Determinants of Bank Interest Margins in Central and Eastern Europe

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Banks' interest margins are among the most important indicators of the cost of financial intermediation. This paper investigates the determinants of banks' interest margins in Central and Eastern Europe (CEE). Given the run-up to EU entry and EU membership itself, dynamics in the banking sector in CEE have developed rather differently than in other emerging market economies. We document that, in contrast to the literature, foreign ownership has a positive effect on interest margins, whereas state ownership proves to be irrelevant. Banks' pricing of loans and deposits, however, is risk-adjusted in CEE – we detect positive risk premia for both interest and credit risk. However, our data provide some evidence for moral hazard behavior. Moreover, the decreasing interest margins in the region during the first half of the current decade seem to be caused by a decrease in operating costs as well as an increase of efficiency levels and rapid financial deepening.

1 Introduction

The participation in, or proximity of, EU integration has led to a process of rapid financial deepening all across Central and Eastern Europe (CEE). The massive entry of foreign banks into the region's banking markets has played a catalytic role in this respect, providing both a transfer of know-how and financial resources. This process has not only affected the macroeconomic performance of Central and Eastern European countries (CEECs) but also changed the microeconomics of banking in the region. Whereas a number of CEECs were struggling with open or latent banking crises in the early phase of the transition process, ever since the formal opening of membership negotiations with a number of countries in the late 1990ies[2] large parts of CEE have witnessed wide-ranging banking sector reforms that have strengthened the institutional set-up of banking systems as well as banks' operating performance.

In this paper, we focus on the determinants of banks' interest margins against the background of the transition process of the CEECs in the run-up to EU membership. We analyze a sample of banks from ten CEE Member States plus Croatia from 2000 to 2005.[3] In fact, interest margins in CEE are still well above the levels observed e.g. in the EU-15, although they have been on the decline over the last years (see e.g. Walko and Reininger, 2004). With banks playing a decisive role in the intermediation of funds for CEE economies, the price of financial intermediation, namely banks' net

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[2] In 1998, the EU formally launched accession negotiations with five CEE applicant countries – the Czech Republic, Estonia, Hungary, Poland and Slovenia. In late 1999, the European Commission recommended opening negotiations with Romania, the Slovak Republic, Latvia, Lithuania and Bulgaria. Membership negotiations with all countries except Bulgaria and Romania were finalized by 2002. While eight CEE countries joined the EU in the 2004 enlargement round, Romania and Bulgaria followed in 2007.

[3] In our sample, we also consider Croatia, which applied for EU membership in 2003 and was granted the status of a formal candidate country by the European Council in mid-2004.

interest margins, is of double interest. On the one hand, the low cost of financial intermediation is desirable from a social welfare perspective. On the other hand, however, this only holds true if risk-shifting problems can be successfully prevented and if banks price credit and interest rate risks in an adequate manner.

By looking at the determinants of interest margins, this paper intends to address both of these issues. We investigate whether interest margins fluctuate alongside banks' exposure, most notably to credit and interest rate risks. Furthermore, we examine which environmental effects or characteristics of the banking system in a given country contribute to reducing the costs of financial intermediation epitomized by lower interest margins. A number of idiosyncrasies of individual CEECs are important in this respect: Micco et al. (2007) e.g. showed that banks' operating performance is connected to their ownership structure. CEE has undergone a rapid change in terms of bank ownership struture. Whereas in 2000 state ownership – though already diminishing – still was of considerable importance in some countries, Poland and Slovenia were the only two countries where the share of state ownership in the banking sector surpassed 10% in 2005. Adding to that, the region's banking sector is largely dominated by the presence of large foreign (mostly EU-15) banking groups. This was already true in 2000, as foreign banks began to enter the CEE market in the late 1990s by way of acquiring banks in the process of privatization or establishing greenfield operations (see e.g. Boss et al., 2007); it is even more true in 2005. In addition, the development of interest margins might also depend on the different stages of the rapidly progressing financial deepening process, not least because different stages of financial deepening can be used as a – although crude – proxy for the development of the banking sector with respect to technological changes and risk management know-how (see e.g. Borovicka, 2007).

The choice of our data set (CEE banks from 2000 to 2005) raises the question whether, and to what extent, this period in the CEECs' transition process differed from the early transition period in the 1990s and what differences exist in comparison with the same period in other emerging market economies. In this respect, the CEECs' membership in the EU is likely to give the CEE transition process a somewhat idiosyncratic dynamics. The immediate post-transition period in CEE was characterized, inter alia, by widespread (open or latent) banking crises. By contrast, the subsequent opening-up of banking markets by means of large-scale privatization coupled with foreign entries restored confidence in the banking sector and set the stage for rapid financial deepening (see e.g. Havrylchyk and Jurzyk, 2006). Furthermore, the period from 2000 to 2005 is characterized by the immediate consequences of EU integration. Most notably, the participation in, or proximity of, EU integration has sped up wide-ranging reforms in the economic and financial systems of the CEECs on the basis of existing core sets of legislation. Thus there are good reasons to believe that earlier results on the determinants of interest margins for either the immediate post-transition period in CEE or other emerging markets are not representative for the run-up period to EU membership. To the best of our

knowledge, there is no paper that addresses the dynamics of banks' interest margins in CEE during the later stage of transition.

