

The determinants of net interest margin during transition

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Abstract

This paper investigates the effect of bank-specific, industry-specific and macroeconomic determinants, as well as the regulatory environment on the net interest margin (NIM) in the banking sectors of the South Eastern European countries over the period 1998-2007. Additionally to the standard determinants employed in the literature, such a study provides a unique natural experiment to examine the effect of the extensive banking sector reform that took place during the examined period. Using both static and dynamic frameworks and advanced market structure measures, the empirical analysis reveals that net interest margin is affected by bank-specific determinants like equity capital, risk and bank size. The regulatory framework plays a crucial role as well as the presence of foreign-owned institutions. However, as financial systems develop and the reform process ends, both the current and future rates of economic growth are likely to have an enhanced impact on bank margins.

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1. Introduction

The establishment of a viable and sound banking system has been a fundamental aspect of the transition of South Eastern European (SEE)¹ countries to a market economy. At the beginning of this transition process, since late in the nineties, the countries of the region faced the difficult task to deeply transform their weak, underdeveloped and shallow financial systems.² The major changes that occurred, the subsequent attempts to catch up with the European Union (EU) standards and the pivotal role of banks (considering the generally under-developed capital markets) in shaping economic developments and even triggering changes at important junctures, make the banking sectors of these countries a distinct field of research.

This “opening up” of SEE countries’ banking industry enhanced credit intermediation (closely related to the general economic growth), affecting the main bank income source in the market, namely the net interest income. Given that in developing banking systems the variation in net interest income is a moving factor of profit volatility, the research on the determinants of net interest margin (NIM) conveys significant information for the design of effective banking policies³ as these transition countries need a stable and efficient banking system, next to the gradual development of financial markets. While a high level of margins is generally indicative of inefficiency, excessive risk taking, or lack of competition within the banking sector, high margins may promote safety and stability in the system (insulate banks from macro and other shocks), a particularly relevant issue in the case of developing countries (Gorton and Winton, 1998).

In fact, this study seeks to measure the effects of bank-specific, macroeconomic, market structure and regulatory factors on net interest margin in the SEE banking sector over the period 1998-2007. In other words, our objective is to determine whether the interest margins of banks operating in SEE economies are caused by economic factors, or rather by regulatory factors and underdeveloped banking conditions. Such an approach may be useful on specific measures of economic policy, considering the prospect of EU integration, while the area of net interest margins is still relatively under-researched.

Given the above, this study presents two interrelated novelties. First, the relevant literature principally considers developed banking systems with relatively uniform characteristics in their operating environment (e.g., Saunders and Schumacher, 2000; Maudos and Fernández de Guevara, 2004). In contrast, this paper seeks to examine the determinants of NIM in banking sectors under transition, such as those of the SEE countries. Yet, as the SEE banking industry continuously evolves, changes in the

¹ The geopolitical term SEE includes Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania and Serbia -Montenegro.

² However, during the second half of the 1990s banking reform efforts were impeded, either by internal setbacks or by external causes.

³ See Demirgüç-Kunt and Huizinga (1999), Maudos and Fernández de Guevara (2004), Claeys and Vander Venet (2007).

institutional environment may have a direct impact on the interest margins. Therefore, this study attempts a direct analysis of the effect of the banking sector reform process on NIM through the examination of the banking laws implemented during the transition period. Also, this study employs the important research output of the European Bank of Reconstruction and Development (EBRD) of bank and enterprise reform to quantify the reform process in SEE banking, and it identifies all the relevant banking laws that facilitated the transition. Since the EBRD performs a yearly assessment of regulatory reform we are able to exploit the time-series aspect of these indices. Finally, we rely on information from the World Bank (WB) database on bank regulations and supervision (Barth et al., 2001a, 2006, 2008) to construct indices that relate to capital requirements, market discipline, official supervisory power and restrictions on bank activities. These indices can be more informative than the dummy variables and allow us to consider a more harmonized measure that is of particular importance in a cross-country setting.

A prominent theoretical framework on the determinants of NIM was put forth by Ho and Saunders (1981). This theoretical framework has been extended by many other studies, such as Maudos and Fernández de Guevara (2004). The empirical debate that followed suggested two empirical approaches for the analysis of NIM, a single and a two-stage approach.⁴ Yet, neither of these approaches describes the dynamics of NIM, which may be of particular importance in banking sectors under immense reform.⁵ We examine these features by estimating both static and dynamic empirical models.

The rest of the chapter is organized as follows. Section 2 reviews the theoretical underpinnings of the relevant literature and describes the empirical methodology to be followed. Section 3 provides a background of the reform process observed in the SEE banking industry and discusses the dataset. Section 4 presents and analyzes the empirical results. Some conclusions are offered in the final section.

2. Methodology

2.1. Theory and identification

In the literature, the net interest margin is usually expressed as a function of internal (bank-specific) and external (macroeconomic and industry-specific) factors. This approach is widely used in both single and cross-country studies.⁶ The significance of the relationship between interest rate volatility and bank portfolio behavior was initially recognized by Samuelson (1945), however, the starting point for analyzing the determinants of the interest margin, is the model of Ho and Saunders (1981). At least two identification frameworks have been proposed, a single and a two-stage approach. Under the latter, in the pioneering study of Ho and Saunders (1981) for a sample of US banks over the period 1976-1979, an

⁴ The first appearing more appropriate in light of the institutional and regulatory forces that may impact NIM.

⁵ Recent panel-data econometric methods allow the estimation of reduced-form equations, where corrects possible endogeneity problems.

⁶ However, the relations between bank's characteristics or external factors and margins are not constant across countries or different periods within the same country.

estimate of the so-called “pure margin”⁷ is obtained in the first stage, while the second stage analyses the relationship between this margin and a number of variables posited by the theoretical background. Using a similar methodology, Saunders and Schumacher (2000) studied the banking systems of six European countries and the US, over the period 1988-1995. In an empirical application of the two-stage approach for seven Latin American countries, Brock and Suarez (2000) reported that bank spreads in the 1990s were influenced by liquidity and capital risk at the bank level, and by interest rate volatility, inflation and GDP growth at the macroeconomic level, although the results differed across countries.

On the other hand, a one-step approach incorporates all the determinants of interest margins in a single stage. Angbazo (1997), for a sample of 286 US commercial banks, for 1989-1993 shows that bank interest margins reflect both default and interest rate risk premium. As Angbazo (1997), Drakos (2003), focuses on bank’s net interest rate margins in an attempt for evaluating the effects of the transition process in the Central and Eastern European Countries and in the Former Soviet Union Countries for the period 1993-1999, suggesting that margins have significantly decreased, indicating that the transition process has been to some extent effective. Demirgüç-Kunt and Huizinga (1999) in a sample of 80 developed and developing countries over the period 1988-1995, report that in developing countries foreign banks have greater margins than domestic banks, while indicators of better contract enforcement, efficiency in the legal system, and lack of corruption are associated with lower realized interest margins.

Maudos and Fernández de Guevara (2004) include bank-operating costs and a direct measure of the degree of competition (Lerner Index). Claeys and Vander Venet (2007) investigate the determinants of bank interest margins in transition countries of Central and Eastern Europe (CEEC), for the period 1994-2001. Their findings indicate that several bank-specific factors, such as cost efficiency, capital adequacy, and risk behavior have significant impact on bank margins as well as market concentration. Carbo and Rodriguez (2007) in a sample of seven European countries in the period 1994-2001 indicate a positive relationship with credit, liquidity and interest rate risk, as well as operating inefficiency and capital-to-assets ratio, while the influence of concentration (Herfindhal-Hirschman index) is insignificant. Finally, Lepetit et al. (2008) in a study of 602 European banks over 1996–2002, find that higher income share from commissions and fees is associated with lower margins.

2.2. Determinants of the net interest margin

A one-step approach, which is to be employed in the present study, integrates all the determinants of interest margins in a single stage, and is more suitable for studies that face several constraints in data (for a brief review of these studies see Appendix I). This empirical model involves the estimation of the following linear equation:

⁷ The pure spread factors, indicate the difference between loan and deposit rates, and reflect the compensation of bank inventory risk arising from uncertainty about loan and deposit transactions.

$$NIM_{it} = c + \sum_{j=1}^J \beta_j X_{it}^j + \varepsilon_{it} \quad (1)$$

where NIM_{it} denotes the observed net interest margin for bank i at year t , c is a constant term, X_{it} s are j explanatory variables and ε_{it} is the disturbance. All variables are expressed in natural logarithms to improve the regression's goodness of fit and to reduce possible simultaneity bias. Because structural conditions in banking and general macroeconomic conditions, such as differences in legislation, accounting standards and tax structures may generate differences in bank performance from country to country and over time, we include both country and time effects in our estimations (see also Bikker and Metzmakers, 2005).⁸ In other words, net interest margin (NIM), defined as the spread between interest revenue on bank assets and interest expense on bank liabilities as a proportion of bank assets, is expressed as a function of internal (bank-specific) and external (industry-related, macroeconomic and regulatory) determinants (see also Ho and Saunders, 1981; Berger, 1995a; Demirgüç-Kunt and Huizinga, 1999; Drakos, 2003; Maudos and Fernández de Guevara, 2004).

Eq. (1) presents a static analysis of NIM into its determinants, which is the norm in the literature. Yet, bank margins show a tendency to persist over time, reflecting the dynamic nature of the reforms implemented, impediments to market competition, informational opacity and/or sensitivity to regional/macroeconomic shocks to the extent that these are serially correlated (Berger et al., 2000; Carbo and Rodriguez, 2007). Therefore, we also adopt the following dynamic specification of the model, which includes a lagged dependent variable⁹ among the regressors and/or treats some explanatory variables as predetermined.¹⁰

$$NIM_{it} = c' + \alpha NIM_{i,t-1} + \sum_{j=1}^J \beta_j' X_{it}^j + \varepsilon_{it}' \quad (2)$$

A value of α between 0 and 1 implies that the margin persists, but it will eventually return to its normal (average) level. A value close to 0 means that the industry is characterized by high speed of adjustment, while a value of α close to 1 implies very slow adjustment. Below we analyze the economic significance and measurement of each variable included in the empirical model. First of all, we include a number of bank-specific control variables that have been instrumental in explaining bank interest margins.

Leverage: Leverage (capital adequacy) is proxied by the ratio of equity to assets (EA) and serves as an indicator for the risk of insolvency and the market value of assets (Maudos and Fernández de

⁸ However, these will not fully account for the changes that occurred during the 90s.

⁹ The validity of the instruments applied is tested with the Sargan test.

