Italian banks have a more important market power, but the test rejects the hypotheses of collusive oligopoly behaviour.

In 2001, Shaffer [2001] makes a study on the EU countries. Using the Bresnahan and Lau methodology, he finds almost identical structure of the UE banking markets. According to his results, the European banks compete fiercely on their local markets and so are well integrated.

Gelos and Roldos [2002] analyse the structure of the emerging banking markets, including the Polish and Czech banking markets. They find that these banks compete fiercely among them.

The same result is obtained in this paper. Moreover, we confirm that the behaviour of Czech banks is more competitive than the behaviour of Polish banks. For the Romanian and Bulgarian banks, we find that they have a market power and so the banking competition is a monopolistic one. Thus, we can conclude that the Polish and Czech banking markets are well integrated into European banking market, what is not the case for Romanian and Bulgarian banking industries.

Table 9. The structures of the European banking markets.

	ML-WT [1994]: 1989	De B&D [2000]: 1992-1995	Sh [2001]: 1979-1991	G&R [2002]: 1994-1999	This paper
France	H=0.77	H=0.36	λ=0.0248		
Germany	H=0.47	H=0.25	λ=-0.0002		
United Kingdom	H=0.85		λ=0.0010		
Italy	H=-0.89	H=0.04	λ=0.0068		
Spain	H=0.57		λ=0.0008		
Belgium			λ=0.0129		
Denmark			λ=0.0049		
Finland			λ=-0.0096		
Sweden			λ=-1.8E-05		
Portugal			λ=0.0065		
Poland				H=0.88	λ=0.0826
Czech Republic				H=0.94	λ=0.00065
Romania					H=0.35
Bulgaria					H=0.50

5. Conclusions

All three countries made efforts for reforming theirs banking sectors. Poland opened gradually to the international banks' aspirations. This assured system stability and minimised the systemic risk. On the other hand, the Czech authorities allowed to the foreign banks to entry freely on the market. This augmented the competition on the market and eliminated the average and small banks with bad financial discipline. Thus, the authorities have disciplined the banks and in a consequence they restructured their balance sheets, which have been not degraded due to the inflation problems. According to EBRD [2001] report, these countries obtained a substantial progress towards the international standards as regards the banking solvency and prudential supervision. Romania and Bulgaria had more problems in the banking industry. The hyperinflation degraded a lot the banks' balance sheets and in a consequence certain banks went to bankruptcy.

Analysing the structure of the banking systems of these countries, the influence of the internal factors as well as external ones contributed to the consolidation of these industries, which can have repercussions on the bank behaviour.

Basing us on Rosse and Panzar methodology, we find that the Romanian and Bulgarian banks have a market power; that is, the banking competition is a monopolistic one. The market power is less accentuated on the Bulgarian banking market.

Using the Bresnahan and Lau model, the study of banking conduct confirms a competitive structure for the Polish and Czech banking markets. Nevertheless, the Polish have a certain market power.

Following the comparative analyses, we can finally conclude that the Polish and Czech banking markets are well integrated into European banking market. The structures of the Romanian and Bulgarian banking markets are different from a competition one, which indicates that these markets are not so well integrated into European banking system.

Tableau A.1. Estimation results for ***Poland*** with $b_3+b_4+b_5=0$.

Coefficient	Model 1		Model 2		Model 3	
	Value	***t-stat***	***Value***	***t-stat***	***Value***	***t-stat***
For demand function (2a)						
a	5604*	2.85	5882*	2.80	5705*	2.92
a_P	-7025136*	-3.39	-3276798*	-3.03	-7180460*	-2.64
a_Y	-0.49*	-2.76	-0.21***	-1.78	-0.57**	-2.35
a_Z	323083*	2.00	587248*	2.50	460746	1.39
a_{PY}	15.45**	1.96			18.16***	1.65
a_{PZ}			-9598671***	-1.64	-4889978	-0.42
R^2	*0.42*		*0.38*		*0.43*	
R^2-*ajust.*	*0.34*		*0.29*		*0.33*	
DW-stat	*2.09*		*2.11*		*2.05*	
For supply function (5a)						
b_1	7.72*	3.38	6.54*	3.98	7.33**	2.01
b_2	-0.59*	-3.57	-0.50*	-4.18	-0.56**	-2.11
b_3	0.24*	8.02	0.26*	9.88	0.26*	4.50
b_4	-0.37*	-4.07	-0.37*	-5.97	-0.38*	-2.73
λ	***0.0906****	***3.63***	***0.0793****	***3.08***	***0.0848****	***3.17***
Wald λ=0	$\chi^2(1)$=13.15(0.00)		$\chi^2(1)$=9.51(0.00)		$\chi^2(1)$=10.07(0.00)	
R^2	*0.99*		*0.99*		*0.99*	
R^2-*ajust.*	*0.98*		*0.99*		*0.98*	
DW-stat	*1.47*		*1.21*		*1.79*	

Note: *, ** and *** signify that the coefficients are significant at 1%, 5% and 10% statistic significance, respectively.

Tableau A2. Estimation results for ***Czech Republic*** with $b_3+b_4+b_5=0$.

Coefficient	Model 1		Model 2		Model 3	
	Value	***t-stat***	***Value***	***t-stat***	***Value***	***t-stat***
For demand function (2a)						
a	-11554	-0.92	-19209	-1.62	-17686	-1.49
a_P	-78678757	-1.61	-64006035*	-5.02	-1.05E+08**	-2.25
a_Y	0.70	0.51	1.56*	3.67	0.45	0.35
a_Z	1900124	1.50	-9402247**	-2.08	-9463784**	-2.11
a_{PY}	73.90	0.81			77.44	0.92
a_{PZ}			6.73E+08*	2.58	6.75E+08*	2.62
R^2	*0.46*		*0.53*		*0.54*	
R^2-*ajust.*	*0.40*		*0.47*		*0.47*	
DW-stat	*2.03*		*2.12*		*2.00*	
For supply function (5a)						
b_1	2.16	1.30	2.78***	1.67	2.68	1.61
b_2	-0.07	-0.65	-0.12	-1.02	-0.11	-0.96
b_3	0.21*	11.18	0.21*	11.11	0.21*	11.10
b_4	-0.09*	-3.49	-0.09*	-3.43	-0.09*	-3.40
λ	***0.00056***	***0.56***	***0.0008***	***0.62***	***0.00074***	***0.60***
Wald λ=0	$\chi^2(1)$=0.33(0.56)		$\chi^2(1)$=0.38(0.54)		$\chi^2(1)$=0.35(0.55)	
R^2	*0.91*		*0.91*		*0.91*	
R^2-*ajust.*	*0.89*		*0.89*		*0.89*	
DW-stat	*1.87*		*1.87*		*1.88*	

Note: *, ** and *** signify that the coefficients are significant at 1%, 5% and 10% statistic significance, respectively.

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