COMPETITION AND CONTESTABILITY IN CENTRAL AND EASTERN EUROPEAN BANKING MARKETS*

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ABSTRACT

This study analyzes the evolution of competitive conditions in the Banking industries of fourteen Central and Eastern European (CEE) transition economies using firm-level data. The results of the competition analysis suggest that the banking markets of CEE countries cannot be characterized by the bipolar cases of either perfect competition or monopoly over 1993-2000 except for FYR of Macedonia and Slovakia. That is, banks earned their revenues as if operating under conditions of monopolistic competition in that period. Furthermore, the cross-sectional analysis of competitive structure reveals initially a decreasing trend between 1993 and 1996 and a subsequent increasing trend in competitive conditions after 1996. Large banks in transition countries operate in a relatively more competitive environment compared to small banks, or in other words, competition is lower in local markets compared to national and international markets.

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Central and Eastern European (CEE) countries have gone through significant economic and political transformations during the last decade. As they moved away from state control to a relatively free-market system, these countries launched wide-ranging economic and financial reform programs to stabilize their economies and to establish market forces as performance drivers.[1] Throughout the transition, strengthening and restructuring of the financial sectors, as well as improving the supervision and regulation of banking and financial services, received a strong emphasis to cope with market forces and sustain economic stability and growth. Privatization of state-owned banks and elimination of the restrictions on domestic and foreign market entries increased the number of commercial banks operating in their highly concentrated and inefficient national markets, and changed the competitive conditions in banking profoundly.

The initial efforts of transformation to market economies were reinforced later on by the goal of membership in the European Union (EU). As the process of achieving full integration among its member countries was evolving, the EU initiated an eastward enlargement plan through the inclusion of former socialist countries from Central and Eastern Europe into the union. Such developments are expected to have a substantial influence on the financial and banking systems of CEE countries, with increasingly tighter links to the EU. Even before this phase, widespread deregulation and liberalization, accompanied by technological development and internationalization have significantly changed the competitive structure of European financial services industry.

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[1] See Scholtens (2000) for a survey of the efforts for developing financial systems in CEE countries during the early transition years (1990-1996).

These new competitive conditions are likely to entice large European financial institutions that are currently operating at relatively low margins to extend their cross-border operations into the potentially more profitable markets of CEE countries.

Based on the above discussion, we wish to review the effects of recent changes in the competitive structure of the CEE banking markets and to measure the current level of market contestability that may have been facilitated by the recent liberalization and deregulation progress.[2] Specifically, we would like to know whether the recent legal and institutional reforms were sufficient to transform the market structure into a more competitive mode or whether there are still some serious obstacles inherited from the earlier system that prevent the realization of competition.

The results of this study will likely have important policy implications since the research focuses on the essential structural and regulatory aspects of banking which enable CEE countries to promote financial stability during the transition period and to create an efficient financial infrastructure centered on future accession to the EU. Since their money and capital markets are still in infancy, the transition countries have primarily bank-based financial systems; banks intermediate large portions of capital flows and household savings, and constitute the primary source of business financing. These conditions imply that a potential break-down in their banking systems can yield contagion effects to all other sectors of their economies. Indeed, these transformation challenges, give rise to some of the following policy questions: As they open their economies to a greater influence from the western world, how should they manage the transition process by avoiding financial distress and adjust successfully to the expected

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[2] Although the central focus of the paper is not to evaluate the effects of liberalization and restructuring directly, we do try to measure their possible effects on banking sector contestability in section 4.2.1 where the overall sample is decomposed into sub-periods 1993-96 and 1997-2000;

new competitive environment? How should they design and implement the competitive policies, and appropriate supervisory and regulatory framework? Should they enforce market discipline by promoting foreign competition or adapt defensive policies to protect the infant banking industry from competition? These are some of the important policy directions addressed by CEE countries for the successful development of stable, efficient, properly supervised financial systems for both the transitional economic reforms and their preparations for accession to the EU.

The aforementioned policy perspectives, as well as increasing interest in this topic among academics and practitioners alike, motivate our examination of competition and contestability in the CEE transition economies. Given the challenges that the CEE countries face, the empirical results of this study should be timely and helpful for policymakers to better understand how their decisions affect both market conduct and the performance of financial institutions under their supervision. In the present study, we employ the theory and some concepts of the new industrial organization literature for analyzing and measuring the banking competition in fourteen European transition economies. To the best of our knowledge, there are no prior comprehensive empirical analyses of changing competitive conditions in the CEE banking industry published in academic journals.[3] Hence, this study tries to fill this gap and extend previous studies on bank competition to the CEE banking markets using the Panzar-Rosse H-statistic (Panzar and Rosse, 1987).

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[3] One of the reviewers correctly has pointed out that several related papers have been presented and widely discussed in congresses, symposia, and seminars, but "have not yet appeared in academic journals." Since we have had no direct access to these related studies and cannot evaluate their contributions, we wish to acknowledge them here as works-in-progress. Thus, we shall make direct references only to peer-reviewed research that has been published in academic journals. Nonetheless, we acknowledge and appreciate the information content in the reviewer's comment.

The rest of the study is organized as follows. Section 1 sets the stage for our analysis by reviewing briefly the recent history of banking reforms in Central and Eastern Europe. Section 2 summarizes the previous studies and methods employed to test competition in the banking literature. Section 3 presents our model, the testable hypotheses, and the data used to assess competitive conduct in CEE banking markets. Section 4 discusses the empirical results. Finally, section 5 presents the conclusions and outlines suggestions for future research.

1. Banking in Central and Eastern Europe

Until the social and economic transformation reforms in late 1980s, a socialist banking system was in effect in CEE countries. At the center of this structure was a monobank that performed the simultaneous roles of central bank and commercial bank. The monobank was in charge of issuing currency, managing the payments system among enterprises, providing savings deposit facilities to households, making loans to enterprises and covering the deficits of the State budget. These monobanks, however, had neither expertise nor control over the process of assessing and managing risk and return, and/or the granting of loans, since lending decisions were then made centrally by the state, which typically allocated funds based on political priorities rather than efficiency and profitability considerations.

The restructuring of the banking system in CEE economies started in the late 1980s after the collapse of their Communist regimes. Hungary and Poland took the lead in establishing independent central banks, followed by the three Baltic States (Estonia, Latvia, and Lithuania) and the Czech and Slovak Republics. The monobank system was

transformed into a two-tier banking system by breaking up the monobank into a central

bank and a number of commercial banks in each country by new regulatory frameworks.[4]

New commercial banks were allowed to engage in a wide range of banking activities,

usually specializing in sectors, with increased roles in management and credit allocation.

However, these artificially established banks inherited many problems from central

planning that plagued the banking system: capital inadequacy, non-performing loans to

State Owned Enterprises (SOEs), non-diversified loan portfolios and clientele,

inexperienced management and personnel, underdeveloped branch networks, and other

related problems.