¹⁰ Estimation of Eq. (1) is carried out using simple static methods. As regards Eq. (2), we use the system GMM estimator proposed by Blundell and Bond (1998). Besides accounting for the specified dynamics, this estimator has two additional virtues. First, it does not break down in the presence of unit roots (for a proof see Binder et al., 2003) and second it accommodates the possible endogeneity by means of appropriate instruments. It is usually proposed using as instruments the first differences of the independent variables of the model as well as the lagged value of the dependent variable (Athanasoglou et al., 2006).

Guevara, 2004). Capital acts as safety net in the case of adverse developments. Indeed, the insolvency risk affects firm's income through the risk premium that the bank has to pay in order to borrow funds. This issue is particularly important in transition countries due to the high proportion of non-performing loans in loan portfolios. On the other hand, since equity is a relatively expensive source of funding, an increase in equity capital on a voluntary basis or as a result of regulation may increase the average cost of capital (Angbazo, 1997; Saunders and Schumacher, 2000; Drakos, 2002; Martinez Peria and Mody, 2004). As a result a higher NIM could be required (Saunders and Schumacher, 2000). However, banks with considerable capital adequacy are facing lower risk of bankruptcy thus reducing their funding costs, and they are able to have higher margins by charging more for loans or pay less on deposits (Demirgüç-Kunt and Huizinga, 1999; Demirgüç-Kunt et al., 2004; Sologoub, 2006). Moreover, holding capital in excess is a mean for banks to signal solvency and creditworthiness and inspire depositor trust, especially in developing countries or in periods of financial crisis (Demirgüç-Kunt and Huizinga, 1999; Demirgüç-Kunt et al., 2004; Claes and Vander Venet, 2007). This feature will induce depositors, especially professional market participants, to act prudently and avoid depositing money in badly capitalized banks. When depositors exert "depositor market discipline", this may enable the bank to lower its deposit funding costs and, hence, increase its interest margin.

Portfolio performance: Portfolio performance captures the bank's capability in matching the needs for deposit and loan services and is measured by the loans to assets ratio (*LA*). Bank loans are naturally the main source of income, being the most risky and having the highest yield (in terms of expected return) among bank assets as well as the highest operational costs, as they need to be originated, serviced and monitored. Other things constant, the more deposits are transformed into loans, the higher the interest margin and profits. Hence, an increase in loans may result in wider margins and reflects the banks' ability to integrate risk and cost considerations in their loan pricing behavior. However, if a bank needs to increase risk to have a higher loan-to-asset ratio, then profits may decrease.¹¹ The findings of Claes and Vander Venet (2007) indicate that *LA* is significant in explaining a substantial part of interest margins in accession countries and can be mainly considered as a compensation for risk taking.

Default risk: Credit risk (a bank's quality of assets) is measured by the ratio of loan loss provisions to loans (*LLP*)¹² and refers to the uncertainty associated with loan repayment. Because most of bank earning assets are in the form of loans, problems with loan quality have been the major cause of bank failure. Symptoms of poor loan quality include high levels of non-performing loans and loan losses. A high proportion of loan provisions relative to loan assets and rapid growth of the loan portfolio are

¹¹ Rapid credit growth makes it difficult to assess credit quality. The large volume of new loans tends to depress non-performing loan ratios in the short term, due to the fact that potential portfolio quality problems usually materialise with a significant lag. Moreover, rapid credit expansion may also entail lower standards, thereby resulting in lending to less creditworthy customers.

¹² It may have been better to use as a proxy for credit risk a measure of non-performing loans instead of loan-loss provisions, since the latter may be subject to income smoothing. Unfortunately, this measure is unavailable from Bankscope (see also Maudos and Fernández de Guevara, 2004).

potential early-warning signals of loan-quality problems, which may indicate potential failure. Banks that make risky loans may also be obliged to hold a higher amount of provisions. In turn, this may force them to charge higher margins in order to compensate for the higher risk of default, leading naturally to a positive relationship (see also Drakos, 2002; Maudos and Fernández de Guevara, 2004).

Liquidity risk: Liquidity risk is proxied by the liquid assets to total assets ratio (*LIQ*).¹³ A high liquidity ratio implies that a bank has adequate liquid assets to prevent unexpected deposit withdrawals or to fund increased loan demands. However, banks with high levels of liquid assets, either voluntarily for prudential reasons or as a result of regulation, may receive lower interest income than banks with less liquid assets, which is usually indicative of emerging markets. In this case, and given that the market for deposits is reasonably competitive, the relationship with net interest margin is expected to be negative (Angbazo, 1997; Demirgüç-Kunt et al., 2004). However, banks with high levels of liquid assets in cash and government securities may receive lower interest income than banks with less liquid assets. On the other hand, Martinez Peria and Mody (2004) state that the liquidity ratio may have a positive impact on interest margins to the extent that banks are able to transfer this opportunity cost to borrowers.

Implicit interest payments: Implicit interest payments are measured by the ratio of the difference between non-interest expense and non-interest revenue over total earning assets (*IIP*). This ratio reflects payments to depositors through service charge remissions or other types of transfers due to competition in the market for deposits instead of explicitly paying an interest rate (Angbazo, 1997). It should be regarded as extra interest expense that is likely to be reflected in higher margins (see Ho and Saunders, 1981; Saunders and Schumacher, 2000; Maudos and Fernández de Guevara, 2004).

Management quality: This variable is proxied by the ratio of earning assets to total assets (*MGMT*). It is included as an indicator of the management's contribution in interest margins. Management decisions are reflected in the composition of a bank's portfolio by means of providing, *inter alia*, profitable composition of assets and low-cost liabilities. Naturally, profitable management decisions will lead to a positive relationship between management quality and net interest margins (Angbazo, 1997; Drakos, 2002; Maudos and Fernández de Guevara, 2004).

Overhead expenses: This variable is measured by overhead costs divided by total assets (*EFF*) and is used to capture cross-bank differences in their organizational and operational form, including cost management (Demirgüç-Kunt and Huizinga, 1999; Abreu and Mendes, 2003; Demirgüç-Kunt et al., 2004). Banks that bear higher average operating expenses may opt for higher margins to offset their higher transformation costs, which implies a positive relationship (Maudos and Fernández de Guevara, 2004; Martinez Peria and Mody, 2004). On the other hand, higher operational efficiency may induce

¹³ This is a deposit run off ratio that indicates what percentage of customer and short-term funds could be met if they were withdrawn suddenly. Therefore the higher this percentage the more liquid the bank is and less vulnerable to a classic run on the bank.

banks to pass the lower costs onto their customers in the form of lower loan rates and/or higher deposit rates, thereby lowering interest margin (Claeys and Vander Venet, 2007).

Bank size: We employ the logarithm of total assets (*SIZE*) to capture the effect of bank size on margins in order to account for potential economies or diseconomies of scale in the banking sector. This variable controls for cost differences as well as product and risk diversification according to the size of the credit institution. Martinez Peria and Mody (2004) assert that larger banks may be able to reap economies of scale and pass on some of these benefits to their customers in the form of lower margins. Size can in itself entail a reduction in the cost of obtaining resources (deposits or borrowing) if there is a reputation (“too big to fail”) effect, as larger banks may be seen by customers as safer and may thus benefit from a lower cost of external resources (Gual, 1999). Moreover, small banks are assumed to suffer from informational asymmetry problems more than large banks do. Whereas, for banks that become extremely large, the effect of size could be negative due to bureaucratic or other reasons. On the other hand, agency problems, control problems and all the difficulties and costs associated with managing large institutions may decrease the benefits of scale economies, while large banks may hold a substantial amount of market power and higher efficiency levels that would allow them to offer higher margins (also as a compensation of customers’ worries regarding the safety of their transactions in these banking sectors).

Moreover, we incorporate industry-related and macroeconomic variables to capture the differences in the banking and macroeconomic environment, which may influence bank income sources.

Market structure: The structure of a banking market is captured by the degree of competition and concentration. As a proxy of the degree of concentration we consider either the 3-firm concentration index (CR_3) (constructed as the market share of the three largest banks in each country in terms of total assets)¹⁴ or the Herfindahl-Hirschman index (*HHI*) (calculated as the sum of squared market shares in term of assets of the individual banks). As an alternative measure¹⁵ we also apply a direct indicator of market power (*MP*) following the method of Uchida and Tsutsui (2005).^{16, 17} Market power, implies that banks may enforce higher interest margins, either by setting lower deposit rates or higher loan rates or even by exercising both of them. An extensive literature studies the impact of concentration on bank

¹⁴ As a check on the robustness of the results, we use the share of total deposits held by the three largest banks in the industry as an alternative concentration measure in our analysis. Both measures yield very similar and consistent results.

¹⁵ The new research recognized problems with traditional concentration measures such as Herfindahl Index and n-firm concentrations and specified alternative measures of competitiveness.

¹⁶ For an analytical presentation see Appendix II.

¹⁷ The market power is preferred here to the Herfindahl index since the more static measure of concentration may not capture the degree of competition. The values of the index range from 0 (perfect competition) to 1 (monopoly). The market power captures more information about the actual price-setting behaviour of banks in relationship to their cost structures. The results generally show that competition could be present in markets even with a relatively high degree of concentration. However, as pointed out by Berger et al. (2004), the concentration measure may endogenously reflect the market share gains of efficiency firms rather than an exogenous measure of competition. Therefore, we supplement the concentration measure with measures of market power in each country.

profitability (see Berger, 1995b for a review). In this context, there are three main hypotheses explaining the relationship between market structure and performance. The first one is the collusion hypothesis, also called the structure-conduct-performance (SCP) hypothesis, arguing that bank concentration (or market share) signals market power and a positive association between profits and concentration. For policymakers, this creates a challenge since more competition is desirable for lowering spreads, but could generate vulnerability where the “franchise” value of domestic banks is seriously eroded. In these terms, greater concentration should result in higher spreads, while enhanced efficiency (such as labor cost savings) should reduce spreads. The efficiency structure hypothesis contends that larger concentration levels and market shares could reflect greater efficiency by the largest banks, which in turn are able to lower costs and obtain higher profits. In this case, the positive relationship observed between concentration and profitability is spurious and simply proxies for the relationship between superior efficiency and concentration (Demsetz, 1973). That is, increased profits are assumed to accrue to more efficient firms because they are more efficient and not because of collusive activities. The third one is the relative market power hypothesis which claims that only firms with large market share and differentiated products can obtain market power and are able to earn non-competitive profits (see Berger, 1995a).

Some researchers suggest that the relationship between concentration and bank margins is positive based on the SCP hypothesis (Berger, 1995b; Carbo and Rodriguez, 2007). In contrast, Claeys and Vander Venet (2007) fail to find a significant relationship between market concentration and interest margins as a possible reflection of the rapid development of bank lending in the accession economies and increased competition following the entry of foreign banks. According to Demirgüç-Kunt et al. (2004), if bank concentration reflects only regulatory restrictions on competition, then any positive relationship between bank margins and concentration should vanish when controlling for regulatory restrictions. On the other hand, a negative relationship would may well be in place. In the same vein, Maudos and Fernández de Guevara (2004) conclude, by using a wide sample of European banks in the period 1993–2000, that the fall of margins in the European banking system is compatible with an increase in market power, as proxied by the Lerner and Herfindahl-Hirschman indexes. Martinez Peria and Mody (2004) state that relatively more efficient banks should be able to charge lower spreads, as a result of having lower costs.