In analyzing the dynamics of interest margin in CEE, we intend to shed some light on three specific questions:

1. *To what extent do bank interest margins fluctuate alongside banks risk exposure?*

   We would expect CEE bank interest margins to be positively related to both credit risk and interest rate risk, which would reflect the risk-adjusted pricing of both loans and bank debt (see e.g. Maudos and Fernández de Guevara, 2004). The strength of this relationship may, however, depend on bank characteristics, e.g. bank capitalization. In this regard we might see moral hazard behavior of thinly capitalized banks, with these banks responding less to changes in credit/interest rate risks. The extent to which a bank's earnings base is diversified is another issue that could possibly impact interest margins (see e.g. Elsas et al., 2006, or Stiroh, 2004).

2. *Does a bank's ownership model impact its interest margins?*

   Regarding the role of the ownership model in financial sector dynamics, we focus on two aspects. One is state vs. private ownership, the other foreign vs. domestic ownership. State ownership is usually associated with lower profitability, as banks are used as a "means for economic policy," although implicit or explicit state guarantees could also lower their refinancing costs. Regarding foreign vs. domestic ownership, a number of reasons exist why the operating performance of foreign banks may differ from that of their local counterparts. One of these reasons is differences in risk management techniques, another is efficiency gaps (see e.g. Bonin et al., 2005). An additional difference could be the customer base of foreign banks, as foreign banks' market entries could e.g. have been motivated by the expansion of their domestic clients abroad. An additional factor is that foreign ownership in CEE is mostly equivalent to ownership by a foreign bank. This may again have an influence on interest margins through potentially lower refinancing costs of subsidiary banks as they have access to internal capital markets and/or benefit from implicit guarantees from their parent institutions (see e.g. BIS, 2006).

3. *To what extent are bank interest margins affected by environmental factors?*

   Interest margins may of course also be the result of changing environmental conditions. These can e.g. relate to GDP growth, progress in the process of financial deepening and/or the liberalization of the economic system of a given country. Given the fact that interest margins are considerably lower in the EU-15 than in the CEE Member States (e.g. ECB, 2006), one might, for example, hypothesize that progress in terms of financial deepening is a viable means to lower the cost of financial intermediation.

Our results show that in contrast to the literature, foreign ownership has a positive effect on interest margins and, in contrast to studies on other emerging markets, state ownership

has no significant impact. Our results reveal positive risk premia for interest and credit risk indicating a risk adjustment in the pricing of bank loans and deposits. Moral hazard, however, seems to be an issue with CEE banks. Moreover, we document a tradeoff with noninterest revenues and interest margins revealing some importance of income source diversification.

The major drivers of interest margin reductions in CEE banking have been a substantial decrease in operating costs, higher efficiency and the fast transformation process of economic environments combined with rapid financial deepening in the region.

The following 2nd section describes the underlying theoretical model and section 3 specifies the empirical application. Section 4 presents our results and section 5 concludes.

2 Determinants of Banks' Interest Margins

This paper builds on a microeconomic dealership model in the line of Ho and Saunders (1981). From a modeling perspective, we apply the Maudos and Fernández de Guevara (2004) model of interest margins.[4] Intuitively, their model works in the fol-

lowing way: Banks are risk-averse agents that take deposits and grant loans. Demand for both loans and deposits arrives randomly, with the probability of arrival depending on the interest margins the bank charges and the elasticity of loan demand/deposit supply. The random character of deposit supply and loan demand exposes them to interest rate risk. The bank also faces credit risk. A risk-averse agent will demand higher margins for both interest rate and credit risks. In addition, Maudos and Fernández de Guevara (2004) argue that operating costs, which may e.g. vary with product differentiation, impact interest margins. Even in the absence of any kind of risk, banks will have to cover their operating costs, which are a function of deposits taken and loans granted.[5] The model further predicts interest margins to be an increasing function of the average size of banks' operations because more risk is concentrated in a single customer. Interest margins are also predicted to be a decreasing function of the degree of competition in a banking market.

To sum up, the theoretical model of Maudos and Fernández de Guevara (2004) lists the following determinants of a bank's interest margin: its

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[4] *The original Ho and Saunders (1981) model has been extended to include different kinds of loans and deposits (Allen, 1988), the volatility of money market interest rates (McShane and Sharpe, 1985), credit risk (Angbazo, 1997) and operating costs (Maudos and Fernández de Guevara, 2004). Empirically different variants of the model have been applied to the U.S. banking market (e.g. Angbanzo, 1997), to a number of EU-15 banking markets (Saunders and Schuhmacher, 2000, Maudos and Fernández de Guevara, 2004, or Liebeg and Schwaiger, 2007). Drakos (2003) has been the first to apply the Ho and Saunders (1981) model to CEE banks. He focused on the early period of transition (i.e. from 1993 to 1999), a period marked by banking crises in many CEECs.*

[5] *As in a perfectly competitive environment the prices are set by the market, which simply results in the exit of banks with high expenses, some doubts about this argument may be justified. Higher operating costs may, however, also generate product differentiation due to higher service and/or higher marketing expenses and may therefore enable a bank to charge higher interests rates for loans and offer lower interest rates for deposits. In this respect, Fries and Taci (2005) e.g. argue that banks in transition are moving from the defensive restructuralization of banking operations (cost cutting) to operating strategies based on service improvements and innovation, which require a higher level of spending.*

degree of *risk aversion,* the *competitive structure* of the banking market, *interest rate risks, credit risks,* the *interaction* between credit and interest rate risks, the bank's *operating costs* and the *average size* of a bank's operations.

