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COMPETITION AND CONTESTABILITY IN TRANSITION BANKING: AN EMPIRICAL ANALYSIS

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Abstract
In this paper we focus on the market structure of the banking system in a set of Transition countries. In particular, by employing reduced-form revenue equations in a panel framework we are able to estimate the Panzar-Rosse ***h***-statistic. We mainly control for heterogeneity by conditioning our estimation on bank-specific characteristics so as to account for differences in financial risk, size and finance mix. Our empirical results indicate that for the vast majority of cases banking systems operate under Monopolistic Competition.

JEL Classification: C33, G21, L11, P34
Keywords: h-statistic, Market Structure, Panel Estimation, Transition Banking

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1. Introduction

The degree of competition in the banking sector has been at the frontier of research for the past two decades. Knowledge of the market structure[1] is of particular importance to academics and policy makers as well as practitioners. Academics and policy makers seem to accept the view that financial intermediaries play a crucial role in the effective functioning of modern economies, owing to their comparative advantage in terms of information gathering, screening and monitoring - which result in economies of scale and scope (Diamond, 1984). For that reason, banks are sometimes characterized as being 'special' (for an extensive discussion see Bossone, 2000). In fact, recent research has arrived at an even stronger conclusion, namely that the efficacy of financial intermediation can also affect economic growth, if not exerting a causal impact on it (King and Levine, 1993a, 1993b; Levine, 1997; Levine and Zervos, 1998). Given the strong links between market structure and the efficiency of a particular sector, one would expect that the higher the degree of competition in the banking sector, the higher its efficiency in terms of allocating funds and in general operating as an intermediary between lenders and borrowers.

Following the breakthrough in the so-called new empirical industrial organization[2] literature significant progress has been made in the way econometric analysis can be employed in order to measure market power utilizing firms' observed behavior. In particular, moving away from using standard measures such as concentration ratios, Panzar and Rosse (1987) have developed a systematic way to infer market structure in the form of the so-called ***h-statistic***. By estimating reduced form revenue equations one can estimate unit input factor elasticities, which can then be used to construct the statistic. Panzar and Rosse show how one can map values of ***h*** to standard market structures.

There are numerous studies which have applied this methodology to study the market structure of various banking systems, typically North American and Western European. For instance, recent studies have focused on the market structure of EU and US banking sectors (Molyneux *et al*., 1994, 1996; De Bandt and Davis, 1999). Along similar lines a number of studies have focused on the Canadian banking sector (Nathan and Neave, 1989; Perrakis, 1993; Shaffer, 1993).

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1. The terms market power and market structure will be used interchangeably in the paper. We recognise the fact that the two terms are not identical; in fact there is an ongoing debate in the Industrial Organisation literature on the issue, but in our context a distinction between the two is not crucial.
2. A term coined by Bresnahan (1989).

However, there is a lack of studies focusing on the market structure of the banking sectors of transition economies. As mentioned earlier, the banking sector is of the utmost importance because of its special role in promoting growth and the smooth functioning of modern market economies. In the case of the central and eastern European (CEE) and former Soviet Union (FSU) countries the banking sector is even more important since bank credit represents the main source of capital (Perotti, 1993). In this paper we focus on the competitive conditions in some transition banking systems. The choice of the specific transition banking systems that we examine has been dictated by the availability of data at the bank level, which reflects the quality and comparability of financial accounting and disclosure policies. For this reason we are not able to cover the entire set of banking systems in transition; but in our view, given the data limitations, we do provide a comprehensive characterization of transition banking.

The remainder of the paper is organized as follows. Section 2 provides some background information regarding conditions in transition banking. Section 3 discusses the ***h****-statistic* and also has a methodological discussion. Section 4 presents the dataset used and the econometric methodology employed. Section 5 discusses the empirical results and finally Section 6 presents our conclusions.

2. Transition Banking: An Overview

2.1 Facts and Trends

Following the historic political events that took place in the late 1980's, CEE and FSU countries embarked on an extensive liberalization of their economies, which was the hallmark of their transition from the Soviet model of central planning to that of the market economy. The cornerstone for a successful transition was thought to be a strong and stable banking system in which bank credit would be allocated on a strict net present value basis (Saunders and Sommariva, 1993). During the pre-transition period, the dominant paradigm was that of a monobank, explicitly controlled by the state, whose main purpose was to accommodate the central plan by providing credit or monetizing debts. In fact, under central planning there was no need for a financial system to allocate savings to investment since that was done by the plan (Gros and Suhrcke, 2000). As a result, banking practices in the former socialist countries were largely characterized by inefficiencies that took the form of large bad debts, preferential allocation of credit and distortionary pricing of loans (Brainard, 1991; Perotti, 1993; Thorne, 1993; Roe *et al*., 2000).

The establishment of a competitive banking system independent of the state, albeit effectively regulated by it, has been at the core of the strategies proposed by the IMF and the World Bank. As a consequence, demonopolisation, the breaking up of

the original monobank, resulted in a number of different state-owned banks,[3] with a number of them privatized, which specialized in different products and operations (Long and Sagari, 1990). Additionally, a large number of private banks, including foreign banks, were granted operating licenses. In general, as Tang *et al.* (2000) point out, the number of banks (in absolute terms and also in terms of banks per population) has dramatically increased. However, this hardly describes the experiences of all transition countries. The size of the banking sector, as measured by the number of banks, has indeed increased in comparison to its pre-transition size. However, within the transition period the size of the banking sectors has been shrinking, reflecting probably the consolidation which took various forms (exit, mergers and acquisitions, and bank failures). Although the trend has been shared between CEE and FSU countries, the paths followed by each county were quite different.

Today, almost fifteen years after the beginning of the transition process, the economies of CEE and FSU countries have undergone major changes. Their banking sectors have changed dramatically both in terms of size, regulatory framework and practice. Moreover, a number of transition economies are in the process of joining the European Monetary Union. Therefore, it would be useful to assess the extent of the success of the transition process in terms of inducing competition in the banking sectors and evaluate the market structure of their banking sectors. It is a precept of socialist economic thought that the State should play a central and active role in determining this allocation. By contrast, under a market-oriented economy structure, this function is devolved to private savers and investors. Hence the transition to a market-based economy requires that the State retreat considerably in order to give the private sector scope to develop and decide how capital will be deployed.

The withdrawal of the State implies reducing the powers of previously protected institutions or transforming them to operate within the context of a market. Thus it is interesting to see to what extent the policies that have been adopted in these countries have been effective in overcoming the persistence of state dominance in finance. In all countries we are going to examine, one of the first steps in financial transition was the implementation of two-tier banking, where the national bank spun off its commercial banking activities into separate institutions. This created a commercial banking sector that was still essentially state-owned and controlled. Reducing the role of the State in making detailed decisions on credit allocation was to be accomplished by privatization of state-owned banks on the one hand and the emergence of new private banks on the other. Panel A of Table 1 shows the share of assets owned by State banks. According to this evidence, the State continues to dominate commercial

3. An extreme version of this was the break up of the old Bulgarian monobank by making virtually every branch office an independent bank.

banking in some of these countries. But the picture that emerges is that of a clear downward trend in all countries we consider, albeit at different speeds, reflecting different experiences in privatizing state-owned banks.