Ownership: As regards ownership, we incorporate the relevant information on the status of each credit institution following the procedure suggested by Bonin et al. (2005). In particular, we distinguish banking institutions into four mutually exclusive categories, namely, majority state-owned banks, majority domestic private ownership, strategic foreign ownership, and other foreign majority ownership. We include dummy variables for the foreign ownership (*SFO*) that equals one if the majority is held by

strategic foreign owners,¹⁸ the government ownership (*GO*) variable that equals one if the majority is held by a governmental body and the domestic private ownership (*DPO*) variable that equals one if the majority is held by domestic private investors. Demirgüç- Kunt and Huizinga (1999) find that foreign-owned banks tend to have both higher margins and profits. In contrast, Martinez Peria and Mody (2004) study Latin American banks and suggest that foreign banks are able to charge lower spreads relative to domestic banks. Demirgüç-Kunt et al. (2004), conclude that the degree of state ownership of the banking industry is positively linked to interest margins. Sapienza (2002) finds evidence that state-owned banks charge lower interest rates, especially to firms located in regions with strong political clout.

Reform: To examine the impact of banking sector reform on interest margins we use dummy variables that correspond to important changes in the regulatory frameworks, the EBRD index of banking sector reform and individual regulatory indices. Table 1¹⁹ provides a comprehensive chronological account of important regulatory events with references to the most important banking legislation. These include the fundamental “banking laws” passed in each country during the sample period that characterize the organization and function of each country’s central bank and encompass *inter alia* regulation on licensing and provision of banking services, bank supervision, and the requirements on funds, reserves and capital. To measure the process of banking reform, we assemble a data set consisting of the implementation dates of the main banking laws affecting the financial services industry. We assume that changes in the regulatory regime remain over time, and as such the (time-specific) dummies take a value of one at the year of the implementation of the relevant law and remain equal to one until the end of the sample period. Obviously, the reform process when treated like this is viewed as an ongoing process that affects banks not only at the year of change in the regulatory regime, but for all the succeeding years of the sample period.

The EBRD index of banking sector reform has been compiled with the primary purpose of assessing the progress of the banking sectors of formally centrally planned economies. This will enable us to assess how the changes in regulation of the last decade (such as financial and bank reform, financial market liberalization, the implementation of prudential regulation) have affected bank margins in the SEE.²⁰ As this indicator quantifies and qualifies the degree of liberalization of the banking industry, it is suitable for an explicit evaluation of the effect of banking sector reform on the performance of banks (see

¹⁸ Regarding banks having majority foreign ownership, we distinguish between those that have a single majority owner or a single controlling owner (which are defined as strategic foreign ownership), and those that the foreign owners together hold more than 50 per cent of the shares, although no one of these has a controlling stake (which are defined as other foreign majority ownership).

¹⁹ These laws have increased the attractiveness of the SEE banking system for foreign investment, strengthened prudent standards and practices in the banks’ operations, enhanced corporate governance, and improved efficiency in the banking operations and supervision.

²⁰ In this study, we introduce the EBRD index of banking system reform in the SEE countries to identify the progress in areas such as: i) the adoption of regulations according to international standards and practices, ii) the implementation of higher and more efficient supervision, iii) the privatisation of state-owned banks and iv) the write-off of non-performing loans and the closure of insolvent banks.

also Claeys and Vander Vennet, 2007).²¹ The reform scores of *EBRD* range from 1.0 to 4.0+, with 1.0 indicating a rigid centralized economy and 4.0+ implying the highest level of reform, which corresponds to a fully industrialized market economy. The upward trend of the index reflects the extensive restructuring that took place in the SEE banking sector during the sample period.

Finally, the principal focus of this study is to examine whether the regulatory tools have an impact on interest margins. In other words, we examine all the regulations promoted under the three Pillars of Basel II (capital stringency, official disciplinary power and private monitoring). To quantify the different classes of regulation we use the approach followed by Barth et al. (2001b, 2006, 2008). Specifically, regulatory indices are constructed that relate to capital requirements (*caprq*), official supervisory power (*spower*), market discipline (*mdisc*) and restrictions on activities (*actrs*). We briefly discuss these indices below, while additional information can be found in Appendix II.

The first index (*caprq*) shows the extent of both initial and overall capital stringency. Initial capital stringency refers to whether the sources of funds counted as regulatory capital can include assets other than cash or government securities and borrowed funds, as well as whether the regulatory or supervisory authorities verify these sources. Higher values of *caprq* indicate more stringent capital requirements. In our case, it ranges between 3.70 (e.g., Croatia) and 6.10 (e.g., Bulgaria). The second index (*spower*) reveals the power of the supervisory agencies to take specific actions in relation to their authority against bank management and directors, shareholders, and bank auditors. Higher values indicate more powerful supervisors. Barth et al. (2004) highlight various advantages and disadvantages from granting broad power to supervisors. On the other hand, powerful supervision might be related to corruption or impede bank operations. In the present study, the index ranges between 6.00 (e.g., Serbia) and 12.30 (e.g., FYROM) with higher values indicating more powerful supervisors.

The third index (*actrs*) is determined by considering whether securities, insurance, real estate activities, and ownership of non-financial firms are unrestricted, permitted, restricted, or prohibited. Higher values indicate higher restrictions. Barth et al. (2004) outline several theoretical reasons for restricting bank activities as well as alternative reasons for allowing banks to participate in a broad range of activities. In the present study, *actrs* takes values between 1.92 (e.g., Croatia) and 2.98 (e.g., Romania). The last index (*mdisc*) shows the degree to which banks are forced to disclose accurate information to the public (e.g., disclosure of off-balance sheet items, risk management procedures, etc) and whether there are incentives to increase market discipline (e.g., subordinated debt, explicit deposit insurance). Higher values indicate higher disclosure requirements and more incentives to increase market discipline.²²

²¹ Since the EBRD performs a yearly assessment of regulatory reform we are able to exploit the time-series aspect of these indices.

²² We should note here that establishing new banking laws is unlikely to guarantee influence in the immediate term. If banking-sector reform does affect interest margins, then it is expected that there are lags between establishing new banking laws and the time that these laws are translated into more sound, effective and competitive banking practices. Therefore, to the very best, the regulatory practices of the previous period are expected to impact the

Demirgüç-Kunt and Huizinga (1999) assert that poor contract enforcement may prompt banks to require higher margins, while higher effectiveness of the legal system and a cleaner in corruption level government are associated with lower margins, as banks may require a lower risk premium on their investments in countries that are relatively free of corruption. Demirgüç-Kunt et al. (2004) conclude that regulatory restrictions (in terms of a number of indices reflecting activity restrictions, bank entry, reserve requirements, banking freedom, economic freedom and property rights) increase net interest margins.

(Please insert Table 1 about here)

Macroeconomic environment: To capture the effect of the macroeconomic environment we use GDP growth (*GDP*) and inflation (*INF*). Demirgüç-Kunt and Huizinga (1999) and Demirgüç-Kunt et al. (2004) suggest that GDP per capita serves as a general indicator of economic development by reflecting differences in banking technology and the mix of banking opportunities. Also, an increase in GDP per capita could be expected to increase bank's income as a result of more lending and lower default rates (Brock and Suarez, 2000; Claeys and Vander Venet, 2007). In contrast, low GDP per capita weakens the debt servicing capacity of domestic borrowers and contributes to an increase of credit risk. In a similar vein, Carbo and Rodriguez (2007) suggest a negative relationship between GDP growth and bank margins. However, Drakos (2002) asserts that the relationship between growth and margins is ambiguous, depending on whether the aggregate demand for dealership services is an increasing function of GDP growth or not.^{23,24} High inflation rates are generally associated with high loan interest rates and, therefore, higher margins. However, high inflation may also be viewed as a proxy for poor macroeconomic performance and stability, which makes the accurate assessment of credit and market risks more difficult. If inflation is not anticipated and banks are sluggish in adjusting their interest rates, then there is a possibility that bank costs may increase faster than bank revenues and hence adversely affect bank margins (Demirgüç-Kunt and Huizinga, 1999; Brock and Suarez, 2000; Sologoub, 2006). Finally, Martinez Peria and Mody (2004) find a negative impact of inflation in Latin-American banks' margins, suggesting that bank costs do not respond immediately.

3. Elements of the SEE banking system

Our dataset includes information on the banking sectors of seven SEE countries, namely Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania, and Serbia-Montenegro, for the period 1998-2007.

contemporaneous degree of interest margins. In fact, in the estimations below, we used lags of the implemented regulatory reforms as captured by all four types of measures discussed above.

²³ If it is assumed that the aggregate demand for dealership services is an increasing function of GDP growth, then one would expect, *ceteris paribus*, to increase margins. An alternative scenario could be that higher growth is a proxy for higher corporate profits and therefore, more scope for internal funding of investment and hence lower demand for dealership services, which would push interest margins downwards.

²⁴ Note that this discussion relates to the choice between static and dynamic empirical framework. As macroeconomic variables are naturally characterised by significant dynamics, we may expect that the dynamic model provides a more robust picture about the relationship in hand.

The particular sample period is chosen in an effort to examine the influence of the most important banking laws launched in these countries. All bank-level data are obtained from the Fitch–IBCA Bankscope database, the macroeconomic variables (including inflation and GDP growth) from the IMF’s International Financial Statistics and the banking reform index from the European Bank for Reconstruction and Development. After reviewing the data for reporting errors and other inconsistencies, we end up with a panel of 160 banks, which comprises a large portion of banks in terms of the number and of the assets of financial institutions operating in the SEE countries.