In the literature, the interest margin explained by these factors is referred to as the "pure" or model-based interest margin. From an empirical point of view, a number of other factors reflecting market imperfections, bank-specific components or macroeconomic influences might lead to deviations from these "pure" interest margins. The *payment of implicit interest* in the form of loan- or deposit-related commissions obviously has to be considered in this context (Saunders and Schumacher, 2000). The *quality of management* (Angbazo, 1997) may also have an effect on empirical interest margins. Moreover, Stiroh (2004) documents interplay between noninterest and interest revenues that could hinge on *income diversification. General economic conditions* (Bikker and Hu, 2002) could also have an influence in this context. With respect to CEE, the aforementioned widespread presence of foreign banks as well as the

diminishing role of state ownership makes the *ownership structure* of banks an issue, too (Drakos, 2003). In an empirical model of bank interest margins, these factors will also have to be captured.[6]

Thus, the observed interest margin of bank i in country j at time t, IRM_{ijt}, is given by:

$$IRM_{ijt} = f\left[PIM_{ijt}(\bullet), X_{ijt}, Y_{jt} \right]$$

where PIM_{ijt} is the pure interest margin, X_{ijt} is a vector of bank-specific control variables, and Y_{ijt} is a vector of industry-specific and macrocontrol variables.

3 Empirical Model

In order to capture unobserved cross section-specific effects, we estimate a fixed effects model using the within-group estimator for our dealership model. The fixed effects specification is preferred vis-à-vis both a random effects model[7] and first differencing.[8] As a Pesaran (2004) test indicates the presence of cross-sectional dependence in our sample, we display standard errors robust to cross-sectional correlation following Driskcoll and Kraay (1998). The empirical specification thus takes the form[9]

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[6] *The distinction between an empirically observed interest margin and a pure interest margin that induces the need for control variables is common to dealership models in the line of Ho and Saunders (1981). See also Angbazo (1997), Saunders and Schuhmacher (2000) or Maudos and Fernández de Guevara (2004).*

[7] *A Hausmann specification test rejects the hypothesis of a random effects model adequately modeling individual effects. The p-values for the respective Hausmann tests are displayed for each model specification that is estimated (see tables 2 and 3).*

[8] *For large N and small T (as in our sample), the choice between a fixed effects vs. a first differencing model depends on the efficiency of the respective estimators, which is determined by the serial correlation of errors. Following Wooldridge (2002), we perform a test for serial correlation in the idiosyncratic errors using the first differencing approach. The test rejects the null hypothesis of no autocorrelation in differenced errors, indicating that the fixed effects model is more efficient than first differencing. The p-value of the test statistic is again provided for every specification in tables 2 and 3.*

[9] *As several papers indicate the persistence of bank profits over time (e.g. Athanasoglou et al., 2005, and Goddard et al., 2005) we also performed a dynamic panel data approach, using the one-step GMM-estimator by Arellano and Bond (1991), which introduces common time effects to capture the potential influence of cross-section dependencies. The lagged interest rate margin variable was, however, found to be insignificant. Furthermore, to make sure nonstationarity does not affect our data, we performed the panel data unit root test according to Maddala and Wu (1999), resulting in the rejection of the null hypothesis of nonstationarity. The respective test statistics can be obtained from the authors upon request.*

$$IRM_{ijt} = const + \sum_{k=1}^{K} \alpha_k PIM_{kijt} + \sum_{l=1}^{L} \beta_l X_{lijt} + \sum_{m=1}^{M} \gamma_m Y_{mjt} + u_{ijt}$$

and $u_{ijt} = \mu_{ij} + v_{ijt}$, where IRM_{ijt} is the interest margin of bank i in country j in year t, α_k are the K coefficients of the variables determining the pure interest margin PIM_{ijt}, β_l are the L coefficients of the bank-specific control variables and γ_m are the M coefficients of the industry-specific and macro-control variables that are constant over all banks in a given year and country j. u_{ijt} consists of the individual effect μ_{ij} and the residual term v_{ijt}.[10]

Empirically, the interest margin is measured as net interest income (interest income net of interest expenses) in relation to total assets. The determinants of the "pure" interest margin as proposed by the model are proxied by the following variables:

Risk aversion is captured by the equity-to-total assets ratio – the higher the ratio, the higher is a bank's risk aversion. *Interest rate risk* is captured by the standard deviation (within a year) of daily interbank money market rates, whereas *credit risk* is measured by the ratio of customer loans to total assets, with the ratio of loan loss provisions to net income (risk/earnings ratio) being used to check for the robustness of results.