During the initial transition, restrictions on the establishment of new banks were

relaxed and some governments also encouraged the establishment of new banks as a way

of enhancing competition. This period was characterized by a growing number of

commercial banks and efforts to strengthen the two-tier system. Governments accelerated

the restructuring efforts with the introduction of schemes for revamping their banking

systems.[5] While restructuring their banking systems, many of these CEE countries

experienced severe banking crises due both to corporate distress and the absence of

effective regulatory and legal structures.[6] The lack of effective corporate governance and

payments discipline exacerbated the problems. The bank administrators and managerial

personnel lacked the knowledge and experience of banking procedures, as well as the

technology practiced in market economies; additionally the customers were not

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[4] Some of the assets of the Monobank were transferred to newly established commercial banks without cleansing the non-performing loans and many of these banks were technically insolvent from the date of their establishment.

[5] For example, Hungary has adopted the Anglo-Saxon model of separation between the commercial and investment banking functions, while the Czech Republic, Poland, Bulgaria, and Romania have followed the German-Japanese models of universal banking (Thorne 1993) .

[6] Space limitations prevent us here from dwelling on the details and dates of these crises for each of the countries. For more details, the reader is referred to (Caprio and Klingebiel, 2002).

accustomed to the new banking practices. Thus, the banking sectors did not have sufficient flexibility to operate adequately or competitively in a market economy. Commercial banks experienced dramatic deteriorations on their balance sheets due to substantial amounts of non-performing assets, capital inadequacy, and currency devaluations. However, after enacting and implementing the new prudential regulations to stabilize the banking system, and bailing out of bad loans by governments, banks experienced significant balance sheet restructuring and improvements in asset quality.[7]

Despite the problems experienced in the early years of transition, the CEE governments appeared determined to develop competitive and efficient financial systems based on market forces for the conversion from central planning to market economies and for fulfilling the obligations for future EU integration. CEE governments initiated large-scale privatization programs that substantially diminished the state ownership in banking during the mid-1990s. The main motive behind privatization of state-owned banks was the desire to enhance competition and efficiency in the banking sector through increased foreign and domestic participation. Banking crises that affected the region during this period have basically accelerated the privatization process and thus, foreign participation. By the end of the decade, the average share of foreign ownership in terms of both total assets and capital exceeded 60 percent. Despite the large-scale privatization and more

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[7] According to various asset quality proxies in 1999, except for the Czech Republic and Bulgaria, banking sectors in CEE countries seem to have attained a viable level of asset quality. But we should note that these asset quality ratios are not quite comparable to those in Western European countries where a ratio of non-performing loans to gross loans of more than 5% is considered as a serious problem for a given bank.

liberal public policy towards the elimination of entry barriers, however, the banking sector remained highly concentrated throughout the sample period.[8]

During the course of transition, the CEE countries have shown significant progress in integrating with the developed economies of the EU. Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia are negotiating their potential accession to the EU. In order to strengthen their financial systems they are trying to increase the transparency of their economic policymaking and financial institutions, by adopting internationally accepted standards.

2. Theory and Literature Review

2.1. Major Approaches to Competitive Behavior

In the literature, two "structural" approaches for assessing competition are the "Structure-Conduct-Performance Hypothesis" (SCP) and the "Efficient Structure Hypothesis" (ESH). The SCP hypothesis attempts to infer the degree of competition in an industry from its structural features (Bain, 1951). Basically, the SCP implies that concentration in the banking industry can generate market power, allowing banks to earn

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[8]For example, the 3-Bank concentration ratio (CR3) in our pooled sample went down from 80.5 % in 1993 to 59% in 1997, and subsequently rose to 65% in 1999 for the region. Nevertheless, the largest three banks in Estonia, Lithuania, and Yugoslavia held more than 90% of the assets in the banking industry in 1999. Over the sample period, on average, Russia had the lowest CR3 ratio of about 49%, followed by Poland and Hungary with CR3 ratio of about 52 %.

monopolistic profits by offering lower deposit rates and charging higher loan rates.[9] The

policy implication of these findings is that governments should monitor keenly bank

mergers and acquisitions and enforce strictly antitrust policies. ESH, on the other hand,

suggests that the positive relationship profitability and market concentration is not a

consequence of market power but of the greater efficiency of firms with larger market

share (Demsetz, 1973). In other words, the superior performance of the market leaders

(due to firm specific factors such as technological or managerial skills) endogenously

determines the market structure, implying that higher efficiency produces both higher

concentration and greater profitability. Based on these arguments bank efficiency serves

as the leading force in market concentration.

"Non-structural models" do not infer the competitive conduct of banks through

the analysis of market structure, but rather recognize that banks behave differently

depending on the market structure in which they operate. Under this framework, the

"Contestable Markets Theory" (CMT), first developed by Baumol (1982), stresses that a

concentrated industry can behave competitively if the barriers for new entrants to the

market are nonexistent or low. CMT assumes that firms can enter or leave rapidly any

market without losing their capital and that potential competitors have the same cost

function as incumbent firms. Baumol emphasizes that incumbent firms are always

vulnerable to hit-and-run entry when they try to exercise their potential market power.

These features of contestable markets imply that a concentrated banking market can be

effectively competitive even if it is dominated by a handful of large banks. Therefore,

policymakers should be relatively less concerned about the market dominance of some

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[9] Proponents of this view use the frequently observed positive statistical relationship between banking
market concentration and bank profitability to justify their arguments.

types of financial intermediaries in a country's financial system, if the financial markets are contestable. Based on these arguments, deregulation and liberalization will likely make the banking industry more contestable or open to competition. In order to test for contestability, previous research has employed the competition model proposed by Panzar and Rosse (1987) or the so-called "H statistic".

2.2. Panzar-Rosse (PR) Methodology and Empirical Literature

The PR approach relies on the premise that banks will employ different pricing strategies in response to changes in input costs depending on the market structure in which they operate. Hence, whether a bank operates in a competitive market or exercises some monopoly power can be inferred from an analysis of that bank's revenue as it responds to changing input prices. In order to measure the competitive structure of the industry, PR established a so-called "H statistic"; this is estimated as the sum of the elasticities of the reduced form (equilibrium) revenues with respect to input prices. More specifically, the H statistic measures the percentage change in a bank's equilibrium revenues caused by one percent change in all of the bank's input prices.[10]

The economic interpretation of the H statistic is as follows. If the market in which banks operate is characterized as monopoly then H statistic is less than or equal to zero. This is due to the economic intuition that a monopolist's revenue will respond in the opposite direction to a change in input prices, as a one percent increase in input prices leads to a one percent increase in marginal costs, thus reducing equilibrium output and

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[10] The details of formal derivation of H statistic can be found in Panzar and Rosse (1987) and Vesala (1995).

revenue. PR further show that the H statistic is also negative when the structure is a conjectural variations short-run oligopoly.

The H statistic is equal to one when the market structure is characterized as perfectly competitive; under this condition, a proportional shift in all input prices will increase both marginal and average costs by the same proportion, without changing the equilibrium output of banks. In order to survive the competition, banks will be forced to increase prices until they cover the increased costs. During this adjustment process, the inefficient banks might be acquired by efficient ones or be eventually driven out of the market by competition. The reduction in the number of banks in the industry will increase the demand faced by each incumbent bank, thereby leading to a rise in the output price and revenue by the same amount as costs. Shaffer (1982) shows that the H statistic is also unity for a natural monopoly operating in a perfectly contestable market and also for a sales-maximizing firm that is subject to breakeven constraints.