During the last decade, the banking sector of the SEE countries has undergone substantial changes, aiming at enhancing the sector’s solvency and credibility. Table 2 provides some descriptive statistics for our sample. It presents the structure for the overall sample over the examined time period as well as for each country. The average NIM stands at 4.82 per cent, much higher than the respective of the EU banking system, with Romania presenting the highest ratios, while Albania appears to have the lowest (3.36). The average *EA* totaled 19.56 per cent, which is again higher than the European average, due mainly to the ongoing restructuring process of the state-owned institutions, the relatively low credit expansion, the riskiness of assets and the banks’ compensation for the poor access to other sources of funds. The average ratio of loans to total assets is as high as 47.27 per cent. The improved macroeconomic conditions, combined with the need for new investments and the boost in household consumption, could provoke considerable high rates of credit expansion in the future. However, during the examined period, although banks are by far the most important pillar in the financial sector of the examined countries, the degree of financial penetration through loans is much lower than in other emerging markets and the EU (European Central Bank, 2005). Sluggish credit growth can be partially attributed to inadequate legal protection for lenders, lack of credit history for most companies and scarcity of adequate risk management techniques, as well as stricter bank regulation and supervision (Cottarelli et al., 2005). Yet, given the links that have often been identified between lending booms and financial stability, an uncontrollable credit expansion could be unwanted. As regards *LLP*, the average amounted to 5.67 per cent. Despite the improvement in the loan portfolio quality in the region, the share of non-performing loans to the total loan portfolio is still high relative to the EU average. The poor loan quality was inherited from the old regime of those countries, where credit risk evaluation was irrelevant and the regulatory framework was inefficient (Stubos and Tsikripis, 2005). The SEE banking sector could be characterized as emerging and is dominated by relatively small financial institutions (average total assets stand at 578.59 million euros).

Concentration is rather high, mainly due to the strengthening of the private sector and to a number of M&As. Furthermore, foreign bank entry, in some cases, contributed to bank concentration. The average concentration ratio of the three largest banks in terms of total assets ranges from 51.54 per cent in Bosnia to 78.34 per cent in Albania, considering that Albania has the smaller number of banks (the average figure for the SEE region stands at 60.93 per cent). This high degree of concentration in small

banking systems is unavoidable if banks in these economies are to achieve a size that will allow them to compete with foreign banks. According to the Herfindahl-Hirschman index,²⁵ Serbia and Bosnia are at the lower end of market concentration levels, as opposed to Albania. The recent literature tends to suggest application of market power measures, estimated using non-structural approaches. The picture presented by the market power estimates is mixed, with some countries reflecting fairly competitive practices (e.g., Serbia, Bulgaria and Romania), other reflecting anticompetitive behaviour (Bosnia) and most lying in between. Differences among the SEE countries in the average value of the macroeconomic variables are quite substantial. Average GDP growth still remains far behind the EU, even though fast growth has been documented in recent years. Monetary performance across the region has seen significant improvements in the recent past. Yet, the average annual inflation rate in the period 1998-2007 amounted to 13.65 per cent, which is still considerably higher than the EMU's, presenting rather big differences among years for the majority of the SEE countries.

The banking sector reform progress, as measured by the EBRD index which identifies this progress in the framework for prudential supervision and regulation, varies from an average of 1.90 in Serbia to 3.57 in Croatia. Over the last decade, the financial sectors of the SEE countries have converged towards a universal bank-based system, with the presence of foreign institutions being increasingly important. Buffeted by banking crises that crippled their entire economies, local governments have realized the importance of opening up their banking systems to foreign capital and know-how. These privatization programs were so extensive that in most countries the largest proportion of banking system is already controlled by foreign banks.

(Please insert Table 2 about here)

4. Empirical results

The aim of this paper is mainly to present an empirical specification of the determinants of the net interest margin in the banking sector of the South Eastern Europe²⁶ for the period 1998-2007. In this section, we investigate whether interest margins are affected by (i) bank-specific and/or (ii) regulatory and other macroeconomic indicators. In the present study, we integrate all the determinants of interest margins in a single stage, in which various potential determinants of the interest margin are included.

As discussed above, we opt for both static and dynamic specifications. The static specifications are the norm in the literature and refer to the estimation of Eq. (1). Tables 3 and 4 report the empirical results obtained from random effects panel data estimation of Eq. (1).²⁷ We apply the least squares

²⁵ The HHI is calculated as the sum of the squared market shares in total assets of the individual banks. Note that the index is calculated on a county-specific basis.

²⁶ We assume that the banking markets of individual countries in the region possess similar characteristics and therefore the region can be considered as a single market.

²⁷ We estimate our model with a generalized-least-squares (GLS) procedure referred to as the error-components model. Given our pooled time-series, cross-sectional data, a GLS procedure is preferable to ordinary least squares

methods of fixed effect (FE) and random effect (RE) models. There is strong evidence that our specification follows a RE model as the Hausman test indicates. Overall, the results show good fit, as indicated by the Wald tests and R-squared values.²⁸

(Please insert Table 3 about here)

Table 3 reports the results of eight alternative specifications of the static model. We first include the bank-specific control variables that have been shown to be instrumental in explaining bank interest margins and consecutively we control for the macroeconomic and ownership status. In columns III- V we differentiate between different measures of market structure. In columns VI to V we include the variables that capture the effect of different forms of ownership on interest margins for different market structure variables. *NIM* is positively and significantly affected by internal determinants at the 5 per cent level or above (among others, the proportion of loans in the asset composition, the quality of the credit portfolio, the financial leverage of the firm, the implicit interest payments, the overhead expenses and the size²⁹), their effect being (in general) in line with the theoretical and empirical priors conferred in Section 2.

In particular, the positive impact of equity capital on *NIM* implies that banks characterized by high levels of capital tend to charge higher margins, either because they present safer institutions or because equity is a relatively expensive form of capital. This effect could also be associated with the pressure generated by solvency regulations (see also, Carbo and Rodriguez, 2007). The positive and significant effect of *LLP* on margins shows that loan quality, which has been proved problematic in the recent past, plays a crucial role in driving bank margins. As expected, a high *LA* ratio is associated with high interest margins, a finding that coincides with studies of developed banking systems (Claeys and Vander Vennet, 2007). Likewise, the positive effect of bank size on *NIM* possibly illustrates the fact that large banks charge higher margins as a compensation of customers' worries regarding the safety of transactions in relatively risky banking sectors, such as the ones of the SEE countries. Management quality is statistically significant, indicating that managerial decisions influence in a great extent bank margins. Implicit interest payments have a positive and statistically significant impact, supporting the view that a relatively high proportion of bank margins reflect charge remissions or other types of transfers to depositors (extra interest expenses).

A notable result is the insignificant effect of all measures of concentration. This result follows the discussion of a strand of literature, which suggests that the relationship between concentration and interest margins should vanish in transition economies or when regulation restrictions are taken into account (see also Demirgüç-Kunt et al., 2004). This is in line with recent evidence indicating that margins and

(OLS) because OLS estimates may be biased and inconsistent, while GLS model allows for correction of potential cross-sectional heteroscedasticity and/or serial correlation.

²⁸ The coefficients of the time and country dummies have been omitted from the regression output but are available upon request.

²⁹ We also apply the square term of size in order to capture the possible non-linear relationship. However, in all different specifications it remained insignificant and was omitted.

concentration are not necessarily positively related and that interest margins may be even lower in more concentrated markets as we will see in dynamic models (Cetorelli and Gambera, 2001). From the results obtained above, a significant part of margins is explained by bank-specific characteristics instead of market power (concentration), pointing that public initiatives should be aimed at achieving a climate of financial stability. Encouraging competition among banks would be of minor importance as concentration and market power present insignificant influence on margins.

As regards the macroeconomic variables, GDP growth remains insignificant in all models. The negative influence of inflation (although at 10 per cent level) can point possible problems of banks in anticipating their interest rates in the significant and rapid changes of inflation rates in most of the SEE countries. When, ownership variables are included in our estimation models (Models VI-VIII) we don't observe considerable diversification in the results. A notable result is that the coefficient on *SFO* is negative and significant at the 10 per cent level. The entry of foreign banks has played an important role in the bank reform process by increasing levels of efficiency-hence superior management and efficiency should offer more competitive rates and decrease margins (see Drakos, 2003; Majnoni et al., 2003; Martinez Peria and Mody, 2004; Berger, 2007). When market power measure is applied the estimation coefficient loses its significance.³⁰

Table 4 incorporates the regulatory variables. We capture the effect of banking sector reform by means of the EBRD index (models I-III), individual indices (IV-VI) and the banking laws (models VI-IX) respectively. The significance and sign of variables is not affected compared to Table 3. The EBRD index has a positive impact on margins, a relationship that given our theoretical priors is counterintuitive. However, when we use the banking-law dummies the picture is modified, with the effect of regulatory policies implemented during 1998 and 1999 being positive while in years 2002 and 2003 being negative and significant. This implies that at a late stage of bank reform, an effective legal system reduces the required risk premia on bank lending. Therefore, in the SEE banking systems, the wider relationship between banking sector reform and interest margins may be given alternate interpretations, which in fact may not be restricted to economic phenomena.³¹ Turning now to the regulatory indices, the results in columns IV-VI show that lower restrictions on activities increase the interest margins of banks. Therefore, it seems that allowing SEE banks to own non-financial firms and engage in securities underwriting, insurance and real estate activities can create complex, politically and economically powerful banks (Barth et al., 2004a), while increase the risk premia required by banks. The positive relationship between *power* and margins, however, shows that an increase in the ability of regulators to suspend manager decisions, remove and replace managers or directors, supersede shareholders' rights, force a bank to charge higher margins.

³⁰ Note, however, that these effects are partially captured by the implementation of market power, which is reflected in the reduced significance on the coefficient of *SFO* in column VIII.

³¹ Such explanations may include informational opacity, partisan politics, domestic alliances and institutional capacity.

(Please insert Table 4 about here)

Since endogeneity concerns might still remain (especially concerning macroeconomic and reform indicators), we re-estimate our model using dynamic estimations. This is quite expected as the transformation of interest margins is usually subject to exogenous rigidities that may require time to be smoothed out, even when the transition is rapid. Therefore, we adopt a dynamic specification of the model by including a lagged dependent variable³² among the regressors (see also Athanasoglou et al., 2006). The use of the GMM is appropriate due to the possibility of endogeneity in the above model due to the inclusion of internal bank-specific factors (see Berger and Mester, 1997).³³ To take into account the possibility of endogeneity, following Arellano and Bond (1991) and Blundell and Bond (1998), we apply the system-GMM estimators.

To determine whether our instruments are valid in the system GMM approach, we use the specification tests proposed by Arellano and Bond (1991) and Arellano and Bover (1995). First, we apply the Sargan test, a test of over-identifying restrictions, which tests the overall validity of the instruments. Second, we test whether the differenced error term is second-order serially correlated.³⁴ Thus, failure to reject the null hypothesis could supply evidence that valid orthogonality conditions and instruments are used. In our models, this hypothesis of second-order serial correlation is always rejected. The model seems to fit the panel data reasonably well, having fairly stable coefficients, while the Wald test indicates fine goodness of fit and the Sargan test shows no evidence of over-identifying restrictions. Compared to the system-GMM estimates, there is a serious upward bias in the static estimates.³⁵

The results obtained from the estimation of the dynamic model (Eq. 2) are reported in Tables 5 and 6. The picture presented is somewhat different, with the economic and/or statistical significance of many of the variables examined being altered. The highly significant coefficient of the *lagged NIM* variable confirms the dynamic character of the model specification. In the present study, α is highly significant across all models, which means that *NIM* persists to a moderate extent, justifying the use of dynamic panel data modeling.