The interaction of credit risks and interest risks is covered by introducing an interaction term between the interest rate risk and the respective credit risk specifications. *Operating costs* are computed as the relation of operating expenses to total assets. *The average size of operations* is captured by the log of total customer loans. The *competitive structure* of the market is captured by the concentration ratio of the five largest banks in any banking market.[11]

A number of environmental variables and bank characteristics are used to account for empirical deviations from pure interest margins. Following Angbazo (1997), Saunders and Schumacher (2000) and Maudos and Fernándes de Guevara (2004), the *payment of implicit interest rates* is measured by the ratio of the difference between noninterest expense minus other (i.e. noninterest) operating income to total assets. The quality of management is proxied by the cost-to-income ratio, the *importance of noninterest revenues* is calculated by the ratio of noninterest revenues to total assets, with the ratio of noninterest revenues to total revenues

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[10] Given the presence of large differences in the size of individual banks, heteroskedasticity could be a problem in our sample. We control for this by using a robust estimator of the variance-covariance matrix of the parameter estimates.

[11] The use of a market concentration ratio as a right-hand side variable of course implicitly assumes that market concentration is exogenous to the change in banks' interest margins. To make sure that our parameter estimates are not distorted by the endogeneity of the concentration variable (which would lead to inconsistent parameter estimates), we perform a test for the exogeneity of the concentration ratio following Wooldridge (2002), confirming the hypothesis of strict exogeneity of our competition variable. Results can be obtained from the authors upon request.

being used in a robustness check.[12] The change in *economic conditions* is proxied by the real GDP growth rate in a given year for each country as well as by the Index of Economic Freedom which is provided by the Heritage Foundation and covers the business environment side of economic conditions. *GDP per capita* is intended to measure the different stages of the economic convergence process and can thus to some extent also be used to proxy the development of the banking sector with respect to technological change. We use the relationship of total banking assets to GDP for robustness purposes in this respect.

Regarding *ownership structure,* we use a dummy for state ownership for every bank in every year. This dummy assumes a value of 1 if state ownership is above 50% (we use the 25% threshold to check for robustness of results) and 0 otherwise. Foreign ownership is captured by the share of foreign ownership in a given bank at a given point in time. To see whether results are stable to an alternative definition of variables, we also use a foreign ownership dummy which is 1 in case the largest shareholder is a foreign company and 0 otherwise. To analyze the impact of foreign entries on domestic banks, we use the overall share of foreign-owned assets in banks' total assets of a country in a given year.

The use of foreign ownership as a right-hand side variable implicitly assumes its exogeneity. In our case, this is equivalent to the assumption that foreign bank presence at any time t is determined by market or bank characteristics of time $t–1$. As this assumption seems to be quite restrictive, we perform a test for the exogeneity of foreign ownership according to Wooldridge (2002), which confirms the strict exogeneity of foreign ownership. This result is in line with the findings of Claessens et al. (2001) and Havrylchyk and Jurzyk (2006). Claessens et al. (2001) document that (in contrast to e.g. a low-cost environment, low taxes etc.) the net interest margin is insignificant for a foreign bank's decision to enter a market. Havrlychik and Jurzyk (2006) show that the higher profitability of foreign banks is acquired rather than "inherited."

In the following, after briefly discussing our data, we will estimate a reference model and subject it to a number of robustness checks based on alternative variable defintions.

3.1 Data

Our data on banks' balance sheets and profit and loss accounts stem from Bureau van Dijk's Bankscope

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[12] *The definition of the variables that measure the payment of implicit interest rates and the importance of noninterest revenues may raise concerns of mutlicollinearity, as do the definitions of the variable measuring the quality of management and operating costs. To check for multicollinearity, we computed variance inflation factors (VIFs) for all independent variables based on a pooled ordinary least squares (OLS) regression. VIFs are obtained by regressing an explanatory variable i on all other independent variables. As a rule of thumb, VIFs greater than 10 would indicate a problem of multicollinearity (Gujarati, 1995). In case of our reference model, VIFs range from 1.23 to 5.17, which means that multicollinearity does not seem to be a problem. In addition, we computed pairwise correlations between these variables, which were also rather small (not above 0.4). Moreover, we checked for the stability of parameter estimates when omitting individual variables. The empirical results in section 4 proved to be insensitive toward leaving out these variables one by one. Trading off the potential problem that could arise by omitting variables with their potential collinearity, we decided to include all variables in the model.*

database. This database comprises 402 banks from 11 CEECs (the total of 10 CEECs that joined the EU in 2004 and 2007, respectively,[13] plus Croatia, which was officially granted candidate country status in 2004). The time span observed is six years (2000–2005). As there is no complete set of data available for a number of variables used, our sample is reduced to an unbalanced panel of 247 banks and 930 observations, for which we constructed a time series based on the ownership information available for each bank from the Bankscope database. Interbank rates are taken from Bloomberg, GDP per capita and real GDP growth from Eurostat and the source of the Index of Economic Freedom is the Heritage Foundation.