As the third case, PR distinguish the situation of monopolistic competition, in which, although banks behave like monopolists, the market entry or exit of other banks with imperfect rival products makes them always generate precisely zero profits. In this case the H statistic will lie between zero and unity, as revenues will increase less than proportionally to changes in input prices. Since H statistic is a decreasing function of the perceived demand elasticity, in the literature, a higher H statistic is sometimes interpreted as an indicator of a higher degree of competitiveness. Different interpretations of the H-statistic, which are discussed in Shaffer (1982,1983), Nathan and Neave (1989), and Molyneux et al. (1994), are summarized in Table 1.

An important advantage of PR model is that, it does not require output price and quantity data, which are not readily available most of the time or which are costly to obtain. Since reduced-form revenue equations can be estimated without estimating the structural equations, the data availability issue (especially for the supply side) becomes less of a concern. Furthermore the need for correcting for the quality disappears since output prices are not involved. Another benefit of the model is that it can incorporate bank-specific factors in the production function by using firm-level data. It also allows to examine the differences among banks arising from type (e.g. commercial vs. savings), size (large vs. small), ownership (domestic vs. foreign, or state vs. private) etc. Applying the PR method to banking requires treating banks as single-product firms that produce loans and other earning assets using deposits and other funding as input variables in the production function. This approach also assumes that (except for the monopoly case) the test is undertaken on observations that are in long-run equilibrium, and that banks are profit maximizing firms with conventional demand and cost structures.

Table 2 summarizes the previous studies that have examined the competitive structure of the banking industry in various countries by using H-statistic. Shaffer (1982) applied the PR methodology to a cross-section of banking firms in New York in 1979, and found that competitive conduct of banks cannot be characterized as monopolistic or perfectly competitive in the long run. Similarly, Nathan and Neave (1989) also rejected the hypothesis of monopoly and perfect competition for Canadian banks, trust companies and mortgage companies over the period 1983-1984. Molyneux et al. (1994) used the same analysis in a sample of German, UK, French, Italian, and Spanish banks for each year of the period 1986 to 1989. On average, their results suggest monopolistic competition in

Germany, France, Spain and the UK, and monopoly in Italy. Vesala (1995) applied a similar model to the Finnish banking industry and found monopolistic competition for 1985-88 and 1991-92, and perfect competition for 1989-90. Molyneux et al. (1996) examined the competitive conduct of Japanese commercial banks and found monopoly for 1986 and monopolistic competition for 1988. Coccorese (1998) and Hondroyiannis et al. (1999) found monopolistic competition for Italian and Greek banking sectors. In a more recent study, De Bandt and Davis (2000) reported monopolistic competition for large banks and monopoly for small banks for Germany and France, and monopolistic competition for small and large banks in Italy over the period 1992-1996. Bikker and Groeneveld (2000) found monopolistic competition of varying degrees for EU countries for the period of 1989 to 1996. Finally, in a more comprehensive study, Bikker and Haaf (2002) examined competitive conduct of banks in 23 developed countries over the time period 1988-1999. They reported that, in general, the banking markets of industrialized countries could be characterized by monopolistic competition. However, they could not reject the case of monopoly for the samples of small banks in Australia and Greece, and perfect competition for large banks in several countries.

3. Empirical Model, Testable Hypotheses and Database

3.1. Empirical Model

We are interested in evaluating the effects of recent changes in competitive structure of the CEE banking industry and in showing how close is such banking industry to the state of high competition envisioned by recent legal and institutional reforms. We

should, however, note that, although banks can somehow differentiate themselves through specialization in certain areas and through the provision of new services, the PR approach can not capture the degree of competition in each division of banking markets separately; it is basically a means of estimating the overall competitive conduct in a given banking system. In order to apply the PR methodology to the banking industry we follow the previous studies and adopt the "intermediation approach" to bank modeling where the financial intermediation role of a bank is emphasized.[11] It also reflects the realities of banking in the CEE countries, as they attempt to cross the threshold to modern banking.

We estimate the following bank revenue equation in which revenue is explained by factor prices and other bank-specific variables that affect long-run equilibrium bank revenues for CEE countries for the years 1993 through 2000.

$$\ln(REV_{it}) = h_1 \ln(PF_{it}) + h_2 \ln(PL_{it}) + h_3 \ln(PK_{it}) + \beta_1 \ln(TA_{it}) + \beta_2 \ln(EQTY_{it})$$

$$+ \beta_3 \ln(LOAN_{it}) + \beta_4 \ln(IBDP_{it}) + \sum_{l=1}^{L} \alpha_l D_l + \varepsilon_{it} \qquad (1)$$

for t=1,…..,T where T is the number of periods observed, and i=1,….. ,I, where I is the total number of banks and ln is the natural logarithm. The dependent variable (REV) is the ratio of total interest revenue (or total revenue) to total assets. The model posits that banks use three input factors- namely, deposits, labor, and physical capital. Variables PF, PL and PK are the unit prices of these inputs or reasonable proxies: (PF) the ratio of

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[11] Two empirical approaches to modeling bank output are the "intermediation" and the "production" approaches. The intermediation approach treats banks as financial intermediaries that create output only in terms of their assets, using their liabilities, labor and capital. Deposits are treated as inputs that are intermediated into banks' outputs (loans and investments) and interest on deposits is a component of total cost, together with labor and capital costs. The production approach, views banks as firms that use capital and labor to produce loans and deposits. Since deposits are considered as output, the interest expense on deposits is not included in the costs. For further discussion of these approaches, see Berger et al. (1987)

interest expenses to deposits and other liabilities, (PL) the ratio of personnel expenses to total assets, and (PK) the ratio of non-interest expenses to fixed assets.[12] A number of control variables, included to account for size, risk, and deposit mix differences, are similar to those used in previous studies. These factors are total assets (TA), financial capital (EQTY), net loans (LOAN), and interbank deposits (IBDP). To take the country-specific characteristics into account, country dummy variables were also added in the pooled sample estimations.

The 3-input factor model with total interest revenue (INTREV) as the dependent variable will be referred to as Model (1a) and the model with total revenue (TOTREV) as the dependent variable will be referred to as Model (1b). The definitions of the dependent and explanatory variables for the model as well as their descriptive statistics for the overall sample are presented in Table 3. Under the PR framework, the H statistic is equal to the sum of the elasticities of the revenue with respect to the three input prices:

$$H = h_1 + h_2 + h_3 \tag{2}$$

For almost all the banks in Bulgaria and Yugoslavia and for several banks in other CEE countries, BankScope data do not provide personnel expense figures as a separate cost item. To rectify this problem and also for robustness check a second model is specified, as shown in Equation (3), where the sum of personnel expense and capital expense variables are combined into the total overhead expense variable.