One of the most striking differences between the static and dynamic models relates to the impact of *LIQ*, with the dynamic models predicting a positive and significant relationship. When, ownership

³² Our theoretical model displays a dynamic approach in which banks need to match deposit supply and the demand of lending. The maximization of bank wealth considers both initial and end-of-period information. Thus, we consider that previous values of bank margins may affect current values of margins.

³³ To guarantee robustness we control for country heterogeneity and temporal variation in the above specifications through the appropriate use of dummy variables (see Baltagi, 2001). These dummy variables have been found jointly statistically significant in virtually all equations, but they are not reported to save space. The validity of the instruments employed is tested with the Sargan test.

³⁴ The choice of the lagged levels and lagged first-differences as instruments is made in a way that guarantees validity of the resulting overidentifying restrictions.

³⁵ In order to ensure robustness we compared the various consistent GMM estimators (system GMM) to simpler static estimators, which are likely to be biased in opposite directions as regards the lagged dependent variables in panels with a small time dimension. In the first estimates, standard errors are biased, as discussed previously, although the bias is expected to be small. Indeed, the difference in the coefficients between the two estimation methods is found to be significant.

variables are included in our estimation models (Models VI-VIII) we don't observe considerable diversification in the results. Thereafter, in all these models the coefficient estimates of the loans-to-assets, loan loss provisions to loans, equity to assets, implicit interest payments, overhead expenses to assets and size are positive and statistically significant at 1 per cent level of significance. Finally, we observe that concentration presents a negative impact on interest margins, while market power has no significance. If concentration reflects regulatory restrictions and efficient-structure forces, then we may actually find a negative coefficient on concentration after controlling for regulatory impediments to competition (Maudos and Fernández de Guevara, 2004).

(Please insert Table 5 about here)

As observed in Table 6, credit risk is found to significantly augment margins (Angbazo, 1997). Operating inefficiency is also positively and significantly related since banks with higher costs apparently tend to operate with higher margins (Altunbas et al., 2001). As predicted, *EA* represents a premium on bank margins, due to the pressures of solvency regulations on bank lending activities. The significance of equity to assets variable is relatively important considering that capital adequacy ensures systemic stability and maintains depositor confidence (Angbazo, 1997; Maudos and Fernández de Guevara, 2004). As in the static models, banking sector reform affects *NIM* at the beginning of our sample period in a positive way, while as banking reforms progress further, the margin tends to decrease, indicating that deeper transformations are required for policy to have any impact on interest rate margins. This non-linear relationship between reform and interest margins may reflect the transition from defensive restructuring of banking operations to operating strategies based on service improvements and innovation as the economic environment for banking improves. When we use *EBRD* instead of the banking-law dummies the picture is also modified, with the effect of reform becoming positive and significant. In the years to come, one would expect the impact of banking policy to be further amplified as a result of the ongoing legal and financial integration with the EU. This will provide further incentives for strategic foreign ownership, resulting to increased availability of market based finance and thus to increased competitive pressures that will reduce bank margins.

However, when we look at the individual regulatory indices (columns IV-VI) we observe that the coefficients of *caprq*, *spower*, and *actrs* increase and all three are statistically significant at the 1% level. As regards *caprq*, which was not significant in the static specification, we now observe that it has a positive impact on interest margins. Thus, it is likely that capital regulations reflected in the index (e.g., adjusting capital ratio to market risk, deducting unrealized losses in securities portfolios and foreign exchange from regulatory capital) increase the costs of operating in the industry. Furthermore, through the positive effect of *spower*, it seems that when supervisors have power banks increase their interest margins. As Bolt and Tieman (2004) point out if banks maintain ratios above the minimum capital requirements, sudden losses on their loan portfolio will not immediately lead to regulatory action.

Therefore, since equity is more expensive than deposits, banks have to consider the trade-off between the increased cost and the disciplinary action that powerful supervisors can take.

Finally, our results indicate that enhanced market monitoring leads in lower interest margins. Thus, incentives to monitor banks (e.g., absence of deposit insurance, use of subordinated debt), credit ratings and better accounting and auditing systems that provide the market participants with more information about the real risk of bank assets (e.g., disclose of risk management procedures to public, directors legally liable for erroneous/misleading information) impose market discipline and reduce risk-taking. Another problem is that due to reduced transparency and complicated structures of ownership and control, financial conglomerate groups can experience important corporate governance problems, which are generally already large in emerging markets. We observe that consistent with the private monitoring hypothesis, regulatory proposals (e.g., European Shadow Financial Regulatory Committee, 1999, 2000) and past studies (e.g., Barth et al., 2004a) financial disclosures and other incentives that enhance market discipline can be an effective tool in decreasing margins.

(Please insert Table 6 about here)

Some interesting conclusions are drawn from both static and dynamic models. Management efficiency has a positive and significant effect on interest margins, indicating managers shift the cost of improved efficiency by overcharging customers. A noteworthy feature is the role of bank capital. Financially sound banks are facing lower risk of bankruptcy thus reducing their funding costs, and they are able to have higher margins (Sologoub, 2006; Demirgüç-Kunt and Huizinga, 1999). On the other hand, capital serves as a signal of the banks' creditworthiness in SEE bank markets. When depositors exert "depositor market discipline",³⁶ this may enable banks to lower deposit funding costs and, hence, increase interest margin. Considering the fragile environment of SEE markets, a bank with a sound capital position is able to pursue business opportunities more effectively and has more time and flexibility to deal with problems arising from unexpected losses, thus achieving increased profitability.

In a dynamic context, the greater the volume of liquid reserves, the greater the opportunity costs, so a greater interest margin is needed. SEE banking system still lacks the resources to meet the liquidity standards of the developed banking systems, maintaining an illiquid position to prevent failures. To the extent that banks are able to transfer this opportunity cost to borrowers, spreads will rise with liquidity ratios (Angbazo, 1997). Since loans are the most risky and cost-intensive asset class, our findings support the hypothesis that more lending results in wider margins and reflects the banks' ability to integrate risk and cost considerations in their loan pricing behavior. Higher interest margin may also simply due to banks' lending to high risk borrowers. Default risk has a positive and statistically significant relationship with the net interest margin, as it was expected (Drakos, 2003), indicating the risk premium set by the

³⁶ Martinez Peria and Schmukler (1998) find evidence that market discipline more generally exists in developing countries, even in the presence of deposit insurance. In the SEE, depositors have few alternatives for bank deposits; yet they are regularly confronted with information about bad asset quality in some banks and even outright bank failures. This feature will induce depositors to act prudently and avoid depositing money in badly capitalized banks.

banks over the net interest margin, in order to compensate for cases of non-repayment or default of a loan, showing that the SEE banks should focus more on credit risk management, which has been proved problematic in the recent past.

One of the most significant variables in the explanation of the interest margin appears to be operating expenses. If banks incur high administrative costs in the process of providing their services as intermediaries, they are likely to increase the spread they charge their customers. According to our results, larger banks are earning higher margins. These banks may be able to reap economies of scale while they do not choose to pass on some of these benefits to their customers in the form of lower spreads (Martinez Peria and Mody, 2004). On the other hand, size can in itself entail a reduction in the cost of obtaining resources (deposits or borrowing) if there is a reputation (“too big to fail”) effect.

Adding the GDP growth variable to the estimation shows that *NIM* does not depend on the prevailing business cycle conditions. According to Claey's and Vander Venet (2007), the positive association between the business cycle and bank margins is mainly a characteristic of the Western European bank markets, as a reflection of more lending and lower default rates, while in Eastern Europe no such relationship is found. Our result can be partially explained by the fact that all the SEE countries face the transitory line of transforming their economies under the European standards. Therefore, the above macroeconomic indicators are reasonably influenced by a number of other financial factors. As it concerns inflation, our findings show that this macroeconomic factor does not provide conclusive evidence, as it is subject to the model rigidities. The positive coefficient on inflation, in dynamic specifications, supports the hypothesis that disinflation has a negative effect on net interest margins. Certainly, these results imply that the dynamic specification is more apt to the theoretical predictions. This corroborates the hypothesis that lower inflation (and decreasing inflation expectations) have a more pronounced downward effect on long-term compared to short-term interest rates, leading to declining intermediation margins.

The EBRD index on bank reform is significantly positive for the SEE bank markets, indicating that as asymmetric information problems decline and banking system becomes more stable, banks are more willing to grant loans (since they can better identify good from bad borrowers), which leads to higher margins. This finding stresses the prime importance of policy measures to diminish the asymmetric information problems associated with adverse selection and moral hazard in transition banking. Therefore, in all different models, we do not observe that an effective legal system reduces the required risk premia on bank lending (Demirgüç-Kunt and Huizinga, 1999). As shown in this analysis, the increasing levels of financial reform (closely related to general economic growth) and improvement in the structure of the credit institutions' aggregated balance sheet, are joint (albeit contrary) determinants of bank margins. These measures sought to increase financial intermediation and facilitate efficiency. This contrasts with the recent international experience, where various aspects of financial liberalization have

been linked to substantial reductions in margins, as merely the legislation in these countries deals with reform and not with deregulation process.

When we use banking-law dummies instead of the *EBRD*, the picture is modified, with the effect of reform being positive during the early stages of reform and becoming negative at a later stage; indicating that a tightening reform policy, progressively, over time, generally reduces margins. The reason may be that an effective legal system reduces the required risk premia on bank lending. However, the early stages' rules and regulations governing the functioning of the banking system appear to increase the cost of intermediation. This phenomenon may also be attributed to the longer-term nature of the effect of technological improvements. However, financial liberalization leads to more stable markets in the long run. This relationship may reflect the transition from defensive restructuring of banking operations to operating strategies based on service improvements and innovation as the economic environment for banking improves. Nonetheless, the evidence does not support the hypothesis of a sustained effect, as the rest of the coefficients remain insignificant.

In the period under consideration there was a notable entry of foreign banks. The negative coefficient on the foreign bank variable indicates that the presence of foreign banks reduces the average net interest margin significantly. The presence of foreign banks is often associated with a more stable lending environment, as well as superior managerial experience and risk management, lower costs, which may lead them to set prices more aggressively, benefiting borrowers. When market power is included in the model, foreign ownership loses its significance on margins. The implication is that part of the benefits from foreign entry may be offset where market power levels also increase.

Concentration does not seem statistically significant in static models. If bank concentration reflects only regulatory restrictions on competition and our data fully measure regulatory restrictions, then any relationship between bank margins and concentration should vanish when controlling for regulatory restrictions. The finding that interest margins are not determined by bank market structure is probably a reflection of the rapid development of bank lending in transition economies and increased competition following the entry of foreign banks. Hence, the results reject all the hypotheses linked to market power and suggest that banks did not use their monopoly power in setting their lending and deposit rates.