Table 1 shows the evolution of our variables for the median bank for the years 2000 to 2005. Following a common trend also observed in Western European countries (e.g. Liebeg and Schwaiger 2007), the interest margin (IRM) decreased from 3.5% in 2000 to 2.7% in 2005. During the same period operating costs (OPEXPRATIO) decreased markedly — from 4.7% to 3.2%. So did cost-to-income ratios (CIR, from 63.2% to 47.8%), noninterest revenues (NON-INTREV, from 2.3% to 1.8%) and implicit interest payments (IIP, from 1.4% to 0.4%), thereby indicating substantial gains in CEE banks' efficiency. The evolution of interest risks (STDIBR) is rather volatile over the period under observation, but was lower in 2005 than at the beginning of the decade. Our proxy for credit risks (KK) increased during the sample period, whereas risk aversion (RISKAV) declined slightly. Concentration (CR5), which stood at 71% in 2005, did not vary to a large degree over time. GDP growth (GDPGROWTH) was within a range from 4.2% to 5.3%. The Index of Economic Freedom (FREEDOM) did not change substantially, whereas intermediation depth (INTERM) increased rapidly from 38% of GDP to 88%.

With respect to the ownership variables used in our model, the median share of foreign ownership (FOREIGNSHARE) increased noticeably from 45% in 2000 to 85.5% in 2005, depicting the change in banking ownership structure during the observation period. The share of banks that had a dominant foreign owner (LARGESTFOREIGN) paralleled this development, growing from 54.1% (i.e. 46 banks) to 67.8% (120 banks) from 2000 to 2005. State ownership was found to play a minor and decreasing role in CEE banking markets: 5.7% of all banks had the state as majority shareholder in 2005, down from 8.2% in 2000.

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[13] Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia. Given the regional focus of this study, we exclude Malta and Cyprus.

Table 1

Descriptive Statistics

Symbol	Definition of sample medians[1]	2000	2001	2002	2003	2004	2005
IRM (%)	Ratio of net interest income to total assets	3.447	3.219	3.325	3.143	2.896	2.688
OPEXPRATIO (%)	Ratio of operating costs to total assets	4.716	3.900	3.953	3.710	3.502	3.239
RISKAV%)	Debt-to-equity ratio	9.834	10.053	10.066	10.153	9.732	9.272
STDIBR	Standard deviation of interbank rates per country	0.860	0.963	0.810	1.332	0.619	0.584
CIR (%)	Cost-to-income ratio	63.230	55.641	55.637	52.877	49.789	47.760
CROSSIBR	Interaction between LLPR and STDIBR	4.150	5.642	4.753	2.092	2.073	1.546
NONINTREV (%)	Ratio of noninterest revenues to total assets	2.283	1.971	1.905	1.789	1.820	1.789
IIP (%)	Ratio of operating expenses minus noninterest income to total assets	1.439	0.910	0.865	0.797	0.498	0.366
CR5	Market share of five largest banks per country	71.000	70.000	71.000	70.000	67.000	71.000
HHIASSETS	Herfindahl index by country, calculated on the basis of total assets	0.143	0.145	0.135	0.133	0.135	0.154
SIZE	Log of total customer loans	12.017	12.166	12.162	12.157	12.396	12.985
GDPGROWTH (%)	Annual growth of real GDP	4.200	4.300	4.600	4.300	5.300	4.300
INTERM (%)	Ratio of a country's total banking assets to nominal GDP	37.635	69.464	62.156	71.873	77.327	87.596
GDPPERCAPITA	GDP per capita (EUR thousand)	9.404	9.604	9.975	10.209	11.060	11.550
FREEDOM	Index of Economic Freedom according to the Heritage Foundation (0=lowest; 100=highest)	62.964	60.072	64.336	61.536	62.217	62.446
KK (%)	Ratio of customer loans to total assets	41.742	44.933	49.635	55.024	53.711	54.893
CROSSKK	Interaction between LLPR and KK	0.425	0.538	0.455	0.410	0.331	0.303
NONINTREV2 (%)	Ratio of noninterest revenues to total income	40.733	38.239	36.666	37.304	37.690	41.109
FOREIGNSHARE	Share of foreign ownership for each bank (%)	45.000	50.465	70.835	65.830	75.000	85.520
LARGESTFOREIGN	Dummy (1 if largest owner is foreign), % of total observations if dummy is 1	54.118	54.237	60.667	61.257	64.115	67.797
STATE50	Dummy (1 if state owns more than 50%), % of total observations if dummy is 1	8.235	11.017	7.333	7.330	7.656	5.650
STATE25	Dummy (1 if state owns more than 25%), % of total observations if dummy is 1	8.235	11.017	8.000	7.850	8.134	6.215
	Number of observations in a given year	85	118	150	191	209	177

Source: Bankscope, Bloomberg, Heritage Foundation, Eurostat.
[1] Median by bank or country (depending on definition of variable).

4 Results

Table 2 shows the results of our reference model and table 3 presents the results on the hypothesis of moral hazard behavior. Econometrically, a Hausmann test and a test for serial correlation in residuals according to Wooldridge (2002) confirm the use of a fixed effects model rather than a random effects model or first differencing.