Table 1. State Dominance in Banking and Bank Credit Creation

Panel A: Asset Share of State Controlled Banks (%)							
Country	1992	1993	1994	1995	1996	1997	1998
FSU Countries							
Estonia	...[a]	25.7	28.1	9.7	6.6	0	7.8
Latvia	...[a]	...[a]	7.2	9.9	6.9	6.8	8.5
Lithuania	...[a]	53.6	48	62.5	54.9	48.8	45.3
Ukraine	...[a]	...[a]	...[a]	...[a]	...[a]	...[a]	...[a]
CEE Countries							
Bulgaria	...[a]	...[a]	...[a]	...[a]	82.2	66	...[a]
Czech Rep.	...[a]	20.6	20.1	19.5	18	18.1	18.8
Hungary	75.3	74.4	74.9	62.8	52	16.3	10.8
Poland	...[a]	86.2	80.4	71.1	69.6	51.6	48
Romania	...[a]	...[a]	80.4	84.3	80.9	80.2	74.6
Slovak Rep.	...[a]	70.7	66.9	61.2	54.2	48.7	50

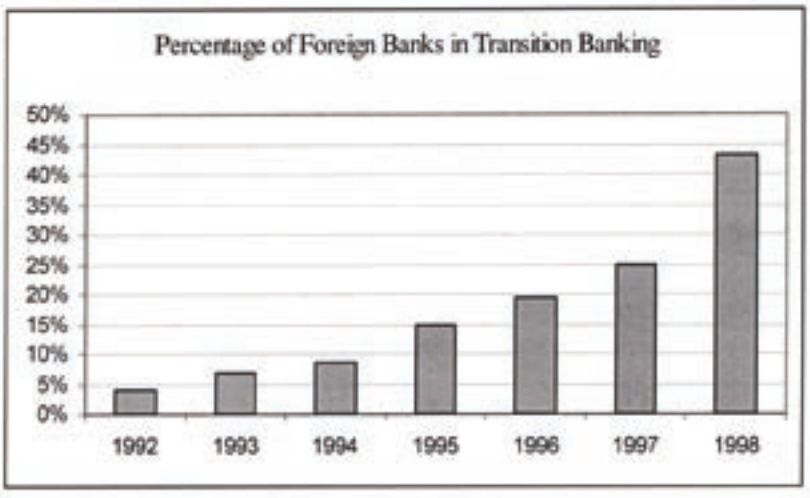
Next, let us consider some aggregate measures of financial depth that would give us an indication of the degree to which outside finance is available for investment projects of all types through the banking system. Panel B of Table 1 reports data relevant to this question. Consider first the FSU countries. For Estonia, we see that the fraction of domestic credit creation, which takes the form of loans to the private sector, has gradually increased over time. Conversely, there seems to be an upsurge in domestic credit creation in the early years of transition, and a gentle decline afterwards. On the other hand, Lithuania and Ukraine exhibit a much more stable credit creation process, even though credit creation in Ukraine is extremely low. As far as the CEE countries are concerned, we see that Bulgaria starts out with a low rate of credit creation, which increases rapidly by the mid-1990s. The rest of the countries in our analysis seem to exhibit a stable domestic credit creation, with the Czech Republic leading the way (having an average credit creation rate of 58%), followed by the Slovak Republic (32%), Hungary (26%), Poland (13%) and Romania (11%).

In Figure 1 we report the percentage of licensed banks with foreign ownership operating in the FSU and CEE countries relative to the total number of banks. The percentages reported exclude portfolio investments of foreign individuals but include wholly foreign-owned new banks, new banks with mixed ownership, and privatized banks where foreign companies have taken an identifiable stake. One may infer that transition economies as a whole have been increasingly open to foreign banks.

Panel B: Bank Credit to Private Sector as a Percentage (%) of GDP							
FSU Countries							
Estonia	7.5	11.2	14.1	14.8	18	25.8	25.3
Latvia	...(a)	17.3	16.4	7.8	7.2	10.5	14.1
Lithuania	...(a)	14.1	16	12.6	11.7	15.3	16.3
Ukraine	2.6	1.4	4.6	1.5	1.4	2.4	...(a)
CEE Countries							
Bulgaria	5.8	3.7	3.8	21.1	35.6	12.6	12.7
Czech Rep.	...(a)	50.8	59.5	59.4	57.4	66.4	58
Hungary	33.1	28.1	26.1	22.5	22	24	...(a)
Poland	11.4	12.2	11.2	12	14.9	17.1	...(a)
Romania	...(a)	...(a)	...(a)	...(a)	11.4	8.5	12.8
Slovak Rep.	...(a)	32.1	24.3	27.8	32	44.2	...(a)

Notes: Source: EBRD (1998). Panel A reports the asset share of state controlled banks in total banks assets. Panel B reports the bank credit to private sector as a percentage of GDP.
(a) Missing entries imply that the data was not available.

Figure 1. Percentage of Foreign Ownership Banks in Transition Economies



Notes: Source: EBRD (1998) and authors' calculations.

In the early 90's it was widely believed that the arrival of foreign banks would create considerable competitive pressures in transition banking systems despite the fact that many banks remained state-owned (see also Panel A of Table 1). These pressures may have aggravated the problems of domestic banks in dealing with their portfolios of non-performing loans because good-quality borrowers switched to the foreign competitors. However, although foreign competition has apparently squeezed margins to some extent, they have remained relatively high for the banking sector as a whole (Drakos, 2003).

3. Assessing Market Structure: The Panzar- Rosse h-statistic

In order to assess the degree of competition in the banking sector in the economies under study, we employ the method developed by Panzar and Rosse (1987), which draws conclusions based on reduced form revenue functions. This method measures the degree of market power by the extent to which changes in cost (factor prices) are reflected in equilibrium revenues. Hence, the degree of competition in the markets under study is assessed by the so-called ***h-statistic***, which is computed as the elasticity of gross revenue to cost. As Panzar and Rosse highlight in their seminal paper, estimating ***h*** as the factor price elasticity of revenues, provides a way of empirically assessing the impact of a shift in a firm's cost curves on equilibrium revenue, even though cost data might be unavailable.[4]

On the one hand, when banks operate under perfect competition at their long-run equilibrium, then a proportional change in cost induces an equiproportional change in revenues; with a perfectly elastic demand, output does not change, while output price rises to the same extent that cost has changed. On the other hand, when banks operate in a monopolistically competitive environment, then revenues will increase less than proportionally to a change in cost, since the demand each bank faces is rather inelastic. Lastly, when banks operate as monopolists, there may be no response or even a negative response in revenues due to changes in cost. To this end, the statistic we seek to compute (***h-statistic***), will be non-positive in the case of monopoly ($h \leq 0$), positive but smaller than one in the case of monopolistic competition ($0 \leq h \leq 1$), and will equal one under perfect competition ($h = 1$). The economic implications of the ***h-statistic*** are summarized in Table 2.

4. The description of the test here is given in accordance with the empirical analysis that follows. In fact, studies assessing competition in the banking industry such as Molyneux *et al*. (1994, 1996), de Bandt and Davis (1999), Nathan and Neave (1989), Perrakis (1993), Hempell (2002) *inter alia,* use the implications of the ***h-statistic*** with respect to factor price elasticities of the reduced form revenue function. In our study we employ an aggregate measure of cost and we do not further decompose cost to its components for two reasons. First, in many cases no data were available. Second, we know from duality theory that a 1% increase in all factor prices leads to a 1% upward shift in all of the firm's cost curves. So instead of asking the question: what will be the percentage change in equilibrium revenues resulting from a 1% change in all factor prices (i.e. the ***h-statistic*** has been originally presented in Panzar and Rosse (1987) and subsequently used in empirical analyses), one could rephrase the question to read: what will happen to equilibrium revenues if costs increase by 1%.

Table 2. Interpreting the Panzar-Rosse h statistic

Parameter Regions	***Competitive Environment Test***
$h \leq 0$	Monopoly / Perfectly Collusive Oligopoly
$0 < h < 1$	Monopolistic Competition
$h = 1$	Perfect Competition / Natural Monopoly in a Perfectly Contestable Market / Sales Maximizing Firm subject to a Breakeven Constraint
Parameter Regions	***Equilibrium Test***
$h \leq 0$	Disequilibrium
$h = 0$	Equilibrium

A critical feature of the ***h***-statistic is that the Panzar-Rosse statistic is valid provided that the banking systems considered are in equilibrium. As suggested by various authors (see in particular Molyneux *et al*., 1994), one should verify that costs are not correlated with industry returns, since competitive capital markets will equalize risk-adjusted rates of return across banks. To implement such a test, one has to apply two "modified" versions of the Panzar-Rosse basic method, by estimating an equation as the one described above (i.e. gross revenue on cost) with either the Return on Assets (*ROA*) or the return on equity (*ROE*) replacing bank revenue as the left hand side variable. In this framework, $\boldsymbol{h}$=0 implies that the market is in equilibrium, while $\boldsymbol{h}$<0 would imply disequilibrium. It should be noted, that equilibrium does not imply that competitive conditions are not allowed to change, an assumption which would be violated for the period considered. It only implies that changes in the banking sector are taking place gradually.