However, in dynamic specifications, concentration has a negative and significant impact on the net interest margin. In line with Berger (1995a), our estimations show that even though there was a considerable increase in concentration (when a series of mergers started to occur), suggesting that the industry was moving to a less competitive structure and hence margins should have increased, the improvement of the managerial practices (captured by the bank-specific variables) resulted in lower margins. On the other hand, the efficiency–structure hypothesis contends that larger concentration levels could reflect greater efficiency by the largest banks, which in turn are able to lower costs and charge lower spreads. To summarize, concentration in banking markets does not necessarily lead to higher margins. In the light of the evidence obtained, the continuity of the process of reduction of margins will

be conditioned by the implementation of measures that help banks' efforts to reduce their average costs and to improve their efficiency levels, and by achieving a climate of financial stability that will reduce the risk faced by banking firms.

5. Conclusions

In this paper, we specified an empirical framework to investigate the effect of bank-specific, industry-specific, macroeconomic determinants and regulatory environment on the net interest margin of South Eastern European banks for the period 1998-2007. Evidently, the regulatory framework plays a crucial role and, while early stages of reform present positive impact on margins, the margins tend to reduce at more advanced stages. Also, promoting foreign entry may be desirable since, as our results demonstrate, this should exert downward pressure on bank interest margins by improving the operational efficiency of the banking sector. Enhancement of bank efficiency requires new standards in risk management (capital and credit) and operating efficiency, which, according to the evidence presented here, crucially affects bank margins. Hence, our results underline the importance of binding capital adequacy rules as a means to prevent banks from taking excessive risks and as a tool for maintaining depositor confidence. From the results obtained above, a significant part of margins is explained by bank-specific characteristics such as portfolio performance, default risk and leverage, pointing that public initiatives should be aimed at achieving a climate of financial stability. Obviously, the specific measures of economic policy must be oriented towards specific aspects of banking business. This is likely to set new standards in performance and efficiency, making bank management to address particular firm-specific issues, such as the composition of the balance sheet, the quality of the credit portfolio, as well as the range of financial products and services.

As the SEE banking industry continuously evolves, the dynamic empirical frameworks are more apt to proxy the true effect of these determinants on NIM. Finally, with respect to the macroeconomic variables, inflation has an effect on margins (although weak), while GDP has no significance. However, as financial systems develop and the reform process ends, both the current and future rates of economic growth are likely to have an enhanced impact on bank margins.

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Table 1

Deregulation and financial market changes in the SEE banking system for the period 1998-2007

Albania	Banking law (1998, 2004, 2006); Regulation on bank's investments in the equity of commercial companies (2001); Minimum required reserves (2003); Credit risk management (2004); Consolidated supervision (2006); Operational risk management at branches of foreign banks (2007).
Bosnia	Banking law (2000, 2002, 2003, 2005, 2006).
Bulgaria	Banking law (1998, 1999, 2000, 2001, 2002, 2006, 2007); Bank bankruptcy (2002, 2003, 2005, 2006, 2007); Law on bank deposit guaranty (1998, 2001, 2006).
Croatia	Banking law (1998, 2002, 2007); Capital adequacy requirements (2003, 2005, 2006, 2007).
FYROM	Banking law (2000, 2002, 2003, 2007); Methodology of determining the guarantee capital of banks (2003); Methodology for determining the risk-weighted assets of banks (2003); Capital adequacy (2007).
Romania	Banking law (1998, 2001, 2002, 2003, 2006, 2007); Bank insolvency act (1998); Limitation of credit risk (1999, 2002, 2006); Credit risk provisions requirements (2000, 2002, 2007); Minimum capital requirements (2002, 2007).
Serbia	Banking law (2001, 2004, 2007); Basic provisions on loan administration (2002); Risk management (2003, 2004, 2005, 2007); Capital adequacy (2003, 2004, 2005, 2007).

Source: European Central Bank; Bank of Albania; Central Bank of Bosnia and Herzegovina; Bulgarian National Bank; Croatian National Bank; National Bank of FYROM; National Bank of Romania; National bank of Serbia.

Table 2

Descriptive Statistics (1998-2007)

	ALL	ALBANIA	BOSNIA	BULGARIA	CROATIA	FYROM	ROMANIA	SERBIA
NIM	4.82	3.58	4.68	4.29	4.24	4.56	5.98	5.47
EA	19.78	8.82	25.25	16.22	16.20	29.43	18.14	23.50
LA	47.27	25.51	52.31	45.79	55.67	45.63	43.59	44.49
LLP	5.67	3.04	6.05	1.41	2.27	7.59	2.66	11.35
LIQ	48.92	54.83	33.60	44.16	41.57	39.97	43.32	42.76
IIP	2.48	2.17	3.05	1.42	2.73	2.60	1.08	3.62
MGMT	82.16	90.93	80.15	86.22	86.99	83.00	79.50	72.99
EFF	5.87	2.82	6.79	4.82	4.17	4.83	7.14	8.49
TA	578.59	396.84	153.37	601.27	902.89	548.33	976.79	258.15
CR₃	60.93	78.34	51.54	55.69	58.74	74.74	68.28	59.83
HHI	1821.21	4314.09	1207.11	1606.87	1766.05	4534.95	1705.82	961.30
MP	0.48	0.58	0.80	0.38	0.67	0.65	0.38	0.03
GDP	4.63	6.81	6.87	5.07	3.87	2.86	3.85	4.27
INF	13.65	4.46	5.38	7.32	4.29	3.29	28.11	32.25
EBRD	2.82	2.40	2.46	3.28	3.57	2.70	2.78	1.90
CAPRQ	4.73	4.00	5.00	6.10	3.70	4.20	4.80	5.00
SPOWER	10.44	11.40	12.20	11.30	11.20	12.30	9.80	6.00
ACTRS	2.30	2.40	2.37	2.43	1.92	2.37	2.98	2.00
MDISC	4.38	4.00	3.90	5.00	5.00	4.70	3.70	4.00
Observations with majority ownership								
State-owned	10.7	37.5	14.5	6.5	5.6	0.0	12.0	28.6
Domestic private	35.3	25.0	32.5	35.5	44.4	67.5	15.2	27.0
Foreign with strategic	47.6	21.9	48.2	46.2	45.8	27.5	70.7	31.7
Other foreign	6.4	15.6	4.8	11.8	4.2	5.0	2.2	12.7

Note: NIM: net interest margin; EA: equity / total assets; LA: loans / total assets; LLP: loss loan provisions / loans; LIQ: liquid assets/total assets; IIP: (non-interest expenses- non-interest revenue)/total earning assets; MGMT: earning assets/total assets; EFF: overhead cost/total assets; TA: total assets; CR₃: 3-firm concentration (in terms of total assets); HHI: Herfindahl- Hirschman Index; MP: Market power (a value of MP statistically equal to one implies monopoly practices, while a value equal to zero implies competitive conditions. Lower values suggest increased competition and higher values increased market power); GDP: annual % GDP growth; INF: inflation rate; EBRD: EBRD index on banking reform; CAPRQ: capital requirements index; SPOWER: official disciplinary power index; MDISC: market discipline index; ACTRS: restrictions on banks activities index. Figures are expressed in percentages for all variables (except of TA), and in million euros for total assets.

Source: Fitch-IBCA Bankscope; European Bank for Reconstruction and Development (EBRD); IMF International Financial Statistics and own estimations.

Table 3
Estimation results: Static models (bank-specific, macroeconomic and ownership)

Dep var:NIM	I	II	III	IV	V	VI	VII	VIII
EA	0.067***	0.067***	0.068***	0.068***	0.066***	0.068***	0.069***	0.067***
LA	0.035***	0.038***	0.039***	0.038***	0.037***	0.039***	0.038***	0.037***
LLP	0.002***	0.002***	0.003***	0.003***	0.002***	0.003***	0.003***	0.002***
LIQ	-0.001	-0.001	-0.001	0.001	0.001	-0.001	0.001	0.002
IIP	0.006***	0.005***	0.006***	0.005***	0.005***	0.006***	0.006***	0.006***
MGMT	0.016***	0.020***	0.019***	0.021***	0.019***	0.019***	0.021***	0.018***
EFF	0.015***	0.011***	0.011***	0.009***	0.014***	0.011***	0.009***	0.014***
SIZE	0.001***	0.002***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
HHI				0.000			-0.001	
CR ₃			-0.003			-0.002		
MP					-0.010			-0.010
GDP		-0.002	-0.001	-0.002	-0.002	-0.011	-0.002	-0.006
INF		-0.001*	-0.002*	-0.002*	-0.001*	-0.012*	-0.001*	-0.002*
GO						-0.112	-0.011	-0.011
DPO						-0.012	-0.012	-0.012
SFO						-0.098*	-0.013*	-0.013
Intercept	0.065***	0.078***	0.092***	0.071***	0.082***	0.089***	0.077***	0.089***
R² with	0.28	0.31	0.31	0.31	0.31	0.31	0.31	0.31
R² betw	0.23	0.23	0.25	0.23	0.25	0.27	0.26	0.29
R² overall	0.29	0.30	0.31	0.31	0.32	0.32	0.31	0.33
Wald test	295.41	337.05	344.17	342.22	341.07	349.54	348.57	347.78

Note: NIM: net interest margin; EA: equity / total assets; LA: loans / total assets; LLP: loss loan provisions / loans; LIQ: liquid assets/total assets; IIP: (non-interest expenses- non-interest revenue)/total earning assets; MGMT: earning assets/total assets; EFF: overhead cost/total assets; SIZE: natural logarithm (total assets); CR₃: 3-firm concentration (in terms of total assets); HHI: Herfindahl- Hirschman Index; MP: Market power; GDP: annual % GDP growth; INF: inflation rate; GO: dummy variable for government ownership; DPO: dummy variable for domestic private ownership; SFO: dummy variable for strategic foreign ownership.

The coefficients of the time and country dummies have been omitted from the regression output but are available upon request. The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request.