4.1 Reference Model

Coming back to our reference model, we will start by summing up the main results first and then further elabo- rate on the issue of banks' risk-taking and ownership.

In our model, most determinants of pure interest margins have the predicted sign of influence and are significant. Operating costs have a positive significant influence, as do risk aversion, credit risk, interest rate risk and the degree of concentration. When looking at the sensitivity of the interest margin with respect to these determinants, it becomes apparent that credit risk is by far the most important driving force. A 10% increase in credit risk would lead to an interest margin increase of 15.5 basis

Table 2

Determinants of CEE Banks' Interest Margins from 2000 to 2005 (Reference Model)

	Dependent variable: Net interest margin (IRM)		
	Coefficient	Standard error	p-value
OPEXPRATIO	0.21326	0.03011	0.000
RISKAV	0.03792	0.00842	0.000
KK	0.02835	0.00301	0.000
STDIBR	0.00202	0.00053	0.000
CIR	−0.02607	0.00173	0.000
CROSSKK	−0.00151	0.00051	0.004
NONINTREV	−0.25351	0.02428	0.000
IIP	0.44977	0.03893	0.000
CR5	0.00403	0.00179	0.025
SIZE	−0.00042	0.00082	0.607
GDPGROWTH	0.0003	0.00023	0.018
GDPPERCAPITA	−9.60e−07	3.71e−07	0.001
FOREIGNSHARE	0.00203	0.00079	0.011
FREEDOM	−0.00015	0.00014	0.284
STATE50	0.00221	0.00135	0.102
_CONS	0.04005	0.01327	0.003
Number of observations	930		
Number of groups	247		
Hausmann test	0.0000		
Test for serial correlation[1]	0.0001		
R-squared	0.6124		

Source: own estimations.
[1] Wald test for serial correlation in the idiosyncratic errors of a linear panel data model according to Wooldridge (2002).

points, whereas an increase in interest rate risk of the same magnitude would only entail a rise by 1.2 basis points.[14] Moreover, operating costs also have a sizeable impact on interest margins, as a 10% change in operating costs will lead to an interest margin reduction by 6.9 basis points. By contrast, bank size does not have any significant influence. Lower costs, lower risk aversion, lower credit and interest rate risks as well as more competition therefore induce lower interest margins.

Concerning the bank-specific variables of the interest margin model, the cost-to-income ratio and noninterest revenues have negative and significant coefficients, which indicates that a higher degree of efficiency results in higher interest margins. We find that a 10% increase in efficiency increases interest margins by 12.5 basis points and a 10% increase in noninterest revenues causes interest margins to drop by 4.5 basis points. Implicit interest payments also have the expected positive and significant influence: The more services are given away "for free" (which means that they are not covered by other operating income), the higher the net interest margin (NIM) has to be. However, the effect is comparatively small, with the change in interest margins amounting to only 1.6 basis points for a 10% change in implicit interest rate payments.

As regards the effect of banks' ownership model on interest margins, we find that foreign ownership has a significant, yet small, positive

[14] All sensitivities listed in section 4 have been evaluated at sample medians for 2005 as depicted in table 2.

impact on interest margins – a 10% increase in the share of ownership increases interest margins by only 1.7 basis points. State ownership, by contrast, has no significant impact.

With respect to the country-specific environmental variables, the Index of Economic Freedom has the predicted negative sign, but is insignificant. So is GDP growth. GDP per capita, however, which can serve as an indication for the progress made in the transition process, does have a significant negative effect on interest margins. Although the coefficient is small, a sensitivity analysis shows that a 10% increase in GDP per capita induces a sizeable decrease in interest margins to the tune of 11.1 basis points.

To check for the robustness of our results, we also estimated five robustness models using alternative variable definitions. Model (1) uses the Herfindahl Index as a proxy for credit risk. Model (2) is estimated with a new variable for noninterest revenues, namely their share in total income. Models (3) and (5) use different variable definitions for capturing the influence of foreign/state ownership. LARGESTFOREIGN is a dummy which assumes a value of 1 if the largest shareholder is a foreign shareholder and 0 otherwise (as opposed to using the share of foreign ownership to proxy for foreign ownership in the reference model), and STATE25 is a dummy which takes the value of 1 if state ownership is above 25% (as opposed to 50% in the refer-

ence model) and 0 otherwise. Model (4) uses intermediation depth (the ratio of a country's banking assets to its nominal GDP) as an alternative to GDP per capita, which is used in the reference model.[15]

With several minor exceptions, the results of our reference model[16] are by and large confirmed by the robustness checks. One of these exceptions concerns the sign of the Herfindahl Index, which is significantly negative. In this regard the concentration ratio of the five largest banks turns out to be insignificant in some models. This suggests that CEE banking markets seem to be all but perfectly competitive. Some other variables change slightly in their significance in comparison with the reference model: State ownership is moderately significant in two of the five robustness models and GDP growth becomes significant once intermediation depth is used instead of GDP per capita to capture economic development.