There are two things worth mentioning. First, as Panzar and Rosse (1987) point out, this approach may not hold for various oligopoly equilibria. For example, they show that in the case of a conjectural variation oligopoly the elasticity of the reduced form output function with respect to cost is negative, while the effect of cost on the reduced form revenues will, in general, be indeterminate. They also stress that their approach constitutes a joint test of the underlying theory and competitive behavior since some of the background assumptions include profit maximization and well-behaved revenue and cost functions. Regarding revenue and cost functions, continuity and differentiability are required; assumptions that are quite general and can accommodate a wide range of theoretical models.[5]

5. We are thankful to an anonymous referee for raising this issue on an earlier draft of the paper.

Secondly, the extension of the Panzar and Rosse (1987) methodology to banking requires the assumption that banks are treated as single product firms.[6] Following De Bandt and Davis (1999), we assume that banks are considered mainly as financial intermediaries. This is consistent with the so-called intermediation approach to banking, where the degree and nature of competition in the loans and deposits markets are independent.[7] In our approach, firms are considered as producing credit and other financial services. Hence, we use a total revenue measure, given that in the markets that we are considering the struggle for survival makes the distinction between interest and non-interest income rather irrelevant. We will return to this issue when presenting our data in the following section.

The time paths of concentration ratios exhibit considerable similarity across countries although, as expected, in absolute terms there is variation that probably reflects different initial conditions. Nevertheless, there is an underlying common downward trend in concentration that followed the initial wave of liberalization. Moreover, the speed of reduction in concentration also differs, probably highlighting the alternative policies (aggressive vs. gradualism) adopted, as well as the degree of liberalization in each country. Based on data for 2000, Hungary has the lowest (top-3 banks) concentration ratio (36.51 %) followed by Poland (39.86 %) and Latvia (44.33 %). At the other end of the spectrum one finds Romania (87.83 %), Bulgaria (76.04 %) and Estonia (75.27 %). Concentration ratios across countries and years are reported in Table 3.

4. Data and Econometric Methodology

4.1 Data

The selection of the countries and banks for the analysis reflects the availability of data at the bank level. The dataset consists of 218 banks from the following countries (number of banks in the sample): [8] Bulgaria (18), Czech Republic (22), Estonia (13), Hungary (29), Latvia (25), Lithuania (14), Poland (37), Romania (15), Slovak Republic (21), and Ukraine (24). The annual balance sheets and profit and loss accounts of banks were collected from the database of Fitch-IBCA Ltd. BankScope (IBCA henceforth) for the period 1992-2000. Our dataset may suffer from selection bias due to the fact that IBCA reports data for large banks only. However, it is not clear in what direction this bias might affect our results. In any case, the banks included in our sample account for the vast majority of banking operations in their respective countries.

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6. Panzar and Rosse (1987) stress that their contribution has the drawback that it is valid only for single product firms, while they conjecture that the results should be similar in the multi-input, multi-output case.

7. See Davis and Salo (1998), and De Bandt and Davis (1999) and the references therein for further details.

8. Sample descriptive statistics are reported in the appendix.

Table 3. Concentration Ratios

Panel A: Concentration Ratios Based on the Three (3) Largest Banks									
Country/Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
FSU Countries									
Estonia	100[a]	93.09	77.15	48.44	43.21	36.5	66.37	66.82	75.27
Latvia	100[a]	86.1	67.77	62.04	57.91	47.39	52.01	49.82	44.33
Lithuania	…[b]	92.88	83.39	71.07	58.5	47.17	51.42	55.57	57.25
Ukraine	100[a]	97.62	71.08	58.46	82.46	68.45	35.29	68.68	45.35
CEE Countries									
Bulgaria	100[a]	91.04	84.84	68.18	71.98	71.89	71.85	74.58	76.04
Czech Rep.	…[b]	50.74	45.51	45.74	41.75	40.09	35.57	42.66	54.21
Hungary	90.14	54.62	60.48	54.88	50.65	54.28	46.15	45.45	36.51
Poland	68.6	59.81	52.26	51.44	45.07	41.41	45.08	38.51	39.86
Romania	99.14	95.95	87.5	70.29	67.12	73.56	51.73	59.36	87.83
Slovak Rep.	…[b]	85.79	82.48	77.29	70.28	63.55	53.44	56.05	71.4
Panel B: Concentration Ratios Based on the Five (5) Largest Banks									
Country/Year	1992	1993	1994	1995	1996	1997	1998	1999	2000
FSU Countries									
Estonia	100[a]	97.77	92.41	65.94	60.61	55.68	92.5	92.53	94.26
Latvia	100[a]	95.89	81.21	74.13	69.99	63.14	69.08	66.94	64.36
Lithuania	…[b]	100	93.59	87.25	76.5	68.38	74.22	80.57	79.95
Ukraine	100[a]	99.45	87.94	77.43	89.37	77.79	53.33	76.1	69.45
CEE Countries									
Bulgaria	100[a]	96.59	92.93	82.73	83.71	82.55	80.05	82.39	84.39
Czech Rep.	…[b]	72.54	65.87	63.9	58.78	58.09	54.07	64.85	81.78
Hungary	96.65	68.36	73.29	70.4	67.06	66.76	62.29	61.32	53.02
Poland	83.39	70.36	67.15	64.85	61.57	56.55	57.92	55.4	48.6
Romania	100[a]	100[a]	97.79	93.65	89.12	86.35	68.98	73.64	94.31
Slovak Rep.	…[b]	97.07	92.82	87.13	80.49	72.68	62.07	66.42	79.51

Notes: The table reports the *m-firm* concentration ratios of Total Assets for the banks included in our sample. Panel A reports the concentration ratios based on the three largest banks, and Panel B the concentration ratios based on the five largest banks in our sample.

(a) The fact that the concentration ratio is 100% reflects the fact that some of the banks in our sample do not report data for the specific year (the panel is unbalanced).

(b) Missing due to non-availability of data.

Note, however, that market structure is reflected in behavior of market participants rather than their actual number. In other words, provided that participants considered in the sample account for a sufficiently large part of the market then inference regarding market structure would not be significantly impeded.

The variables chosen are shown as they appear in the harmonized balance sheets of banks in the IBCA database. The likelihood of contamination of our result from different accounting practices is quite low given that IBCA ensures comparability of data. In particular, we collected data for: Total Assets (TA), Total Operating Income (REV), Total Operating Expenses (COST), Leverage (LEV), and Net Interest Margins (NIM).

One innovation of this paper is that competitive conditions are inferred in terms of total income rather than interest revenue alone. This is considered to be highly relevant given that banks are seeking non-interest revenue as a supplement to declining interest income as deregulation and structural change proceeds. Although previous studies have used gross interest income as the dependent variable, in the current exercise we consider it is more appropriate to look at total income. The distinction of interest and non-interest income becomes less relevant since competition is equally vigorous for both. There may also be important complementarities, with both loans and other non-interest services provided in the context of a customer relationship. In other words, we view banks as firms producing a single homogeneous product. Moreover, it would be hard to defend specialization of banks in their early phases of development. In Table 4, we report Net Interest Income (NII) and Total Operating Income (REV), as a percentage of total assets. Both NII and REV have steadily declined since the mid-1990s, which should be attributed to increased competition and foreign entry.

4.2 Econometric Methodology

The vast majority of empirical studies, with the exception of De Bandt and Davis (1999), have explored the issue of market structure in a cross-sectional framework, where it is implicitly assumed that all banks have access to the same factor markets but only differ in terms of scale of operations. However, relying only on cross-sectional variation (year-by-year estimation) may provide irregular results as De Bandt and Davis (1999) point out. Additionally, as Hannan and Liang (1993) highlight, cross-sectional cost comparisons cannot be adequately performed and important idiosyncrasies make comparisons highly suspect. For these reasons, we adopt a panel estimation approach, effectively utilizing information both from the cross-section of banks and their time series behavior.