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[12] Ideally, the ratio of personnel expense to the number of full time employees would be a better proxy for labor cost. Due to the unavailability of data on the number of employees we cannot employ the ratio of personnel expenses to number of workers as unit price for labor. Using the ratio of personnel expense to total assets as labor cost is a common approach in studies that employ BankScope data. [Molyneux et al. (1994), Bikker and Groeneveld (1999), De Bandt and Davis (2000)].

$$\ln (REV_{it}) = h_1 \ln(PF_{it}) + h_2 \ln(PO_{it}) + \beta_1 \ln(TA_{it}) + \beta_2 \ln(EQTY_{it})$$

$$+ \beta_3 \ln(LOAN_{it}) + \beta_4 \ln(IBDP_{it}) + \sum_{l=1}^{L} \alpha_l D_l + \varepsilon_{it} \qquad (3)$$

where PO is the ratio of overhead expenses to total assets and the other variables are the same as those in Equation (1). This 2-input factor model with total interest revenue (INTREV) as the dependent variable will be referred to as Model (2a) and the model with total revenue (TOTREV) as the dependent variable will be referred to as Model (2b). The H-statistic by Model 2 is thus given by the sum of the two input elasticities:[13]

$$H = h_1 + h_2 \qquad (4)$$

The conventional wisdom about the banking market structure of CEE countries is that several large, old banks dominate the markets and the degree of concentration is relatively high. Monopolistic competition is a priori the most plausible structure for the banking industry since it recognizes that banks can differentiate themselves through specialization, service quality, and advertising although their business is fairly homogenous. The testable hypothesis for monopolistic competition is:

$$0 < H = h_1 + h_2 + h_3 < 1, \qquad (5)$$

where $H \leq 0$ is monopoly and $H=1$ is perfect competition.

The regression models are first estimated by the ordinary least squares (OLS) method on the pooled sample of banks and years, implicitly assuming that standard errors are independently distributed across banks and over time. One advantage of having panel data is

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[13] This new specification helped us to recoup a substantial amount of observations lost due to the unavailability of complete data for the personnel expense variable in two countries.

that it allows controlling for heterogeneity bias, or the confounding effects of omitted variables that are stable over time. Considering the time-series dimension of the data, we also used fixed-effects estimators, correcting for the effect of any combination of time-invariant variables that have been omitted, knowingly or not, from the regression model. This estimation entails specifying a different intercept term for each bank in the sample as well as time dummies for each year. The fixed-effects model with total interest revenue (INTREV) as the dependent variable will be referred to as Model Fixed-1 and the fixed-effects model with total revenue (TOTREV) as the dependent variable will be referred to as Model Fixed-2.

3.2 Discussion of the Variables

Prior studies on market structure have developed different specifications in order to apply the PR methodology to the banking industry. For example, Molyneux et al. (1994) and Bikker and Groeneveld (2000) have used the log ratio of interest revenue to total assets as the dependent variable, while Shaffer (1982), Nathan and Neave (1989), Vesala (1995), Coccorese (1998), and De Band and Davis (2000) have used the logarithm of interest revenues for the same purpose.

In this study two different dependent variables are specified: INTREV as the ratio of total interest revenue to total assets in Models (1a) and (2a), and TOTREV as the ratio of total (gross) operating revenue to total assets in Models (1b) and (2b). The first specification (in which the dependent variable is only the interest part of the total revenue) is consistent with the approach that financial intermediation constitutes the core business in CEE commercial banking. Although interest revenues still generate the principal source of banks' earnings, recent studies on banking activities report an

increasing share of non-interest income from fee-based products and services and off balance sheet credit substitutes in total revenues. Given the increased level of competition in financial markets, this can be explained partly by the desire of financial services firms to expand their revenue generating sources without altering their risk and thus their capital structures, materially. For this reason, it will be appropriate to include total revenues in the model in addition to interest revenues.

Other control variables are included in the Model to account for differences in bank-specific risk, size, and deposit structure of banks, and they are similar to those utilized in previous studies. The two different risk variables employed are the log ratio of equity to total assets (EQTY) and the log ratio of loans to total assets (LOAN). The size variable, log of total assets (TA), is used as a proxy for economies or diseconomies of scale, given the wide range of bank asset sizes in the CEE banking systems. The ratio of Interbank deposits to customer and short-term funding (IBDP) accounts for differences in the deposit mix.

Loans generally represent the biggest portion of earning assets and also convey information about bank's risk preference. We expect a positive coefficient for the LOAN variable since more interest revenue is generated with increasing levels of loans. Equity to asset ratio is included to capture the effect of different risk levels among banks, with better capitalization ratios indicating lower risk levels. Lower capitalization ratios may imply a more aggressive approach in lending with expectation of higher revenues. Therefore, the expected sign on the coefficient for capital ratio is negative. The size variable (TA) accounts for cost differences related to banks size and also controls for

greater portfolio and loan diversification associated with larger banks. An important implication of asset diversification is less risk and hence a lower required rate of return. We do not know the ex-ante effect of size differentials in assets among banks on revenue generating process, and therefore we do not have any expectation on the sign of the coefficient for the size variable. The Interbank deposit ratio (IBDP) variable is included in the analysis because interbank deposits imply higher interest costs relative to customer deposits and thus constitute a more expensive source of funds than other deposits. We expect the coefficient on this variable to be negative.

3.3 Database and Sample Selection

In order to be able to perform reliable econometric analyses on bank competition the first requirement is to have sufficiently large sample of healthy banks for which financial data needed for the model variables are available. The number of banks in transition countries is relatively small and the quality of financial reporting for these newly established institutions may not be at par. Furthermore, there are always discrepancies and inconsistencies in international data, and this is particularly true for the transition countries of Europe.

Annual balance sheet and income statement data for the banks were taken from the BankScope database. The banks in the sample comprise a fairly large portion of CEE banking industry over the period of 1993-2000. Since the banks followed and reported by BankScope represent a large proportion of banks in each country, this sample represents fairly the average bank in the region. The countries included are Bulgaria, the Czech Republic, Estonia, Croatia, Hungary, Latvia, Lithuania, FYR of Macedonia,

Poland, Romania, Slovenia, the Slovak Republic, the Russian Federation, and Yugoslavia. We used the consolidated data for a given bank when available, and otherwise unconsolidated report. The initial sample consisted of 2364 observations on 562 financial institutions. To be included in the final sample, banks had to be classified as commercial banks or cooperative banks in the BankScope data set and they must have had all the model variables available for a given year. Bank holding companies, investment banks and securities houses, saving banks, real estate and mortgage banks, non-banking credit institutions, and other specialized governmental credit institutions are excluded from the initial sample to make the data more comparable across countries. 96 % of the firms in the sample are comprised of commercial banks, and the remaining 4 % are cooperative banks. The selection process yielded a unbalanced panel with 2113 observations belonging to 325 banks over the period 1993-2000. Due to unavailability of the data in1993, the starting date in the sample for Yugoslavia and Estonia is 1994. Not all the banks were in continuous operation over the entire period due to failures, mergers, and de novo entry. Table 4 presents the number of banks in the sample descriptive statistics of bank characteristics under study for each country for 1999. All data are reported in US$ as the reference currency and adjusted for inflation. Differences in the average bank size are substantial. The average Czech bank has more assets ($2.08 billion in 1999) than does the average bank in other CEE countries, followed by Polish and Hungarian banks. However, the average Polish bank has generated more loans than the average bank in other countries, followed by Czech and Estonian banks. On average, banks in the Czech Republic and Poland have the highest equity capital on their balance sheets, followed by Hungarian banks.