An interesting aspect concerns the influence of intermediation depth on interest margins. Apparently, the higher developed a country's banking market is in terms of size relative to GDP, the lower banks' interest margins. A 10% increase in intermediation depth causes interest margins to drop by 4.0 basis points. Given that intermediation ratios in CEE are still way behind euro area averages (some 284% in the euro area, as opposed to a median of 86% for the CEECs in our sample; for euro area data see e.g.

[15] *The use of loan loss provisions as a credit risk proxy would also have made for a natural robustness check. But since loan loss provisioning ratios are rather low in a rapidly growing market (see e.g. OeNB, 2007), we consider their ability to proxy credit risk rather limited and therefore did not use them as a credit risk proxy. Furthermore, loan loss provisions are affected by a number of other factors besides credit risks, especially earnings management, which makes them a sometimes misleading measure of credit risk.*

[16] *The accompanying table can be obtained from the authors upon request.*

Table 3

Risk Shifting – Subsamples Split along the 25% Quantile of the Tier 1 Ratio

	Dependent variable: Net interest margin (IRM)	
	Thinly capitalized banks	Remaining banks
	Coefficient	Coefficient
OPEXPRATIO	0.20894***	0.22456***
RISKAV	0.13608***	0.03178**
KK	0.01840***	0.02697***
STDIBR	−0.00073	0.00195***
CIR	−0.01449***	−0.02984***
CROSSKK	0.00295***	−0.00135***
NONINTREV	−0.18468***	−0.28014***
IIP	0.39554***	0.47723***
CR5	0.00190	−0.00202
SIZE	−0.00273*	−0.00086
GDPGROWTH	0.00009	0.00015
GDPPERCAPITA	−7.05e−07***	−4.88e−07
FOREIGNSHARE	0.00297***	0.00277**
FREEDOM	−0.00027*	−0.00013
STATE50	−0.00013	0.00173
_CONS	0.06695***	0.04822***
Number of observations	246	684
Number of groups	96	206
R-squared	0.7861	0.5995
Test for serial correlation[1]	0.0001	0.0001
Hausmann test	0.0001	0.0000

Source: own estimations.
*Note: ***, **, * indicate significance at 1%, 5%, 10% level.*
[1] *Wald test for serial correlation in the idiosyncratic errors of a linear panel data model according to Wooldridge (2002).*

Rossi et al., 2007), we can expect that margins in CEE will decline significantly in the future, as the depth of financial intermediation approaches euro area levels.

All in all, the robustness checks performed underpin the confidence we had in our estimation results. However, a number of caveats need to be considered when interpreting our results. One of them certainly is the choice of empirical proxies for variables. Due to data restrictions, especially the proxies for credit and interest rate risk are rather crude and perhaps do not fully cover all aspects of these risk categories. The same applies to our proxy for competition. However, it is difficult to come up with stable estimates of another widely used proxy for competition, i.e. the Lerner index, as there were not enough data points available for a number of countries.

4.2 Risk-Taking

Our results indicate that the pricing for loans and deposits is risk adjusted – both credit and interest rate risk have a significant influence on interest margins. Moreover, noninterest revenues and interest margins seem to interact. Our results show a tradeoff between these two income categories. As already suggested in the introduction, this tradeoff could be seen as evidence for the hypothesis that besides credit and interest rate risk, diversification effects in banks' income sources influence their pricing of loans and deposits. Alternatively, this tradeoff could be attributable to cross-selling opportunities – banks are willing to accept lower in-

terest margins as the establishment of a client relationship enables them to profit from noninterest revenues.

Although our results appear to be in line with expectations, moral hazard behavior could still be hidden underneath these results. To check for moral hazard behavior, we follow an approach commonly used in the literature (e.g. Berger and DeYoung, 1997) and split our sample in two along banks' equity-to-asset ratios. We chose the 25% quantile to separate our sample. If moral hazard is indeed present, we expect the interest margins of thinly capitalized banks to be less sensitive to both interest rate and credit risks. Table 3 shows the estimation results of both subsamples.

These results indeed provide some foundation for the moral hazard hypothesis: In fact, we do note that for thinly capitalized banks the interest rate risk is insignificant for the setting of interest margins. Furthermore, the credit risk coefficient is smaller for thinly capitalized banks than for their counterparts. Therefore, the interest margins of thinly capitalized banks are less sensitive toward both credit and interest rate risk than the interest margins of their counterparts with higher equity ratios. Thinly capitalized banks also seem to be less sensitive toward income diversification. As current loan loss provision levels in CEE are rather low – inter alia because of the rapid growth of credit portfolios (e.g. Boss et al., 2007) – the fact that those banks that have a lower equity base are also those which apparently provide for a lower cushion in the form of interest margins gives reason for concern. The sensitivities for credit

and interest rate risk of thinly capitalized banks and their counterparts differs by about 5 basis points for a 10% increase in both risk factors and is thus limited.