In order to assess the competitive conditions in CEE and FSU banking systems we will employ the Panzar- Rosse ***h****-statistic*. In particular, we start by analyzing each banking system on a country-by-country basis, effectively by pooling all available

Table 4. Net Interest Income and Total Operating Income

	Panel A: Net Interest Income/ Total Assets								
	1992	1993	1994	1995	1996	1997	1998	1999	2000
	FSU Countries								
Estonia	6.52	10.20	9.35	7.66	7.05	5.82	5.21	4.27	4.00
Latvia	...[a]	8.89	8.77	8.05	7.81	5.27	6.37	4.50	5.00
Lithuania	...[a]	18.44	12.06	10.22	6.46	5.96	5.51	6.36	5.46
Ukraine	...[a]	15.79	35.30	22.14	12.42	13.99	16.27	9.42	8.67
	CEE Countries								
Bulgaria	...[a]	2.34	-2.58	0.82	3.20	9.00	5.58	5.95	6.80
Czech Republic	...[a]	4.80	3.68	3.30	1.78	2.40	2.75	3.03	2.44
Hungary	6.85	6.23	5.93	5.56	5.02	3.99	3.65	3.71	4.75
Poland	8.53	6.51	9.23	8.74	8.15	6.50	5.67	4.56	4.32
Romania	11.27	15.05	8.43	9.51	8.56	12.11	15.03	13.44	9.00
Slovak Republic	...[a]	5.10	4.32	3.56	2.70	3.04	2.98	2.93	3.94
	Panel B: Total Operating Income/Total Assets								
	1992	1993	1994	1995	1996	1997	1998	1999	2000
	FSU Countries								
Estonia	12.80	13.49	10.77	8.42	8.15	5.99	4.39	6.19	5.00
Latvia	...[a]	11.87	10.94	12.50	11.43	8.63	6.46	7.49	6.68
Lithuania	...[a]	17.90	10.99	11.02	9.45	7.02	7.00	7.57	6.47
Ukraine	...[a]	7.84	22.81	21.05	19.42	17.85	20.89	14.66	14.44
	CEE Countries								
Bulgaria	...[a]	2.50	2.48	7.26	29.58	31.46	6.22	8.36	8.79
Czech Republic	...[a]	5.22	4.88	4.28	3.40	4.51	5.29	4.31	3.84
Hungary	9.24	7.36	7.21	7.15	5.86	5.73	5.66	5.85	7.46
Poland	9.93	10.16	10.70	9.20	8.30	7.61	7.23	6.31	6.67
Romania	12.70	14.74	8.46	12.73	15.62	21.40	16.04	14.40	14.16
Slovak Republic	...[a]	5.45	5.28	4.09	3.85	4.40	5.01	5.75	5.08

Notes: Panel A reports the average of the Net Interest as a percentage of Total Assets, and Panel B reports the average of Total Operating Income (Revenue) as a percentage of Total Assets.

(a) Missing entries imply that the data was not available.

data for banks in each country. We then pool all available observations (i.e. we employ all available data for all banks in each country) in order to assess the market structure for transition as a whole. Our generic model reads:

$$ln(REV_{it})=\alpha+\boldsymbol{h}ln(COST_{it})+\beta_1 LEV_{it}+\beta_2 NIM_{it}+\beta_3 ln(TA_{it})+u_{it} \quad (1)$$

where *ln* stands for the natural logarithm, $\{\alpha,\boldsymbol{h},\beta_1,\beta_2,\beta_3\}$ are constant estimable parameters, u_{it} is a bank-specific well-behaved disturbance term, and the rest of the variables are as defined above. We have estimated the parameters of the model under three alternative specifications: a pooled regression i.e. imposing the same constant and slope parameters across banks as in (1) above (NE, the model has no individual specific effects), allowing for fixed effects (FE) and finally, allowing for fixed effects and time effects (FE & TD).[9]

In the first case, equation (1) is estimated by OLS with a constant term on the pooled sample of banks and years, implicitly assuming that all observations are independent. Then, as it is important to test whether omitted bank-specific variables such as individual bank management and ability, etc., may affect inference, we examine the "fixed effects" estimator, by introducing different intercepts (we assume that $u_{it}=\alpha_i+\eta_{it}$, with $\eta_{it}\sim NIID(0,\sigma_\eta^2)$). In this vein, we introduce some bank heterogeneity in our model, which is not captured by the explanatory variables. Next, in order to control for common across-banks or economy-wide disturbances (like world interest rates, inflation rates etc.) that influence the banking systems in our study, we introduce common time effects (we assume that $u_{it}=\alpha_i+\lambda_t+\eta_{it}$, with $\eta_{it}\sim NIID(0,\sigma_\eta^2)$), where λ_t varies over time but is common across individuals).

The parameter of interest is $\boldsymbol{h}$, which in our context is an estimate of the Panzar-Rosse statistic. In contrast to previous studies that have used interest revenue as the dependent variable, we follow De Bandt and Davis (1999) by choosing total operating income. The reason for doing so, is that in the light of recent market conditions the distinction between interest and non-interest income has become less relevant.

As far as the specification of our empirical model is concerned, we explicitly allow for bank heterogeneity by including a set of bank-specific characteristics based both on previous reported empirical regularities as well as standard finance theory. For instance, we condition on financial leverage (LEV) in order to account for differences in financing mix. Similarly, we include net interest margins (NIM) since they play a prominent role in the determination of bank revenue and also, to some extent, reflect market power and efficiency (Drakos, 2002). Finally, total assets (TA) are included in order to account for differences in size.[10]

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9. An appendix describing our econometric methodology in more detail is available upon request.
10. In previous versions of the paper we had also included loan loss reserves (LLR) in order to control for the risk profile as well. It turned out that this variable was insignificant in almost all empirical specifications, and therefore it has been excluded. Needless to say, our results are invariant to the inclusion/exclusion of this variable.

Before proceeding with the presentation of our empirical results, a word of caution is necessary. More specifically, it is well known that even in perfectly competitive markets delayed changes in pricing of bank services and products imply a downward bias of the estimated ***h***-statistic. In order to control for this event we should condition our estimation on the maturity structure of the bank assets.[11] Unfortunately, such detailed data were not available to us and we were forced to proceed in our analysis without explicitly controlling for the maturity structure of the different banks in the banking systems in our analysis.

5. Empirical Assessment of the Market Structure

5.1 Empirical Results

Various alternative specifications of the base model were estimated, starting with a pooled model without bank-specific effects, a model with fixed effects and finally a model with fixed effects and common time effects. The results presented, our inference and hypotheses testing for each country are based on the most adequately specified model, at which we arrive after a set of model reduction tests.[12] The model selection statistics are reported in Table 5.

The tests indicated that for the case of Ukraine a pooled regression model could not be rejected. In contrast, a model with Fixed-Effects is adopted for Hungary and Lithuania. Finally, a model with Fixed-Effects and Common Time Effects was the most adequate specification for the cases of Bulgaria, Czech Republic, Estonia, Latvia, Poland, Romania, and the Slovak Republic and for the panel of banks as a whole.[13] Having established which is the most adequate statistical model, we can now present our estimation results, which are reported in Table 6.

11. We are thankful to an anonymous referee of this journal for bringing this to our attention.
12. The interested reader is referred to Baltagi (2001) or Greene (1993) for more on the testing strategy.
13. We have also reported results for the whole panel of countries excluding the Czech Republic, and for the whole panel of countries excluding the Czech Republic, Latvia and Ukraine for reasons that we explain below. The adopted empirical specification in both cases is a Fixed-Effects with Common Time Effects model.