4. Empirical Results

4.1 Competitive Structure Tests

Compared to previous studies on bank competition that generally report cross-sectional results for a single country, this study has analyzed the available data in several dimensions. The econometric model with 4 different specifications and 2 different estimation techniques was run on a pooled data set of the fourteen CEE countries to obtain a general picture of the competitive structure of economies in transition over the sample period. Table 5 reports the results of these estimations. For the overall sample, models were estimated for three different time horizons-1993-2000, 1993-1996, and 1997-2000.[14] Panel A of Table 6 lists the results over these three time horizons. In order to account for geographical scope of banking services, we also defined two sub-markets based on asset size, (large and small banks with total assets above and below the median asset size in the sample) and estimated their H-statistics. Estimation results for large and small banks are presented in Panel B of Table 6. We also looked at the trend of changes in competitive conditions by running the regressions on cross-sectional data for each year. These results are reported in Panel C. Finally, we computed the competition index for individual countries over the sample period. These estimates are sumarized in Table7.

4.1.1 Estimation for the Overall Sample

In this section, the econometric model is applied to a pooled sample of CEE banks to evaluate the competitive structure, assuming that banking markets of individual

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[14] The 1993-1996 period corresponds to the initial years of transition that were characterized by non-performing loans of state-owned banks and bank failures due mainly to the problems of adjusting to the new system and worsened economic conditions. The 1997-2000 period is characterized by the completion of debt consolidation, recapitalization of banks, and privatization of major banks along with adoption of restrictive monetary policies to stabilize the economic systems and attain positive GDP growth.

countries in the region possess comparable characteristics and therefore the region can be considered as a single market. Table 5 reports the results of the regression analyses for the period 1993-2000. The regression models estimated all had R-squared values of 0.90 or higher and plausible parameter estimates.

Although the coefficients on the bank specific factors are of secondary interest to competitive analysis, they are reported for the overall sample along with H statistics in Table 5. Note that, the sign on the size coefficient (LNTA) is positive and significant for most of the cases, suggesting that size differentials in assets among banks lead to higher interest revenues per dollar of assets for the larger banks. In other terms, larger banks seem to be more efficient in revenue generating process compared to smaller banks. The positive sign on the coefficient for the loans-to-assets variable (LNLOAN) implies higher interest revenue per dollar of assets for banks with a higher proportion of loans on their portfolio. This is, of course, consistent with the expectations that higher level of loans will generate higher interest income. The risk coefficient, LNEQTY, is also significant and has the expected negative sign, indicating that banks with lower proportion of equity capital (riskier banks) are able to generate higher income per dollar of their assets. Another significant variable with negative coefficient is the deposit mix (IBDP), and it suggests that banks, which obtain a higher proportion of their funds from retail (deposit) markets, are able to generate higher interest revenues per dollar of their assets compared to those banks that rely heavily on interbank funds. This is consistent with the notion that higher shares of "core deposits" in total funds imply the degree of retail operations where banks confront relatively less competition.

The signs on the coefficients for the price of funds proxy (LNPF) and the price of labor proxy (LNPL) are always highly statistically significant and positive in all cases, as expected. The price of funds input provides the highest contribution to the explanation of bank revenues (thus to H-statistic), followed by the price of labor. The coefficient of price of capital proxy is also positive and significant in most of the cases, and provides the least contribution to the H-statistic. In general, both models yield similar results and the explanatory power of the models is satisfactory. The country dummies also contribute significantly to the explanation of dependent variable.

As for the competitive structure tests, we note the following results. For the OLS estimations, models with interest revenue as the dependent variable generally yield higher H-statistics. Furthermore, competition coefficients found by fixed-effects estimation techniques are relatively lower than those from OLS estimations. For the overall sample (Table 5), the mean levels of H values range from 0.46 (Model Fixed-1) to 0.59 (Model-1a) depending on the model specification and are significantly different from both zero and unity. This leads to the rejection of the monopoly hypothesis, the conjectural variations short-run oligopoly hypothesis, and the hypothesis of perfect competition. Our findings indicate that banks in this region have actually operated under monopolistic competition between 1993 and 2000, as expected.

According to Table 6, the estimates of market power coefficient (Model 1a) over the two sub-periods, 1993-1996, and 1997-2000 are found to be 0.54 and 0.59 respectively, and they are statistically significantly different from the bipolar cases of unity and zero. For all models, the estimates for the periods 1993-96 and 1997-2000 indicate a slight but statistically significant increase in H-values, as expected from the

structural economic reforms over the sample period.[15] For individual years, these estimates range between 0.41 and 0.70 for Model 1a and between 0.38 and 0.62 for Model 1b. They are also statistically significantly different from unity and zero. Similar to above conclusions, these results imply that competitive conduct of banks in this region cannot be characterized as purely monopolistic or perfectly competitive between 1993 and 2000. The cross-section estimates for each year indicate initially a decreasing trend between 1993 and 1996 and a subsequent increasing trend in H statistic after 1996, although the competitive conduct must still be characterized as monopolistic competition.

According to both models, the H-statistics for large banks are significantly higher than those for smaller banks. Therefore, we can say that large banks in transition countries operate in a relatively more competitive environment compared to small banks, or, in other words, competition is lower in local markets compared to national and international markets. These results are not surprising, since we expect that larger banks with international operations would confront higher competitive pressures from other Universal European banks.

Overall, the results are consistent with the expectation that liberalization and deregulation of financial markets during the process of transition from command-based to market-based systems have increased the competitive conditions in CEE banking markets. This conjecture becomes noticeable especially after 1996 when transition countries had gone through a substantial privatization, experienced significant foreign bank participation in their markets due to a relatively more liberal financial structure, and adopted new regulations in order to comply with European banking standards before

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[15]The F statistic for testing the differences in the H-values between the two sub-periods is significant at the one percent level, although test results are not explicitly reported to save space.

joining the European Union. This is, indeed the period when most of the structural reforms in the banking sectors had been fully absorbed and accommodated by the CEE countries.

4.1.2 Estimation for the Individual Countries

Observing the structural differences suggested by significant country dummies estimated in the full sample analysis also calls for the evaluation of competitive conditions at the country level. Table 7 summarizes the calculated market power coefficients of the separate analyses for each country over the sample period, under four different model specifications. In the majority of cases, the H-statistic is positive and significantly different from zero and unity, suggesting that banks operating in an environment characterized by monopolistic competition. According to Model (1a), over the period 1993-2000, Latvia has the highest competitive index (0.76) and Slovakia has the lowest (0.10). At least two models fail to reject the hypothesis H=0 for Slovakia and FYR of Macedonia. Therefore, we conclude that for the period 1993-2000 the banking markets of Slovakia and FYR of Macedonia can be characterized as monopolistic (or conjectural variations short-run oligopoly).