Table 4
Estimation results: Static models (regulation)

Dep var:NIM	I	II	III	IV	V	VI	VII	VIII	IX
EA	0.067***	0.068***	0.066***	0.067***	0.067***	0.066***	0.069***	0.070***	0.068***
LA	0.039***	0.038***	0.037***	0.042***	0.041***	0.041***	0.045***	0.044***	0.043***
LLP	0.003***	0.003***	0.002***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
LIQ	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IIP	0.005***	0.006***	0.005***	0.005***	0.005***	0.005***	0.005***	0.006***	0.005***
MGMT	0.018***	0.020***	0.017***	0.024***	0.025***	0.023***	0.024***	0.025***	0.023***
EFF	0.011***	0.009***	0.014***	0.004***	0.003***	0.007***	0.003***	0.001***	0.006***
SIZE	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
HHI		0.010			-0.009			-0.000	
CR ₃	0.002			0.076			0.006		
MP			-0.060			-0.058			-0.068
GDP	-0.000	-0.002	-0.003	0.023	0.025	0.029	0.023	0.027	0.029
INF	-0.011	-0.001	-0.001	-0.020	-0.023	-0.023	-0.008	-0.011	-0.023
GO	-0.010	-0.010	-0.011	-0.003	-0.053	-0.094	-0.130	-0.150	-0.004
DPO	-0.011	-0.001	-0.010	-0.006	-0.004	-0.105	-0.100	-0.104	-0.105
SFO	-0.011*	-0.011*	-0.010	-0.013*	-0.014*	-0.150	-0.160*	-0.163*	-0.153
EBRD	0.012***	0.017***	0.012***						
Lawb1998							0.007*	0.002***	0.084***
Lawb1999							0.069**	0.011**	0.017**
Lawb2000							-0.007	0.012	-0.017
Lawb2001							-0.033	-0.021	-0.004
Lawb2002							-0.039***	-0.002***	-0.007**
Lawb2003							-0.091**	-0.073**	-0.071**
Lawb2004							-0.014	0.003	0.016
Lawb2005							0.082	0.060	0.085
Lawb2006							0.005	0.007	0.090
Lawb2007							0.007	0.009	0.006
CAPRQ				-0.002	-0.001	-0.002			
SPOWER				0.002**	0.002**	0.002**			
MDISC				0.001	0.001	0.001			
ACTRS				-0.010***	-0.010***	-0.010***			
Intercept	0.074	0.040***	0.065	0.163***	0.142	0.155	0.065***	0.060	0.109
R² with	0.32	0.33	0.32	0.34	0.36	0.40	0.42	0.47	0.46
R² betw	0.28	0.28	0.29	0.27	0.28	0.39	0.44	0.44	0.42
R² overall	0.33	0.33	0.34	0.33	0.33	0.34	0.45	0.45	0.45
Wald test	362.11	370.90	361.08	388.70	387.33	386.83	436.18	438.71	455.70

Note: NIM: net interest margin; EA: equity / total assets; LA: loans / total assets; LLP: loss loan provisions / loans; LIQ: liquid assets/total assets; IIP: (non-interest expenses- non-interest revenue)/total earning assets; MGMT: earning assets/total assets; EFF: overhead cost/total assets; SIZE: natural logarithm (total assets); CR₃: 3-firm concentration (in terms of total assets); HHI: Herfindahl- Hirschman Index; MP: Market power; GDP: annual % GDP growth; INF: inflation rate; GO: dummy variable for government ownership; DPO: dummy variable for domestic private ownership; SFO: dummy variable for strategic foreign ownership; EBRD: EBRD index on banking reform; lawb1998-lawb2007: Dummy variables to account for Banking law; CAPRQ: capital requirements index; SPOWER: official disciplinary power index; MDISC: market discipline index; ACTRS: restrictions on banks activities index.

The coefficients of the time and country dummies have been omitted from the regression output but are available upon request. The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request.

Table 5
Estimation results: Dynamic models (bank-specific, macroeconomic and ownership)

Dep var:NIM	I	II	III	IV	V	VI	VII	VIII
Lagged NIM	0.251***	0.220***	0.228***	0.231***	0.295***	0.234***	0.231***	0.293***
EA	0.101***	0.108***	0.107***	0.114***	0.106***	0.107***	0.101***	0.108***
LA	0.105***	0.166***	0.173***	0.161***	0.166***	0.184***	0.171***	0.174***
LLP	0.033***	0.027**	0.039***	0.035***	0.037***	0.034***	0.031***	0.031***
LIQ	0.067***	0.068***	0.069***	0.068***	0.039***	0.064***	0.059***	0.034***
IIP	0.055***	0.048***	0.046***	0.047***	0.053***	0.041***	0.040***	0.049***
MGMT	0.053***	0.030***	0.090***	0.016***	0.023***	0.081***	0.085***	0.016***
EFF	0.084***	0.080***	0.071***	0.078***	0.098***	0.076***	0.084***	0.005***
SIZE	0.090***	0.073***	0.066***	0.073***	0.072***	0.060***	0.064***	0.068***
HHI				-0.053**			-0.059**	
CR ₃			-0.191***			-0.210***		
MP					-0.048			-0.052
GDP		-0.010	0.001	-0.010	0.003	0.001	-0.010	0.003
INF		0.009*	0.025*	0.008*	0.024*	0.028*	0.009*	0.025*
GO						0.012	0.040	0.124
DPO						0.035	-0.070	0.015
SFO						-0.015**	-0.026**	-0.015
Intercept	-1.880***	-1.973***	-1.760***	-1.622***	-1.669***	-1.051***	-1.305***	-1.647***
AR(1)	<i>z</i> =-9.02	<i>z</i> =-6.97	<i>z</i> =-7.97	<i>z</i> =-7.02	<i>z</i> =-7.09	<i>z</i> =-6.97	<i>z</i> =-6.95	<i>z</i> =-7.07
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)	<i>z</i> =0.58	<i>z</i> =0.37	<i>z</i> =0.52	<i>z</i> =0.27	<i>z</i> =0.40	<i>z</i> =0.57	<i>z</i> =0.30	<i>z</i> =0.43
p-value	0.562	0.513	0.606	0.787	0.689	0.571	0.762	0.669
Sargan	70.16	89.12	93.23	89.15	79.18	95.30	91.62	80.81
p-value	0.354	0.347	0.389	0.421	0.474	0.358	0.412	0.437
Wald test	178.07	177.43	127.32	128.70	119.83	130.04	133.55	119.76

Note: NIM: net interest margin; EA: equity / total assets; LA: loans / total assets; LLP: loss loan provisions / loans; LIQ: liquid assets/total assets; IIP: (non-interest expenses- non-interest revenue)/total earning assets; MGMT: earning assets/total assets; EFF: overhead cost/total assets; SIZE: natural logarithm (total assets); CR₃: 3-firm concentration (in terms of total assets); HHI: Herfindahl- Hirschman Index; MP: Market power; GDP: annual % GDP growth; INF: inflation rate; GO: dummy variable for government ownership; DPO: dummy variable for domestic private ownership; SFO: dummy variable for strategic foreign ownership. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request. AR (1): Arellano-Bond test that average autocovariance in residuals of order 1 is 0 (H₀: No autocorrelation); AR (2): Arellano-Bond test that average autocovariance in residuals of order 2 is 0 (H₀: No autocorrelation); Sargan: The test for over-identifying restrictions in GMM dynamic model estimation. The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request.

Table 6
Estimation results: Dynamic models (regulation)

Dep var:NIM	I	II	III	IV	V	VI	VII	VIII	IX
Lagged NIM	0.226***	0.231***	0.286***	0.239***	0.240***	0.209***	0.209***	0.209***	0.209***
EA	0.182***	0.184***	0.155***	0.179***	0.193***	0.158***	0.158***	0.158***	0.158***
LA	0.279***	0.259***	0.267***	0.268***	0.260***	0.264***	0.264***	0.264***	0.264***
LLP	0.033***	0.027***	0.039***	0.035***	0.037***	0.034***	0.034***	0.034***	0.034***
LIQ	0.055***	0.048***	0.029***	0.057***	0.060***	0.035**	0.035**	0.035**	0.035**
IIP	0.039***	0.037***	0.048***	0.042***	0.042***	0.048***	0.048***	0.048***	0.048***
MGMT	0.073***	0.075***	0.020***	0.027***	0.068***	0.021***	0.021***	0.021***	0.021***
EFF	0.103***	0.103***	0.107***	0.102***	0.102***	0.105***	0.105***	0.105***	0.105***
SIZE	0.057***	0.055***	0.065***	0.049***	0.056***	0.063***	0.063***	0.063***	0.063***
HHI		-0.033**			-0.062**				
CR ₃	-0.233***			-0.239***					
MP			-0.075**			-0.077**	-0.077**	-0.077**	-0.077**
GDP	-0.004	-0.018	-0.003	0.014	0.002	0.022	0.022	0.022	0.022
INF	0.031*	0.010*	0.021*	0.025*	0.013*	0.031*	0.031*	0.031*	0.031*
GO	0.054	0.046	0.104	0.028	0.019	0.074	0.074	0.074	0.074
DPO	-0.047	-0.096	-0.024	-0.055	-0.032	-0.019	-0.019	-0.019	-0.019
SFO	-0.032**	-0.039**	-0.011	-0.032**	-0.015**	-0.008	-0.008	-0.008	-0.008
EBRD	0.098***	0.093***	0.097***						
Lawb1998							0.303***	0.303***	0.303***
Lawb1999							0.011***	0.011***	0.011***
Lawb2000							0.076	0.076	0.076
Lawb2001							-0.077**	-0.077**	-0.077**
Lawb2002							-0.034**	-0.034**	-0.034**
Lawb2003							-0.016	-0.016	-0.016
Lawb2004							-0.271	-0.271	-0.271
Lawb2005							0.003	0.003	0.003
Lawb2006							0.059	0.059	0.059
Lawb2007							0.098	0.096	0.096
CAPRQ				0.122***	0.124***	0.122***			
SPOWER				0.182***	0.190***	0.120***			
MDISC				-0.019***	-0.020***	-0.020***			
ACTRS				0.034***	0.089***	0.090***			
Intercept	-1.905***	-1.432***	-1.620***	-1.877***	-1.156***	-1.921***	-1.921***	-1.921***	-1.921***
AR(1)	<i>z</i> =-6.88	<i>z</i> =-6.89	<i>z</i> =-7.06	<i>z</i> =-7.07	<i>z</i> =-7.11	<i>z</i> =-7.24	<i>z</i> =-7.24	<i>z</i> =-7.24	<i>z</i> =-7.24
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)	<i>z</i> =0.56	<i>z</i> =0.35	<i>z</i> =0.43	<i>z</i> =0.66	<i>z</i> =0.49	<i>z</i> =0.59	<i>z</i> =0.59	<i>z</i> =0.59	<i>z</i> =0.59
p-value	0.575	0.725	0.667	0.510	0.623	0.555	0.555	0.555	0.555
Sargan	95.70	92.85	81.61	97.02	92.88	81.87	81.87	81.87	81.87
p-value	0.342	0.315	0.322	0.417	0.420	0.389	0.389	0.389	0.389
Wald test	131.47	133.01	120.17	139.21	136.13	121.21	121.21	121.21	121.21

Note: NIM: net interest margin; EA: equity / total assets; LA: loans / total assets; LLP: loss loan provisions / loans; LIQ: liquid assets/total assets; IIP: (non-interest expenses- non-interest revenue)/total earning assets; MGMT: earning assets/total assets; EFF: overhead cost/total assets; SIZE: natural logarithm (total assets); CR₃: 3-firm concentration (in terms of total assets); HHI: Herfindahl- Hirschman Index; MP: Market power; GDP: annual % GDP growth; INF: inflation rate; GO: dummy variable for government ownership; DPO: dummy variable for domestic private ownership; SFO: dummy variable for strategic foreign ownership; EBRD: EBRD index on banking reform; lawb1998-lawb2007: Dummy variables to account for Banking law; CAPRQ: capital requirements index; SPOWER: official disciplinary power index; MDISC: market discipline index; ACTRS: restrictions on banks activities index. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request. AR (1): Arellano-Bond test that average autocovariance in residuals of order 1 is 0 (H₀: No autocorrelation); AR (2): Arellano-Bond test that average autocovariance in residuals of order 2 is 0 (H₀: No autocorrelation); Sargan: The test for over-identifying restrictions in GMM dynamic model estimation.