Table 5. Model Selection [a]

	FE & TD vs. FE	F(-,-)	FE vs. NE	F(-,-)	FE vs. RE[b] ~ c^2 (4)
Country	Test Statistic[c]				
FSU Countries					
Estonia	3.849***	F(8,42)	4.285***	F(12,50)	10.948**
Latvia	3.197***	F(7,100)	2.687***	F(24,107)	24.645***
Lithuania	0.533	F(7,55)	3.280***	F(13,62)	1.327
Ukraine	0.466	F(7,64)	1.325	F(23,71)	7.019
CEE Countries					
Bulgaria	4.231***	F(7,65)	1.236	F(17,72)	2.381
Czech Rep.	1.879*	F(8,110)	9.593***	F(21,118)	20.774***
Hungary	1.122	F(8,159)	4.400***	F(28,167)	3.880
Poland	2.187**	F(8,180)	5.906***	F(36,188)	8.869*
Romania	4.116***	F(8,48)	1.714*	F(14,56)	13.024**
Slovak Rep.	2.064**	F(8,79)	2.998***	F(20,87)	9.223*
Transition Banking					
All Countries	6.070***	F(8,791)	4.626***	F(217,799)	21.444***
All Countries (B)	4.087***	F(8,884)	3.661***	F(195,892)	19.687***
All Countries (C)	2.225**	F(8,697)	5.032***	F(147,705)	7.540

Notes:

(a) The acronyms used imply: NE: Pooled Regression (No Effects), FE: Fixed Effects, FE & TD: Fixed Effects allowing for common time effects by means of Time Dummies, and finally RE: Random effects. The second entry All Countries (B) includes all countries in the sample excluding the Czech Republic, while the third entry All Countries (C) excludes the Czech Republic, Latvia and Ukraine from the sample.

(b) Hausman's (1978) Test.

(c) One, two and three asterisks denote significance at the 10, 5 and 1 percent level respectively.

More specifically, we first estimate the more general model that features FE & TD and we examine whether it can be reduced to a FE model (i.e. whether we can eliminate common time effects); this reduction is tested via an F-test (likelihood ratio test). If this restriction is not rejected we proceed with testing whether the obtained FE can be further reduced to a pooled regression (i.e. whether fixed-effects can be disregarded) again by means of an F-test (likelihood ratio test). Finally, we test a Random Effects (RE) specification vs. a FE specification, using Hausman's (1978) test.

Table 6. Estimation Results (Estimation Period 1992-2000)

Country (obs)	Model Specification	Estimates [t-ratio]				Diagnostics	
		$ln(COST_{it})$	LEV_{it}	NIM_{it}	$ln(TA_{it})$		
		h	β_1	β_2	β_3	Adj. R^2	DW
FSU Countries							
Estonia (67)	FE & TD	0.376 [1.91]	0.013 [2.18]	0.050 [2.90]	0.676 [3.62]	0.97	1.93
Latvia (136)	FE & TD	-0.032 [-0.27]	0.003 [0.86]	0.045 [4.94]	0.824 [7.01]	0.89	2.26
Lithuania (80)	FE	0.246 [3.86]	-0.005 [-2.25]	0.055 [8.41]	0.783 [11.33]	0.98	2.04
Ukraine (99)	NE	0.255 [5.22]	0.016 [4.88]	0.013 [7.73]	0.819 [13.85]	0.95	1.45
CEE Countries							
Bulgaria (94)	FE & TD	0.339 [3.45]	-0.006 [-0.55]	0.019 [1.43]	0.479 [3.09]	0.80	1.81
Czech Rep. (144)	FE & TD	0.330 [4.83]	6.82×10^{-7} [2.98]	-6.63×10^{-7} [-2.66]	0.628 [9.05]	0.97	1.24
Hungary (200)	FE	0.231 [4.92]	-0.001 [-0.27]	0.078 [6.73]	0.616 [9.36]	0.93	2.13
Poland (299)	FE & TD	0.043 [1.79]	0.009 [2.74]	0.062 [9.25]	0.838 [17.25]	0.98	1.79
Romania (75)	FE & TD	0.259 [2.27]	0.022 [3.65]	0.027 [3.51]	1.170 [12.59]	0.97	1.74
Slovak Rep. (112)	FE & TD	0.514 [5.48]	-0.003 [-0.41]	0.024 [1.30]	0.803 [5.61]	0.93	1.22
Transition Banking							
All Countries (1236)	FE & TD	0.323 [13.91]	7.18×10^{-7} [3.30]	-7.03×10^{-7} [-2.93]	0.629 [24.71]	0.94	1.55
All Countries (B) (1092)	FE & TD	0.294 [12.00]	0.004 [2.46]	0.022 [9.73]	0.649 [20.65]	0.94	1.61
All Countries (C) (857)	FE & TD	0.309 [11.81]	0.001 [0.611]	0.041 [10.41]	0.661 [19.44]	0.94	1.85

Notes: NE: Pooled Regression, FE: Fixed Effects, and FE & TD: Fixed Effects with Time Effects. Values of t–statistics are given in square brackets. For the Czech Republic and the Slovak Republic the sample runs from 1993 to 2000. The second entry All Countries (B) includes all countries in the sample, excluding the Czech Republic, while the third entry All Countries (C) excludes the Czech Republic, Latvia and Ukraine from the sample.

On a general level, the estimates for the ***h-statistic*** are significant with point estimates between zero and unity. In the majority of cases the selected conditioning variables are significant and the estimated models exhibit high explanatory power,[14] but the residuals do not seem in general well behaved. Closer inspection of the residuals reveals that the deviations from the assumption of normality arise due to heteroscedasticity.[15] We explicitly take this issue into account below in our sensitivity analysis.

Another point that deserves attention is that when we examined the results for all the countries together by pooling all banks in our panel, we noticed that the coefficients of Leverage and Net Interest Margins seemed to be heavily influenced by the inclusion of the Czech banks in the panel. More specifically we noticed that when the Czech Republic was included in the panel, the coefficients for the whole panel were of the same order of magnitude as those for the Czech Republic. We have therefore decided to report results for a panel that excludes the Czech banks in order to have a more comprehensive view of transition banking (labeled All Countries (B)).

For all cases the coefficients of Total Assets are highly significant and invariably positive. This finding suggests that size does matter and, *ceteris paribus*, larger banks seem to enjoy higher operating income. With the exception of the Czech Republic banks (and the whole group when Czech banks are included in the panel), the same holds for the coefficients of Net Interest Margin. This finding is in accordance with our priors, since 'larger' margins tend to be associated with increased interest revenue and therefore higher operating income. The sign on the coefficient of Leverage is not uniform across cases, and is significant in six out of ten cases. For the banking systems in which the effect of Leverage is significant, our findings imply that with the exception of the Lithuanian banks, more 'leveraged' firms tend to be associated with higher revenue.

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14. The adjusted R^2 is typically above 0.90 with a minimum of 0.80.

15 Strictly speaking, for most of the banking systems under scrutiny the normality assumption was rejected when we pool the residuals, so inference might be problematic. But this might not be so serious for the following reason. Consider the basic panel equation that reads $y_{it} = \alpha + \boldsymbol{\beta}' \mathbf{x}_{it} + u_{it}$ with $u_{it} = \alpha_i + \lambda_t + \eta_{it}$, and $\eta_{it} \sim NIID(0, \sigma^2_{\eta,i})$. Testing for normality requires that (i) $\eta_{it} \sim NIID(0, \sigma^2_{\eta,i})$ and that (ii) $\sigma^2_{\eta,i} = \sigma^2_{\eta}$. Rejecting the assumption of normality implies that either (i) does not hold, so that each error term is not normally distributed, or that (ii) does not hold, so the error terms across different units of the panel do not have the same variance, hence there is error heteroscedasticity. Closer inspection of the residuals reveals, that deviations from normality arise due to the fact that $\sigma^2_{\eta,i} \neq \sigma^2_{\eta}$, namely the variances of each group member seem to differ across the panel. In order to address this issue, we have also reported heteroscedasticity-consistent standard errors in our sensitivity analysis, in section 5.2. Furthermore, kernel estimates of the residual density function also reveal that deviations are rather limited in nature. These results are not reported for space conservation reasons; they are included in an appendix available from the authors upon request.

In order to examine the validity of our analysis, we next examined whether the banking systems under study are in equilibrium. As already mentioned formal tests employ a variant of equation (1), where the Revenue (REV) is replaced by a measure of (equilibrium) return such as the Return on Equity (ROE) or the Return on Assets (ROA). However, for the case of any transition economy it is difficult to advocate that markets operate at their long run (equilibrium) level since that would be a contradiction in terms (after all, they are still in the transition phase). So the way to interpret these 'equilibrium' tests is that equilibrium does not mean that competitive conditions are not allowed to change. It only implies that changes in banking are taken as gradual[16]. Our 'equilibrium' tests are summarized in Table 7.