According to the above findings, we reject the monopoly and perfect competition hypotheses for individual countries (except for FYR of Macedonia and Slovakia) and conclude that banks in these countries seem to earn their revenues as if under the conditions of monopolistic competition. The results suggest that the highly concentrated banking markets of transition economies do not seem to lead to anti-competitive conduct as suggested by the traditional SCP hypothesis, since the current analyses consistently

reject the existence of collusive behavior. These results seem to be compatible with

contestable markets theory (CMT), if we can assume that incumbent banks set their

prices close to the competitive level because of potential competition; otherwise higher

prices will attract potential entrants with hit-and-run strategies. These results are also

consistent with the expectation that liberalization and deregulation of CEE financial

markets have increased the competitive conditions in CEE banking markets.

4.2. Equilibrium Tests

As noted earlier, the PR approach assumes that banks operate in their long-run

equilibrium phases, thus implying that their returns should not be statistically correlated

with input prices. Previous studies tested the accuracy of this assumption by estimating

the elasticity of bank returns to changes in input prices. For the long-run equilibrium test,

we follow the extant literature by running the original regression model in Equation (3)

with return on assets being the new dependent variable. As suggested by Molyneux et al.

(1994), under this specification a value of $H = 0$ would indicate an equilibrium in the

banking markets under investigation.[16]

We perform the long-run equilibrium tests for individual years and sample period

for the pooled data, and also for individual countries over the sample period.[17] The Wald

test is used to test the H=0 hypothesis. The models were estimated using OLS where the

standard errors were calculated using White's (1980) correction for heteroscedasticity.

The F-statistic for testing hypothesis H=0 indicates that the null hypothesis can only be

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[16] The direction of bias caused by the disequilibrium in the sample is always toward a spurious appearance of market power. In general, if the results indicate a certain form of competitive conduct, we can be relatively sure that the monopolistic behavior is not exercised. If the sample does not indicate long-run equilibrium, $H \leq 0$ no longer proves monopoly, but $H>0$ still rejects monopoly or conjectural variation short-run oligopoly (Shaffer, 1982, 1983).

[17] We do not report the results of the long-run equilibrium tests to save space but they are available from authors upon request.

rejected for the year 1997 at any conventional significance levels. The same analyses are also performed for individual countries over the sample period. The results rejected the existence of equilibrium for Croatia, FYR Macedonia, Slovakia, and the Russian Federation at the 5 percent significance level. Overall, the results reveal the existence of long-run equilibrium of the data for the majority of regressions, thus, implying that the PR methodology can be used constructively to estimate market contestability.

4.3. Policy Implications

In summarizing the specific results of this study, we would also like to make the following remarks regarding the policy questions raised in the introductory section. First of all, CEE countries deserve to be given special attention and enough credit for their achievements in building market-oriented banking systems from almost scratch in such a short time period. Despite the considerable disparities among their progress of achievement, in less than a decade they have passed the threshold point of market economy that made them part of the free world--a progress that took several decades to achieve for the developed western countries.

Broadly speaking, they were rather successful in certain areas of structural reforms such as effective design and implementation of the privatization process, competitive policies, and prudential regulatory framework. With regard to privatization and foreign bank participation, in many of these countries the private sector currently holds more than 70 percent of the assets in banking–a figure which is quite comparable to that of many western economies--and more than half of the assets in the CEE banking industry are owned by foreign institutions. The results of the current study suggest that CEE countries increased their competitiveness with large scale privatization and foreign

participation in their banking systems. It is expected that CEE banks will continue to respond to increased competition by extending the scope of professional services beyond traditional markets, generating other revenue sources by offering new services and products, focusing on non-interest income-generating activities, reducing excess capacity through mergers and/or branch closures, and upgrading their operations through new technology.

Building strong institutions and effective governance was, and will be, the key element throughout the ongoing transition process, which requires market-oriented financial structures. Therefore, it is essential to establish a prudentially-regulated entry policy and careful supervision for both domestic and foreign participation in managing the transition process by avoiding financial distress which is likely to be caused by competitive pressures. Due to the liberal licencing policies, CEE countries experienced a rapid growth of new commerical banks during the early years of transition. Since the markets to be served were initially limited, near exponential growth of commercial banks caused detrimental effects on banks' financial positions. As the free market system unfolded, the positive role the foreign banks played became more significant. The entry of foreign banks had a crucial impact on the modernization of domestic banking systems through the introduction of modern banking practices, and product and service innovation. Regarding the openness and expansion of the banking markets, the results suggest that CEE economies should keep their markets open to well-established foreign banks rather than adopting strictly selective policies if they want to seize the maximum benefit from best-practices of sound financial institutions and to increase the competitiveness and efficiency in their banking markets. Indeed, under the Association

Agreements between EU and CEE candidate countries, openness to foreign participation is also a necessary condition to meet the criteria dictated by the Second Banking Directive that enable any EU member bank to operate freely in other member countries' banking markets.

As the empirical results indicate, the CEE economies have brought their "bank-based" financial systems to the relatively high state of contestability that is somewhat comparable to that of the small economies of western Europe. All regulatory reforms and restructuring achieved nearly the desired results and made banking more competitive. As conditions in CEE markets improve, it is expected that commercial banks will engage in non-traditional activities, thus enhancing their non-interest income sources. These activities will, in turn, further enhance market contestability.

5. Summary and Conclusions

Our study examines the competitive conditions in fourteen Central and Eastern European countries' banking industry, while explicitly controlling for the bank specific factors such as risk, size, and deposit mix for the period 1993-2000. For the transition countries, this period corresponds to an era characterized by substantial reforms to restructure their planned economies into market-based economies, and to liberalize and deregulate sufficiently their financial systems in order to integrate economically with the advanced western world. The basis for the evaluation of competitive conditions is the extant oligopoly theory in the new industrial organization literature, specifically, the competition model developed by Panzar and Rosse (1987).

We find that size differentials in assets among CEE banks lead to higher interest revenues for the larger banks. Higher interest revenue per dollar of assets for banks is associated with a higher proportion of loans on their portfolio. Results also suggest that banks, which obtain a higher proportion of their funds from retail (deposit) markets, are able to generate higher interest revenues per dollar of their assets. Finally, riskier banks are found to be able to generate higher income per dollar of their assets.

The results of the competition analysis suggest that the banking markets of CEE countries cannot be characterized by the bipolar cases of either perfect competition or monopoly over 1993-2000 except for FYR of Macedonia and Slovakia. That is, banks earned their revenues as if operating under conditions of monopolistic competition in that period. Overall, large banks in transition countries operate in a relatively more competitive environment compared to small banks, or in other words, competition is lower in local markets compared to national and international markets. Finally, the cross-sectional analysis of competitive structure shows initially a decreasing trend between 1993 and 1996 and a subsequent increasing trend in competitive conditions after 1996, revealing the inevitable impact of liberalization on competitive conditions. As an overall conclusion, for the region and individual countries under investigation, the banking market structure can be characterized as monopolistic competition. This conclusion holds under a variety of specifications controlling for bank-size, risk and various deposit composition characteristics, and a number of estimation techniques.