The ***, **, and * indicate 1 per cent, 5 per cent and 10 per cent significance levels, respectively. The coefficients of the time and country dummies have been omitted from the regression output but are available upon request.

Appendix I
Summary of the literature on measuring the determinants of net interest margin using single stage approach

Authors	Countries considered	Period	Results
Angbazo (1997)	US banks	1989-1993	Default risk, opportunity cost of non-interest bearing reserves, leverage and management efficiency are positively associated with bank interest margin. Liquidity has a negative impact.
Demirgüç-Kunt and Huizinga (1999)	80 developed and developing countries	1988-1995	Inflation is associated with higher net interest margins. Concentration ratio, bank size and foreign banks positively affect margins. Loans-to-total assets, equity to total assets and overhead-to-assets ratio have a positive influence. GDP growth and legal and institutional indicators (indicators of better contract enforcement, efficiency in the legal system, and lack of corruption) have a negative impact.
Claessens, Demirgüç-Kunt and Huizinga (2001)	80 countries	1988-1995	Foreign bank entry has no impact on net interest margin. Inflation, real interest rate, GDP growth and overhead-to-total assets are positively associated with interest margins. An increased presence of foreign banks is associated with a reduction in margins for domestic banks.
Drakos (2002)	Greek banks	1992-1999	Default risk, leverage, GDP growth, inflation rate and money supply growth have a positive impact. Liquidity and state-owned status reduce net interest margin. Interest rate risk and management ability have no impact.
Abreu and Mendes (2003)	Portugal, Spain, France, Germany	1986-1999	Loan-to-asset ratio, operating costs, equity-to-assets ratio have a positive impact on net interest margin. Market share, unemployment rate, GDP growth and nominal effective exchange rate have no effect. Inflation has a negative impact.
Drakos (2003)	Belarus, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Ukraine	1993-1999	State-owned banks set narrower net interest margins. The entry of foreign banks directly reduces interest margins by intensifying competition and indirectly produces positive externalities to the banking sector by disseminating good practice.
Nys (2003)	12 European countries (Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, UK)	1989-1999	Default risk, administrative costs and opportunity costs have a positive impact on net interest margin. Net fees have a negative impact.
Demirgüç-Kunt, Laeven and Levine (2004)	72 countries	1995-1999	Size, liquidity and GDP growth have a negative impact on net interest margins while concentration, equity and inflation have positive influence. Tighter regulations on bank entry, restrictions on bank activities, and regulations that inhibit the freedom of bankers to conduct their business increase bank net interest margins.
Maudos and Fernández de Guevara (2004)	Germany, France, United Kingdom, Italy, Spain	1993-2000	Market power (proxied by the Lerner Index and Herfindahl-Hirschman-Index), interest rate risk, credit risk, risk aversion, operating costs and implicit interest payments affect net interest margins positively. Quality of management and size have a negative influence.
Martinez Peria and Mody (2004)	Argentina, Chile, Colombia, Mexico, Peru	1995-2001	Bank liquidity, administrative costs and bank concentration have a positive impact on bank spreads. Foreign banks charge lower spreads.
Sologoub (2006)	30 largest Ukrainian banks	2002-2005	Capital adequacy, overhead expenses, the ratio of loans-provisions, net income from fees and commissions and equity have a positive impact on net interest margin. The share liquid assets and inflation are negatively related. Foreign-owned banks tended to have lower interest margins, but their comparative advantage diminishes over time.
Claeys and Vander Vennet (2007)	31 Western and eastern European countries	1994-2001	Market concentration, capital-to-assets ratio, loans-to-assets ratio, GDP growth, and inflation have a positive impact. Efficiency ratio has a negative influence. Foreign entry decreases margins.
Carbo and Rodriguez (2007)	7 European countries	1994-2001	They employ several measures of interest margins (loan to deposits rate spread, gross income, Lerner Index). The results in terms of loan to deposits rate spread indicate a positive relationship with credit, liquidity and interest rate risk, as well as operating inefficiency and capital-to-assets ratio. GDP and loans-to-assets ratio seem to reduce margins, while the influence of concentration (Herfindahl-Hirschman index) is insignificant.

Appendix II Measurement of competition

Following the method of Uchida and Tsutsui (2005),³⁷ we jointly estimate the following system of three equations that correspond to a translog cost function, to a revenue equation obtained from the profit maximization problem of banks, and to an inverse loan demand function:

$$\ln C_{it} = b_0 + b_1 \overline{\ln q_{it}} + \frac{1}{2} b_2 (\overline{\ln q_{it}})^2 + b_3 \overline{\ln d_{it}} + \frac{1}{2} b_4 (\overline{\ln d_{it}})^2 + b_5 \overline{\ln w_{it}} + \frac{1}{2} b_6 (\overline{\ln w_{it}})^2 + b_7 (\overline{\ln q_{it}})(\overline{\ln w_{it}}) + b_8 (\overline{\ln q_{it}})(\overline{\ln d_{it}}) + b_9 (\overline{\ln d_{it}})(\overline{\ln w_{it}}) + e_{it}^C$$

$$R_{it} = \frac{\theta_t}{\eta_t} R_{it} + r_{it} q_{it} + C_{it} (b_1 + b_2 \overline{\ln q_{it}} + b_7 \overline{\ln w_{it}} + b_8 \overline{\ln d_{it}}) + C_{it} \frac{q_{it}}{d_{it}} (b_3 + b_4 \overline{\ln d_{it}} + b_8 \overline{\ln q_{it}} + b_9 \overline{\ln w_{it}}) + e_{it}^S$$

$$\ln p_{it} = g_0 - (1/\eta_t) \ln q_{it} + g_1 \ln gdp g_t + g_2 \ln ir_t + e_{it}^D$$

where C is the total cost (i.e., total expenses) of bank i at time t , q is bank output measured by total earning assets, d are total deposits and short-term funding, w are the prices of inputs, in this case measured by the ratio of total operating expenses (overheads) to total assets, R is total bank revenue, r is the interest rate on deposits calculated as the ratio of interest expenses to total deposits and short-term funding, p is the price of bank output given by the ratio of total revenue to total earning assets, and e are the error terms. Variables with bars represent deviations from their cross sectional means at each time period, and are transformed in this way so as to remove their trend, specified in this way to reduce multicollinearity. We use the annual % GDP growth ($gdp g$) and the short-term interest rate (ir) as exogenous variables that affect demand.³⁸ The degree of competition in each year is given by θ , which represents the well-known conjectural variations elasticity of total industry output with respect to the output of the i th bank. The merit of this approach is that it provides bank-level estimates of market power to be used in the subsequent analysis.

³⁷ The discussion that follows is based on Uchida and Tsutsui (2005) and briefly states the main lines of their procedure.

³⁸ The short-term interest rates used vary between countries (e.g., for some countries we use the interbank rate, for others the central bank rate etc.) because there is no uniform short-term rate reported. Since estimation is carried out for each country separately this is not a potential problem. Many other studies have used a similar approach to specify the inputs and outputs of banks (see e.g., Uchida and Tsutsui, 2005; Brissimis et al., 2008).

Appendix III- Information on regulatory variables

Variable	Category	Description
caprq	Capital requirements	This variable is determined by adding 1 if the answer is yes to questions 1-6 and 0 otherwise, while the opposite occurs in the case of questions 7 and 8 (i.e. yes=0, no =1). (1) Is the minimum required capital asset ratio risk-weighted in line with Basle guidelines? (2) Does the ratio vary with market risk? (3-5) Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital: (a) market value of loan losses not realized in accounting books? (b) unrealized losses in securities portfolios? (c) unrealized foreign exchange losses? (6) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? (7) Can the initial or subsequent injections of capital be done with assets other than cash or government securities? (8) Can initial disbursement of capital be done with borrowed funds?
mdisc	Market discipline	This variable is determined by adding 1 if the answer is yes to questions 1-7 and 0 otherwise, while the opposite occurs in the case of questions 8 and 9 (i.e. yes=0, no =1). (1) Is subordinated debt allowable (or required) as part of capital? (2) Are financial institutions required to produce consolidated accounts covering all bank and any non-bank financial subsidiaries? (3) Are off-balance sheet items disclosed to public? (4) Must banks disclose their risk management procedures to public? (5) Are directors legally liable for erroneous/misleading information? (6) Do regulations require credit ratings for commercial banks? (7) Is an external audit by certified/licensed auditor a compulsory obligation for banks? (8) Does accrued, though unpaid interest/principal enter the income statement while loan is non-performing? (9) Is there an explicit deposit insurance protection system?
spower	Official disciplinary power	This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each one of the following fourteen questions: (1) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? (2) Are auditors required by law to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authorities force a bank to change its internal organizational structure? (5) Are off-balance sheet items disclosed to supervisors? (6) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend director's decision to distribute dividends? (8) Can the supervisory agency suspend director's decision to distribute bonuses? (9) Can the supervisory agency suspend director's decision to distribute management fees? (10) Can the supervisory agency supersede bank shareholder rights and declare bank insolvent? (11) Does banking law allow supervisory agency or any other government agency (other than court) to suspend some or all ownership rights of a problem bank? (12) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than court) supersede shareholder rights? (13) Regarding bank restructuring & reorganization, can supervisory agency or any other government agency (other than court) remove and replace management? (14) Regarding bank restructuring & reorganization, can supervisory agency or any other government agency (other than court) remove and replace directors?
actrs	Restrictions on banks activities	The score for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities (2) insurance activities (3) real estate activities (4) bank ownership of non-financial firms. These activities can be unrestricted, permitted, restricted or prohibited that are assigned the values of 1, 2, 3 or 4 respectively. We use an overall index by calculating the average value over the four categories.

Note: The individual questions and answers were obtained from the World Bank database developed by Barth et al. (2001a, 2006, 2008)