Table 7 reports two alternative ways of examining 'equilibrium': one using the ROA and another using the ROE, instead of revenue as the right-hand side variable.[17] The first finding that emerges from the results in Table 7, for almost all CEE countries, is that there is no evidence against the hypothesis that the "modified" ***h*** statistic is equal to zero, regardless of whether we employ ROA or ROE. The data support the notion that markets are in equilibrium (again recall our discussion above of what 'equilibrium' means). The same holds when we pool all banks across different countries in our sample. This provides support for our conclusions below regarding the degree of competition in the markets under study. As far as the FSU countries are concerned, the Estonian banking system also seems to be in 'equilibrium'. On the other hand, Lithuania seems to be on the borderline when ROA is used, whereas the hypothesis of 'equilibrium' is not rejected when we use ROE. Similarly, the results for Ukraine also show that the assumption of 'equilibrium' might be marginally violated. Lastly, in the case of Latvia, the assumption of 'equilibrium' seems strongly violated.

In order to avoid contamination of our results from banking systems that do not seem to operate in 'equilibrium', when we pool all the banks in our sample, we are also going to focus on a sample excluding banks from the Czech Republic for reasons outlined above, as well as banks from Latvia and Ukraine (which we have labeled All Countries (C)). Furthermore, for the sake of completeness and for reasons of comparability, in presenting our tests below, we will also report results for the banking systems that do not seem to operate in 'equilibrium'. Given that these banking systems might not be in equilibrium, the results should be interpreted with caution and it is left to the reader to assess their importance.

Now, focusing on each country and based on the selected models we are able to draw inferences with regard to their recovered market structure. The Wald tests[18] on ***h*** are summarized in Table 8.

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16. See also DeBandt and Davis (1999) for a similar reasoning.
17. It should be noted that ROE and ROA are linked together by the Du Pont Identity: ROE = ROA × (Assets/Total Equity).
18. These are basically *t-tests*, but they are based on the Wald testing principle since in order to test a restriction on a parameter of the model (here ***h***) we use only the unrestricted estimates of the model. See Greene (1993) Ch.4 for a short discussion.

Table 7. Estimation Results - Equilibrium Tests (Estimation Period 1992-2000)

Country	Model Specification	Estimates and Test Statistics [t-stat] / [p-value]					
		ROA_{it}			ROE_{it}		
		h	Adj. R^2	F-stat	h	Adj. R^2	F-stat
FSU Countries							
Estonia	FE & TD	-1.457 [-1.61]	0.49	2.607 [0.11]	-1.287 [-1.40]	0.51	1.965 [0.17]
Latvia	FE & TD	-1.168 [-3.63]	0.41	13.235 [0.00]	-1.347 [-4.76]	0.46	22.681 [0.00]
Lithuania	FE	-1.064 [-1.96]	0.16	3.858 [0.06]	-0.892 [-1.46]	0.25	2.126 [0.15]
Ukraine	NE	-0.362 [-2.34]	0.24	5.506 [0.02]	-0.295 [-1.99]	0.35	3.987 [0.05]
CEE Countries							
Bulgaria	FE & TD	-0.417 [-1.11]	0.25	1.237 [0.27]	-0.380 [-0.98]	0.26	0.968 [0.33]
Czech Rep.	FE & TD	0.483 [1.59]	0.93	2.536 [0.11]	0.545 [1.72]	0.85	2.946 [0.09]
Hungary	FE	0.041 [0.19]	0.48	0.036 [0.85]	0.090 [0.39]	0.34	0.153 [0.70]
Poland	FE & TD	-0.126 [-1.62]	0.59	2.627 [0.11]	-0.123 [-1.57]	0.54	2.453 [0.12]
Romania	FE & TD	0.120 [0.30]	0.19	0.089 [0.77]	-0.096 [-0.28]	0.46	0.079 [0.78]
Slovak Rep.	FE & TD	0.182 [0.93]	0.53	0.858 [0.36]	0.175 [0.91]	0.59	0.825 [0.37]
Transition Banking							
All Countries	FE & TD	0.119 [1.13]	0.69	1.277 [0.26]	0.018 [0.17]	0.50	0.029 [0.86]
All Countries (B)	FE & TD	-0.131 [-1.30]	0.44	1.700 [0.19]	-0.162 [-1.63]	0.40	2.669 [0.10]
All Countries (C)	FE & TD	-0.071 [-0.93]	0.42	0.866 [0.35]	-0.085 [-1.11]	0.37	1.238 [0.27]

Notes: NE: Pooled Regression, FE: Fixed Effects, and FE & TD: Fixed Effects with Time Effects. Values of t-statistics are given in square brackets. For the Czech Republic and the Slovak Republic the sample runs from 1993 to 2000. The second entry All Countries (B) includes all countries in the sample, excluding the Czech Republic, while the third entry All Countries (C) excludes the Czech Republic, Latvia and Ukraine from the sample.

Table 8. Wald Tests for the h-statistic

Country (obs)	Model Specification	Estimated *h*-statistic [*t*-statistic]	Wald Test Statistics for H_0			Recovered Market Structure
			$h=1$ [*p*-value]	$h<1$ [*p*-value]	$h \leq 0$ [*p*-value]	
FSU Countries						
Estonia (67)	FE & TD	0.376 [1.91]	-3.175 [0.00]	-3.175 [0.99]	1.909 [0.03]	Monopolistic Competition
Latvia (136)	FE & TD	-0.032 [-0.27]	-8.693 [0.00]	-8.693 [1.00]	-0.271 [0.51]	---
Lithuania (80)	FE	0.246 [3.86]	-11.787 [0.00]	-11.787 [1.00]	3.856 [0.00]	Monopolistic Competition
Ukraine (99)	NE	0.255 [5.22]	-15.262 [0.00]	-15.262 [1.00]	5.224 [0.00]	Monopolistic Competition
CEE Countries						
Bulgaria (94)	FE & TD	0.339 [3.45]	-6.742 [0.00]	-6.742 [1.00]	3.454 [0.00]	Monopolistic Competition
Czech Rep. (144)	FE & TD	0.330 [4.83]	-9.792 [0.00]	-9.792 [1.00]	4.828 [0.00]	Monopolistic Competition
Hungary (200)	FE	0.231 [4.92]	-16.321 [0.00]	-16.321 [1.00]	4.915 [0.00]	Monopolistic Competition
Poland (299)	FE & TD	0.043 [1.79]	-39.533 [0.00]	-39.533 [1.00]	1.786 [0.04]	Monopolistic Competition
Romania (75)	FE & TD	0.259 [2.27]	-6.482 [0.00]	-6.482 [1.00]	2.266 [0.01]	Monopolistic Competition
Slovak Rep. (112)	FE & TD	0.514 [5.48]	-5.164 [0.00]	-5.164 [1.00]	5.476 [0.00]	Monopolistic Competition
Transition Banking						
All Countries (1236)	FE & TD	0.323 [13.91]	-29.097 [0.00]	-29.097 [1.00]	13.914 [0.00]	Monopolistic Competition
All Countries (B) (1092)	FE & TD	0.294 [12.00]	-28.783 [0.00]	-28.783 [1.00]	12.003 [0.00]	Monopolistic Competition
All Countries (C) (1092)	FE & TD	0.309 [11.81]	-26.350 [0.00]	-26.350 [1.00]	-11.809 [0.00]	Monopolistic Competition

Notes: The Wald tests reported are either two-sided (for H_0: $\boldsymbol{h} = 1$) or one-sided (for H_0: $\boldsymbol{h} \leq 1$ and H_0: $\boldsymbol{h} \leq 0$) t-tests and are distributed as t (N_i+T_i-k) where k is the number of parameters estimated under the null (including the coefficients on time dummies where appropriate). The second entry All Countries (B) includes all countries in the sample excluding the Czech Republic, while the third entry All Countries (C) excludes the Czech Republic, Latvia and Ukraine from the sample.