Our findings are consistent with previous research on bank competition that generally report varying degrees of monopolistic competition. The results do not support the notion that high concentration in CEE banking markets will result in monopoly rents

as suggested by SCP hypothesis. These results seem to be compatible with contestable markets theory, if one can assume that incumbent firms set their prices close to the competitive level because of potential competition; otherwise higher prices will attract potential entrants with hit-and-run strategies. However, we should also note that the period under investigation corresponds to early years of the ongoing transition from central planning when these countries were lacking many market-supportive institutions essential for efficient financial markets. Therefore, the results of this study should be interpreted with the necessary scholarly scrutiny.

The growth of research and knowledge about the process of political, social, and economic transition from command economies to market economies has been substantial over the recent years. We believe that this infant area will continue to receive a great deal of attention, particularly because a number of interesting questions have been suggested by the examination of competitive structure. It will be interesting for future research to inquire: How did banks react to the European unification in anticipation of increased competition? Which banking activities in the region are likely to be affected because of the EMU? What organizational rearrangement banks have experienced in response to changing competitive conditions? Have there been significant efficiency gains derived from increased competition?[18] If yes, are these efficiency gains passed onto bank customers as reduced costs or improved product and service quality? These are some of the interesting questions on banking in transtion countries to be answered by future research.

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[18] In a companion paper, the authors have addressed this question and found encouraging results. See Yildirim and Philippatos (2003).

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Table 1 Interpretation of H statistic	
Estimated H	Competitive environment test
H ≤ 0	Monopoly or Conjectural variations short-run oligopoly
0<H<1	Monopolistic competition
H=1	Perfect competition Natural monopoly in a perfectly contestable market Sales maximizing firm subject to breakeven constraint.

Table 2 Summary of Literature on Measuring Bank Competition Using P-R Methodology			
Authors	Period	Countries Examined	Results
Nathan and Neave (1989)	1982-1984	Canada	Monopolistic Competition
Shaffer (1982)	1979	New York	Monopolistic competition
Molyneux et al. (1994)	1986-1989	France, Germany, Italy, Spain, United Kingdom	Monopoly for Italy Monopolistic competition for France, Germany, Spain, UK
Vesala (1995)	1985-1992	Finland	Monopolistic competition for all but two years
Molyneux et al (1996)	1986-1988	Japan	Monopoly for 1986 Monopolistic competition for 1988
Coccorese (1998)	1988-1996	Italy	Monopolistic competition
De Bandt and Davis(1999)	1992-1996	France, Germany, Italy	Large banks: monopolistic competition in all countries; Small banks: monopolistic competition in Italy, monopoly in France and Germany
Hondroyiannis et al. (1999)	1993-95	Greece	Monopolistic competition
Bikker and Groeneveld (2000)	1989-1996	15 EU countries	Monopolistic competition
Bikker and Haaf (2002)	1988-1998	23 Industrialized countries	Whole sample: Monopolistic competition Large banks: Monopolistic competition in general, several exceptions of perfect competition Monopoly for small banks in Australia and Greece

Table 3   Definitions and Descriptive Statistics of Regression Variables
(Variables other than ratios are in 1000s of US Dollars)

Variable Name	Specification	Mean	Std. Dev	Min	Max
Interest Revenue (INTREV)	Ratio of total interest revenue to total assets	0.13	0.10	0.0031	0.95
Total Revenue (TOTREV)	Ratio of total operating revenue to total assets	0.19	0.19	0.000	1.94
Price of Funds (PF)	Ratio of interest expenses to deposits and other liabilities	0.10	0.11	0.0002	0.92
Price of labor (PL)	Ratio of personnel expenses to total assets	0.02	0.02	0.0003	0.27
Price of physical capital (PK)	Ratio of non-interest expenses to fixed assets	0.05	0.13	0.0000	2.24
Total Assets (TA)	Total assets	836780	1954800	71.8100	19554211
Fixed Assets (FA)	Fixed assets	34107.88	89327.36	1.0000	1699595
Equity (EQTY)	Ratio of equity capital to total assets	0.16	0.15	0.000	0.95
Deposit Mix (IBDP)	Ratio of interbank deposits to customer and short-term funding	0.27	0.26	0	1
Loans (LOAN)	Ratio of net loans to total assets	0.41	0.18	0	1

Country	N	Assets	Deposits	Other funding	Equity	Loans	Investment securities
Czech Rep.	23	2080406.6	1624421.6	133993.74	181037.25	824995.62	1022069.07
Estonia	4	853797.76	596246.13	77872.34	117707.83	497291.66	247507.28
Croatia	35	371027.14	239724.81	47188.73	55213.97	197176.16	165395.22
Hungary	30	955514.74	747333.03	47471.45	82570.47	407301.88	458503.72
Lithuania	9	283078.5	233102.49	8186.64	29750.64	146475.77	71032.55
Latvia	20	153242.88	132194.78	1500.94	14950.45	69846.75	62257.78
FYR of Macedonia	10	97645.31	63878.15	496.53	16536.54	41953.39	47531.04
Poland	43	1912469.2	1630925.3	7222.85	172547.94	967080.4	779226.86
Romania	27	318874	252160.32	3128.1	48889.57	97394.2	170034.02
Russian Federation	80	535235.56	378220.24	14861.45	69694.85	228825.34	226358.92
Slovenia	20	687551.78	560575.39	24718.57	70852.66	377501.9	274026.27
Slovakia	18	846286.35	738380.42	11147.26	46441.51	484277.61	356381.25

Table 4   Descriptive Statistics of Banks in Sample by Country Average for 1999

All quantity variables are in thousands of US dollars and corrected for inflation.
Total number of banks N = 319 for 1999.

Table 5 Regression Results of Competitive Conditions for CEE banks: Panel data covering the period 1993-2000