4.3 Ownership

In our case, foreign ownership has a positive influence on banks' interest margins. This finding is e.g. in contrast to Claessens et al. (2001) and Micco et al. (2007) for a broad sample of transition countries and to Drakos (2003) for a sample of CEE banks in the early stage of transition.[17] One reason for this difference is the fact that foreign ownership could have a positive effect on banks' refinancing costs (e.g. BIS, 2006). Average financial strength ratings for banks in CEE, for instance, are considerably lower than in EU-15 countries, where most of these banks' parent banks are headquartered (e.g. Moody's, 2007). What makes CEE special in this respect is the fact that foreign ownership is considerably more common than in other transition economies. In this respect, it is worthwhile considering that most of the foreign banking groups active in the region earn a significant portion of their income in these countries. The Italian UniCredit Group, Austria's Erste Bank and Raiffeisen International or the Belgian KBC Group are cases in point. The widespread presence of foreign ownership in CEE, however, reduces the risk of "cut and run" strategies in times of crisis, as these banks would run a considerable reputation risk when letting an individual subsidiary fail in case of a crisis. Thus the implicit guarantee by foreign parent banks is perhaps more credible in

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[17] See also Uiboupin (2004 and 2005).

CEE than in other developing markets – a fact which, in turn, would explain lower refinancing costs. More sophisticated risk management techniques implemented during the transfer of know-how that goes along with foreign ownership could be another reason why foreign-owned banks are charged less for their debt than their domestically owned counterparts Our data indeed reveal that costs for debt capital are indeed lower for foreign-owned banks than for their domestic counterparts. If a bank's largest shareholder comes from abroad, the average cost of debt capital is 2.76%, whereas it is 2.94% for banks with a domestic owner as the largest shareholder. It may be argued that in a perfectly competitive market foreign banks would use their comparatively lower refinancing costs to enter into price competition for bank loans. As the partly contradicting evidence on competition (as measured by a concentration ratio and by the Herfindahl index) shows, the CEE banking market seems to be characterized by imperfect competition. Thus it may not come as a surprise to see that lower refinancing costs are not passed on fully to customers. Another reason for this phenomenon could be the rapid expansion of the CEE banking market itself which offers significant growth opportunities to banks without forcing them to claim market shares from their competitors.

In contrast to Drakos (2003), our results on the influence of a bank's ownership model on its interest margins reveal, furthermore, that state ownership has no significant influence on interest margins. Lower interest margins of state-owned banks are usually explained by the promotion of other than pure business motives. Micco et al. (2007) e.g. show

that the effect of state ownership is particularly pronounced during election years. It may, however, be argued that in later stages of economic development and/or in countries with a low share of state ownership, state banks cease to play a development role in the economy and tend to mimic the behavior of private banks. The rapid process of economic convergence of the CEECs in our sample over the past few years would thus explain why our results for CEE differ from those of Drakos (2003) who studied the early transition period. Our results are compatible to Micco et al. (2007) who found that ownership is only relevant for the banking sectors in transition economies but not for those in industrialized countries.

5 Summary

In this paper we apply a microeconomic dealership model of interest margins supplemented by information on ownership and economic environment to banks in CEE in the late transition period from 2000 to 2005. The most important features of this period are the widespread dominance of foreign banks (mostly from the "old" EU Member States), the shrinking importance of state ownership and the adoption of the legal and economic standards of the EU. Because of these factors, our case study on CEE banking markets during the period from 2000 to 2005 yields results that are rather different from those of studies on other emerging banking markets the early transition period in CEE, which was marked by widespread banking crises.

Our results show that credit risk is by far the most important driver of interest margins in CEE banking, whereas interest rate risk has only a

minor impact. The major reasons for the observed reduction in interest margins are a higher degree of efficiency, lower operating costs and a higher weight of noninterest income in a bank's earnings. Lower risk aversion, higher competition and lower implicit interest payments are additional microeconomic determinants that have a significant, albeit smaller, influence on reducing interest margins.

With respect to banks' risk-taking, we document a risk adjustment in banks' margins for both interest rate and credit risk which reveals positive premia for both risk categories. Moreover, we document a tradeoff between noninterest revenues and interest margins that reveals that income source diversification is of some importance for bank's pricing policies. However, we also found some evidence for the assumption that thinly capitalized banks react to credit and interest rate risks in a less sensitive manner than their counterparts, which indicates the existence of moral hazard behavior. Its impact on margins is limited, however.

In contrast to the literature, foreign bank ownership has a positive effect on interest margins. We attribute this observation to the fact that refinancing for banks owned by foreign companies (mostly banks) is cheaper than for their domestic counterparts since subsidiaries have access to the internal capital market of the banking group they belong to and profit from implicit guarantees by the parent institution.

In contrast to the findings available on other emerging economies, state ownership has no influence on interest margins in the countries and period under observation, which confirms the view that state-owned banks tend to mimic commercial banks in later stages of economic development.

Our estimations also confirm the asssumption that interest margins are lower the more developed an economy is. GDP per capita or, alternatively, intermediation depth both have a considerable and statistically significant negative impact on banks' interest margins. Thus, the expected continuation of the financial deepening process in CEE is assumed to contribute to a further downward alignment of CEE banks' interest margins to EU-15 levels in the medium term.

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