The null hypothesis that the ***h**-statistic* is zero is not rejected for Latvia – which was found to be in disequilibrium above – while for the other nine countries we emphatically reject the null, as well as for the pooled panel.[19] Our main hypotheses, namely whether ***h*** is equal to unity, between zero and one or less than zero, allow us to distinguish between alternative market structures. Our hypothesis testing provides overwhelming evidence against the null of perfectly competitive banking sectors in either group of CEE or FSU countries. Similarly, when pooling all available information in the panel, we note that transition banking (even when we exclude some banking systems due to problems outlined above) as a whole, is consistent with a monopolistically competitive market structure. In fact, our results suggest that most of the banking sectors we have studied are consistent with the paradigm of monopolistic competition.

5.2 Sensitivity Analyses

To assess the robustness of our results, we undertook various sensitivity analyses. The results from our sensitivity analyses are summarized in Table 9. First, our panel exhibits non-normality due to heteroscedasticity. In order to control for the presence of heteroscedasticity, we have used heteroscedasticity-robust standard errors (White, 1980). The only change (see fourth column of Table 9) was encountered in the case of Poland, where the ***h**-statistic* became statistically insignificant.
Second, we estimated equation (1) in first differences in order to check to what extent our results are influenced by the presence of deterministic terms (e.g. constant, fixed-effects and time effects). Given the original model we have estimated

$$ln(REV_{it})=\alpha+\boldsymbol{h}ln(COST_{it})+\sum_{k=1}^{K}\beta_k x_{k,it}+u_{it}$$

with $u_{it}=\mu_i+\lambda_t+v_{it}$, $v_{it}\sim IID\left(0,\sigma_v^2\right)$, by first differencing we obtain:

$$\Delta ln(REV_{it})=\boldsymbol{h}\Delta ln(COST_{it})+\sum_{k=1}^{K}\beta_k \Delta x_{k,it}+(\lambda_t-\lambda_{t-1})+\eta_{it}, \qquad (1')$$

where $\eta_{it}=v_{it}-v_{it-1}$, thus eliminating the constant and the fixed effects. In this manner we can focus on the coefficient of interest, namely ***h***. The first thing we note is that there is a small reduction in the absolute magnitude of the ***h**-statistic* in the majority of cases (see fifth column of Table 9). It turns out that the differences are quite small – exceptions include Latvia (for which the ***h**-statistic* becomes positive) and the Czech Republic (for which the ***h**-statistic* is reduced sharply) – but in general, the inferred market structure remains unaltered.

19. The two marginal cases are Estonia with p-value [0.06] and Poland with p-value [0.07].

Table 9. Sensitivity Analyses (Estimation Period: 1992-2000)

Country	Model Specification	Estimates of *h* and *t-statistics*				
		Estimated *h*-*Statistic* [*t-stat*]	Sensitivity I [a]	Sensitivity II [b]	Sensitivity III [c]	Sensitivity IV [d]
		h	***h***	***h***	***h***	***h***
FSU Countries						
Estonia	FE & TD	0.376	0.376	0.252	...	0.342
		[1.91]	[1.95]	[2.01]		[1.47]
Latvia	FE & TD	-0.032	-0.032	0.084	...	-0.467
		[0.27]	[0.21]	[0.82]		[-3.20]
Lithuania	FE	0.246	0.246	0.223	0.253	0.207
		[3.86]	[3.00]	[3.35]	[3.88]	[2.77]
Ukraine	NE	0.255	0.255	0.294	0.237	0.329
		[5.22]	[4.08]	[3.24]	[4.64]	[4.78]
CEE Countries						
Bulgaria	FE & TD	0.339	0.339	0.404	0.335	0.677
		[3.45]	[2.71]	[3.13]	[3.29]	[2.38]
Czech Rep.	FE & TD	0.330	0.330	0.071	...	0.394
		[4.83]	[2.26]	[2.32]		[4.53]
Hungary	FE	0.231	0.231	0.224	...	0.189
		[4.92]	[3.11]	[3.73]		[3.24]
Poland	FE & TD	0.043	0.043	0.065	...	0.062
		[1.79]	[1.12]	[2.55]		[2.18]
Romania	FE & TD	0.259	0.259	0.379	0.195	0.146
		[2.27]	[2.53]	[3.78]	[1.45]	[0.82]
Slovak Rep.	FE & TD	0.514	0.514	0.402	0.512	0.424
		[5.48]	[5.00]	[3.74]	[5.43]	[3.13]
Transition Banking						
All Countries	FE& TD	0.323	0.323	0.280	0.311	0.325
		[13.91]	[8.55]	[10.72]	[13.21]	[11.17]
All Countries (B)	FE & TD	0.294	0.294	0.264	0.285	0.324
		[12.00]	[7.40]	[9.55]	[11.50]	[6.52]
All Countries (C)	FE & TD	0.309	0.309	0.268	0.301	0.311
		[11.81]	[5.66]	[9.21]	[11.35]	[9.36]

Notes: The sample for the Czech Republic and the Slovak Republic runs from 1993 to 2000. (a) We employ heteroscedasticity-consistent standard errors using White's (1980) method. (b) We estimate the model in first differences to check that the results are similar to the NE, FE and, FE & TD estimator. (c) We have estimated the specific model chosen for each country, after eliminating from the sample banks that report data for a period of less than three consecutive years. (d) The number of foreign banks is included as a regressor in the empirical specification. Although there is no theoretical reason for such a choice, we hope that in this way we can capture the alleged effect that foreign banks would have on the degree of competition in each country and hence on ***h***.

Third, in order to examine if our results were biased by the inclusion of banks that either did not report data for the whole period or went out of business, we eliminated those banks who report data for less than three consecutive years. Our results (sixth column of Table 9) indicate that there is no qualitative change of the estimated ***h****-statistics*.

Finally, we have also included the number of foreign banks as a regressor in the empirical specification in order to capture the degree of banking sector openness (last column of Table 9). In this case, inference regarding the ***h****-statistics* was almost invariably unaltered.

We believe that our results can shed light on the observed market experiences and by doing so they can be used to assess regulation and policies in a dynamic and comparative way. However, they cannot be used to 'predict' what the results of these policies will be in the future. Moreover, the usefulness of our results is that they provide a benchmark to which policy makers could compare future performance and market structure. Of course we should not forget that similar market structures have been found for other major European economies (e.g. Germany, France and Italy; De Band and Davis, 1999).

6. Concluding Remarks

In this paper we have followed recent research in evaluating competitive conditions in banking markets and focused on a sample of banks from a group of CEE and FSU countries. More specifically, we have utilized reduced form revenue equations to estimate the Panzar-Rosse ***h****-statistic*. This statistic was then utilized to assess competitive conditions in the banking markets in the corresponding countries. In our empirical specification we have controlled for bank heterogeneity by conditioning our estimation on bank-specific characteristics that take into account each bank's general financial profile. However, our short sample period as well as the substantial year-to-year variations of the results prevents us from drawing conclusions regarding trends in banking competition. Our findings are therefore limited to the assessment of the level of competition in the banking market for the period 1992-2002.

Our findings suggest that almost all banking sectors in our sample are consistent with the paradigm of monopolistic competition. In some cases, like those of Latvia and Ukraine, we found that the banking systems are far from anything that could be characterized as an 'equilibrium', hence for these two cases our results are hard to interpret: essentially the underlying theory would have to be rejected.

The policy implications emerging from our analysis can be summarized as follows. For the particular period and banking sectors analyzed, our results imply that transition banking is adequately described by a monopolistically competitive market structure. It seems that the transition process has definitely succeeded in introducing a higher level of competition in the banking sector, as this is measured by the Panzar-

Rosse ***h****-statistics*. We should point out however, that if the goal was to converge to a perfectly competitive market, this has not been realized, at least within the period we analyzed. It would be interesting to assess these policies depending on their time horizon, but policy makers should bear in mind that at best what they should hope for, is a degree of competition similar to that in other countries, e.g. Western European countries. Our analysis shows that transition countries, which have prudentially increased the size of their banking sectors and also allowed foreign banks to enter their banking system, are well described by the monopolistic competition, a paradigm which also describes well the behavior of banks of more developed economies.