Independent Variable	Model 1a (INTR) Est. Coeff.	t		Model 1b (TOTREV) Est. Coeff.	t		Model 2a (INTR) Est. Coeff.	t		Model 2b (TOTREV) Est. Coeff.	t		Fixed-1 (INTR) Est. Coeff.	t		Fixed-2 (TOTREV) Est. Coeff.	t	
PF	0.3515	27.5	***	0.2671	22.99	***	0.4093	37.66	***	0.3291	31.63	***	0.2731	23	***	0.2958	17.54	***
PL	0.2038	14.6	***	0.1459	10.60	***							0.1584	7.11	***	0.1769	8.23	***
PK (or PO)	0.0301	3.42	***	0.0785	7.48	***	0.1465	3.45	***	0.2184	9.31	***	0.0323	2.61	***	0.0231	1.12	
LNTA	0.015	1.9	*	0.018	2.23	**	0.0122	1.55	**	0.045	5.59	***	0.0204	0.78		0.086	3.25	***
LNEQTY	-0.07	-4.66	***	-0.055	-3.14	***	-0.055	-3.6	***	-0.0267	-1.72	*	-0.0111	-0.45		-0.033	-1.91	*
LNLOAN	0.1547	12.3	***	0.1212	10.54	***	0.1543	11.82	***	0.1118	8.41	***	0.1389	8.17	***	0.1542	9.35	***
LNIBDP	-0.0097	-2.05	**	-0.0076	-2.02	**	-0.0122	-2.67	***	-0.0127	-2.62	***	-0.0153	-2.46	**	-0.0137	-2.56	**
Czech Republic	-0.8958	-7.83	***	-1.0568	-9.32	***	-1.2318	-11.7	***	-0.6244	-5.8	***						
Estonia	-1.064	-9.26	***	-1.225	-12.68	***	-1.1673	-10.2	***	-0.5103	-4.37	***						
Croatia	-0.9762	-9.69	***	-1.3564	-13.28	***	-1.1309	-11.9	***	-0.5097	-5.24	***						
Hungary	-0.8612	-7.94	***	-1.5687	-9.65	***	-1.0927	-10.8	***	-0.5485	-5.3	***						
Lithuania	-1.2261	-11.2	***	-1.2788	-12.51	***	-1.3246	-12.1	***	-0.6181	-5.56	***						
Latvia	-0.942	-9.14	***	-1.6542	-15.58	***	-1.1036	-11.2	***	-0.4058	-4.05	***						
Macedonia	-0.7026	-6.49	***	-0.9244	-9.36	***	-0.8932	-8.53	***	0.1018	0.96							
Poland	-0.7139	-6.69	***	-0.9649	-8.35	***	-0.9195	-9.22	***	-0.2948	-2.9	***						
Romania	-0.3511	-3.37	***	-0.5325	-5.12	***	-0.5987	-5.96	***	-0.0652	-0.64							
Russia	-0.7304	-7.31	***	-0.8951	-8.36	***	-1.0235	-11	***	-0.258	-2.71	***						
Slovenia	-1.0369	-9.52	***	-1.2547	-11	***	-1.2355	-12	***	-0.623	-5.93	***						
Slovakia	-0.9814	-8.66	***	-1.3622	-11.36	***	-1.3131	-12.5	***	-0.7231	-6.76	***						
Yugoslavia							-1.218	-10.6	***	-0.3056	-2.61	***						
Bulgaria							-1.0625	-10.6	***	-0.2153	-2.1	**						
H - Statistic	0.59	(0.02)		0.49	(0.03)		0.56	(0.02)		0.55	(0.04)		0.46	(0.08)		0.50	(0.07)	
[1]F-value for H=0	758.31***			687.77***			1010.5***			945.85	***		319.45	***		388.44	***	
[2]F-value for H=1	570.05***			883.26***			1843.09***			1818.5	***		426.3	***		457.11	***	
Adjusted R2	0.97			0.96			0.96			0.95			0.98			0.98		
# of observations	1769			1764			2113			2105			1369			1362		

Estimated regression model: $\ln(REV_{it}) = h_1 \ln(PF_{it}) + h_2 \ln(PL_{it}) + h_3 \ln(PK_{it}) + \beta_1 \ln(TA_{it}) + \beta_2 \ln(EQTY_{it}) + \beta_3 \ln(LOAN_{it}) + \beta_4 \ln(IBDP_{it}) + \Sigma_{l=1} \alpha_l D_l + \varepsilon_{it}$

for $t=1,\ldots,T$ where T is the number of periods observed, and $i=1,\ldots,I$, where I is the total number of banks and ln is the natural logarithm. The dependent variable is the logarithm of the total interest revenue (or total operating revenue) scaled by total assets. Variables PF, PL and PK are the unit prices of three inputs: funds, labor, and physical capital. Bank specific factors are total assets (TA), financial capital (EQTY), loans to total assets (LOAN), and interbank deposits to total assets (IBDP). Country dummies are also included in the model. The model is estimated by running Least-squares regressions (except for Fixed-effects models) on the pooled sample of fourteen CEE countries. The models are adjusted to correct for first order serial correlation. The standard errors were calculated using White's (1980) correction for heteroscedasticity. T-statistics are given in italics next to the parameter estimates. The H statistic is equal to the sum of the elasticities of the interest revenue with respect to three input prices: $H = h_1 + h_2 + h_3$. Standard errors are reported in parentheses. The Wald test is used to test the H=0 and H=1 hypothesis. [1]F statistic for testing hypothesis H=0. [2]F statistic for testing hypothesis H=1. ***,**, and * indicate 1,5 , and 10 percent significance levels, respectively.

Table 6 H Statistics for Years and Size Groups							
	Model 1a (INTREV)		Model 1b (TOTREV)		Model 2a (INTREV)		Model 2b (INTREV)
	H	# of Obs.	H	# of Obs.	H	# of Obs.	H	# of Obs.
Panel A								
1993-2000	0.59	1769	0.49	1764	0.56	2113	0.60	2105
1993-1996	0.54	741	0.45	732	0.52	909	0.51	905
1997-2000	0.59	1028	0.49	1032	0.55	1204	0.69	1200
Panel B								
Large Banks	0.72	907	0.60	903	0.71	1056	0.76	1050
Small Banks	0.56	862	0.52	861	0.46	1057	0.52	1055
Panel C								
1993	0.65	110	0.62	98	0.69	122	0.74	120
1994	0.50	161	0.60	187	0.61	185	0.62	185
1995	0.44	220	0.38	215	0.46	268	0.45	266
1996	0.41	250	0.32	248	0.36	294	0.43	293
1997	0.54	285	0.40	272	0.53	337	0.56	332
1998	0.70	252	0.46	245	0.62	303	0.60	305
1999	0.55	273	0.58	276	0.55	332	0.69	330
2000	0.57	218	0.50	223	0.59	272	0.81	274

See table 5 for the definition of estimated regression models.
Large and small banks are determined by total assets above and below the median asset size in the sample.
The Wald test is used to test the H=0 and H=1 hypothesis. Both hypotheses were rejected at the 5 percent level for all of the estimations.

Table 7	H-Statistic for Individual Countries (1993-2000)							
	Model -1a		Model - 1b		Model -2a		Model-2b	
Country	H	# of Obs.	H	# of Obs.	H	# of Obs.	H	# of Obs.
The Czech Rep.	0.52	160	0.43	160	0.39	165	0.35	165
Estonia	0.70	27	0.34	27	0.59	28	0.31	28
Croatia	0.74	235	0.70	235	0.69	236	0.64	236
Hungary	0.36	132	0.41	132	0.43	164	0.43	164
Lithuania	0.44	31	0.37	31	0.36	36	0.52	36
Latvia	0.76	104	0.62	103	0.52	112	0.48	110
FYR of Macedonia	0.18^{MP}	34	0.39^{MP}	34	0.43	33	0.25^{MP}	33
Poland	0.51	243	0.50	243	0.41	261	0.41	261
Romania	0.54	66	0.52	66	0.9	56	0.59	82
The Russian Fed.	0.64	361	0.56	357	0.75	412	0.71	410
Slovenia	0.58	96	0.53	96	0.47	116	0.55	116
Slovakia	0.10^{MP}	88	0.64	88	0.19^{MP}	97	0.36	97
Yugoslavia					0.70	56	0.67	59
Bulgaria					0.59	103	0.60	102

The Wald test is used to test H= 0 and H=1 hypotheses.
^{MP} Means can not reject the hypothesis H=0 (Monopoly) at the 5% significance level.