Appendix **Table A.1:** Sample Descriptive Statistics

Country	REV			COST			LEV			NIM			TA		
	Mean	Median	Std. Dev	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev
FSU Countries															
Estonia	16463.8	6730.1	21119.3	15553.2	5478.9	21096.9	12.09	10.74	6.76	7.19	6.59	3.07	259451.4	77205.9	380246.2
Latvia	10425.6	5673.6	12460.3	9243.5	4737.7	11197.2	14.89	10.71	17.05	7.17	5.97	6.04	113330.3	74625.2	146540.4
Lithuania	17409.6	8925.0	18533.2	14561.2	10575.0	14413.2	13.98	9.68	16.13	7.75	6.23	6.09	254846.4	72197.4	365419.4
Ukraine	48989.2	9752.5	90033.9	29717.2	5443.4	50321.4	18.71	14.84	13.45	18.35	12.82	20.72	224834.8	66709.3	308876.3
CEE Countries															
Bulgaria	47649.6	14923.1	86893.2	33212.4	11165.20	71307.97	14.81	14.51	18.05	3.98	5.50	28.71	498099.7	151441.4	1385659.0
Czech Rep.	281172.7	38668.3	1032844.0	241015.9	28460.66	825408.3	8.97	6.76	13.79	**4.82**	**3.03**	**3.31**	3615227.0	908840.9	5246805.0
Hungary	84326.5	33534.1	136070.3	79236.4	20905.9	148721.4	12.21	9.66	13.79	5.24	4.87	3.16	1925119.0	536392.4	5326466.0
Poland	153389.5	66539.6	207017.4	61572.3	19205.8	108798.0	12.88	11.55	7.72	7.11	6.50	3.47	2293136.0	831301.8	3476427.0
Romania	133545.0	44700.0	188856.6	104292.6	30022.5	187562.0	17.33	16.60	16.82	12.64	10.53	11.89	1040507.0	379319.2	1536586.0
Slovak Rep.	47484.07	18874.43	73677.44	42823.45	14273.39	70176.1	12.75	7.95	17.38	3.38	3.33	15.60	981842.3	414654.3	1426899.0
Transition Banking															
All Countries	99016.5	20591.2	384812.2	71273.9	13489.2	310675.7	13.47	10.40	14.33	**7.20**	**5.51**	**9.62**	1396947.0	288496.8	3410834.0

References

Anderson, R. and Kegels, C. (1998) *Transition Banking: Financial Development of Central and Eastern Europe*, Clarendon Press Oxford, Oxford.

Baltagi, B. H. (2001) *Econometric Analysis of Panel Data,* New York, NY: John Wiley and Sons.

Baumol, W. (1982) "Contestable Markets: An Uprising in the Theory of Industry Structure", *American Economic Review, 72, 1-15.*

Bikker, J.A. and Groeneveld, J.M. (1998) "Competition and concentration in the EU banking industry", De Nederlandsche Bank, Research Series Supervision, No 8, August.

Bossone, B. (2000) "What Makes Banks Special? A Study on Banking, Finance, and Economic Development", *World Bank Working Paper No 1163.*

Brainard, L. (1991) "Reform in Eastern Europe: Creating a Capital Market", *Economic Review, Jan./Feb*.

Bresnahan, T. (1989) "Empirical Studies of Industries with Market Power", *Chapter 17* in Schmalensee, R. and Willig, R. (eds.) *Handbook of Industrial Organisation,Vol. II, pp. 1011-1057.*

Davis, E.P. and Salo, S. (1998) "Excess capacity in EU and US banking sectors: conceptual, measurement and policy issues", *Financial Markets Group LSE Special Paper, No 105.*

De Bandt, O. and Davis, P. (1999) "A Cross-Country Comparison of Market Structures in European Banking", *European Central Bank, Working Paper No 7*.

Diamond, D. (1984) "Financial Intermediation and Delegated Monitoring", *Review of Economic Studies, 51, 393-414.*

Drakos, K. (2003) "Assessing the Success of Reform in Transition Banking: An Interest Margins Analysis", *Journal of Policy Modelling*, *25(3), 309-317.*

Drakos, K. (2002) "The Efficiency of the Banking Sector in Central and Eastern Europe", *Russian and East European Finance and Trade, 38(2), 33-44.*

European Bank for Reconstruction and Development (EBRD) (1998) "Transition Report".

Greene, W. H. (1993) *Econometric Analysis, 2nd edition,* Englewood Cliffs, NJ: Prentice-Hall.

Gros, D. and Suhrcke, M. (2000) "Ten Years After: What is Special about Transition Economies", *EBRD Working Paper No 56*.

Hannan, T. and Liang, N. (1993) "Inferring Market Power from Time Series Data; The Case of the Banking Firm", *International Journal of Industrial Organisation, 11, 205-218*.

Hausman, J. (1978) "Specification Tests in Econometrics", *Econometrica, 46, 1251-1271.*

Hempell, H. S. (2002) "Testing for Competition Among German Banks", *Economic Research Center of the Deutsche Bundesbank DP 04/02.*

King, R. and Levine, R. (1993a), "Finance, Entrepreneurship and Growth: Theory and Evidence", *Journal of Monetary Economics, 35, 513-42.*

King, R. and Levine, R. (1993b) "Finance and Growth: Schumpeter Might be Right", *Quarterly Journal of Economics, 108(3), 717-738.*

Levine, R. (1997) "Financial Development and Economic Growth: Views and Agenda", *Journal of Economic Literature, 35, 688-726.*

Levine, R. and Zervos, S. (1998) "Stock Markets, Banks, and Economic Growth", *American Economic Review, 88, 537-558.*

Long, M. and Sagari, S. (1990) "Financial Reforms in Socialist Economies in Transition", *World Bank, Mimeo.*

Molyneux, P., Lloyd-Williams, D. and Thornton, J. (1994) "Competitive Conditions in European Banking", *Journal of Banking and Finance, 18, 445-459.*

Molyneux, P., Thorton J. and Lloyd-Williams, D. M. (1996) "Competition and Market Contestability in Japanese Commercial Banking", *Journal of Economics and Business, 48, 33-45.*

Nathan, A. and Neave, E. (1989) "Competition and Contestability in Canada's Financial System: Empirical Results", *Canadian Journal of Economics, XXII, 576-594.*

Paznar, J. and Rosse, J. (1987) "Testing for Monopoly Equilibrium", *Journal of Industrial Economics, XXXV, 443-456.*

Perrakis, S. (1993) "Assessing Competition in Canada's Financial System: A Note", *Canadian Journal of Economics, XXIV, 727-735.*

Perotti, E. (1993) "Bank Lending in Transition Economies", *Journal of Banking and Finance, 17, 1021-1032.*

Roberts, M. (1984) "Testing Oligopolistic Behaviour", *International Journal of Industrial Organisation, 2, 367-383.*

Roe, A., Siegelbaum, P., and King, T. (2000) "Analysing Financial Sector Transition: With special Reference to the Former Soviet Union", *World Bank Working Paper No 499.*

Saunders, A. and Sommariva, A. (1993) "Banking Sector and Restructuring in Eastern Europe", *Journal of Banking and Finance, 17, 931-957.*

Schmalensee, R. (1989) "Inter-Industry Studies of Structure and Performance", *Chapter 16* in Schmalensee, R. and Willig, R. (eds) *Handbook of Industrial Organisation ,Vol. II, pp. 951-1008.*

Shaffer, S. (1993) "A Test of Competition in Canadian Banking", *Journal of Money, Credit and Banking, 25, 50-61.*

Smith, T. (1998) "Banking Competition and Macroeconomic Performance", *Journal of Money, Credit and Banking, 30, 793-815.*

Tang, H., Zoli, E., and Klytchnikova, I. (2000) "Banking Crises in Transition Countries: Fiscal Costs and Related Issues", *World Bank Working Paper No 2484.*

Thorne, A. (1993) "Eastern Europe's Experience with Banking Reform: Is There a Role for Banks in the Transition?" *Journal of Banking and Finance, 17, 959-1000.*

White, H. (1980) "A Heteroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity", *Econometrica, 48, 817-838.*