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The Impact of Economic Freedom, Business Regulation and Corruption on Bank Profitability and Bank Stability: Evidence from Europe

Abstract

This paper examines the impact of economic freedom, regulation, corruption and transparency on bank profitability and bank stability using a sample of 681 European financial institutions in 33 European countries over the period 2000-2012. Using unbalanced panel data and 2SLS estimation, our results show that bank performance and bank stability are negatively related, but economic freedom, regulation, corruption and transparency tend to have mixed effects at the aggregate level depending on the profitability and stability measures used. More noticeable differential effects can be detected when we disaggregate the data between the Eurozone, the non-euro European Union (EU) countries and the EU candidate countries, the size of financial institutions, the level of country income, the timing of entrance into the EU enlargement process and specialization of the banks. Our results suggest that policies promoting greater economic freedom, reducing regulation, reducing corruption and enhancing transparency need to be more targeted to reflect the diversity of the banking sector in Europe.

Keywords: *financial crisis, dynamic panels, economic freedom, bank regulation, transparency, corruption*

JEL Classifications: *G21, G28, C33*

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1. Introduction

The financial crisis that erupted in the United States in 2007 and spread rapidly to international markets has had a considerable impact on the banking sector. Moreover, the tensions from the subprime crisis have degenerated into a sovereign debt crisis, affecting many of the European countries. The 2008-2010 period witnessed higher volatility in the financial markets, a negative impact upon the bank risk ratings and other negative repercussions for the financial sector including demands for greater regulation, stricter rules on proprietary trading, and greater scrutiny of banking activities and products (see for example Michalak and Uhde, 2012; Elliot *et al.*, 2013; Slimane *et al.*, 2013; and Milani, 2014). As Mayes (2005) pointed out prior to the financial crisis, problems in the banking sector impact not only the financial system but also the entire economy. In this paper we argue that the economic system of a country as measured by the degree of economic freedom, transparency and level of corruption is likely to have an impact on the banking sector itself.

This paper provides an empirical investigation of the role of economic freedom, business regulation corruption and bank transparency on banking activity in terms performance measured by profitability and stability. In particular, the role of economic freedom on the banking sector has not been greatly studied in the existing literature except in the studies by Sufian and Habibullah (2010a and 2010b) who look at the cases of China and Malaysia. There are reasons to think that banking profitability and stability is to some extent related to overall economic system and environment within which banks operate. Clearly some countries have more or less economic freedom, business regulation, corruption and banking transparency than others. A key question which we examine in this paper is whether the overall economic system and environment in which banks operate affects their overall performance measured by profitability and stability.

Our paper is motivated by recent developments in the European economy and European banking sector and it contributes to the literature in a number of important ways. First, we develop a framework that examines the role of economic freedom, business regulation, corruption and transparency on both bank profitability and bank stability. The studies by Sufian and Habibullah (2010a and 2010b) look only at developing countries and focused mainly on profitability measures To the best of our knowledge this is the first study that attempts to examine the issues of economic freedom on both bank profitability and stability in a combined framework at the European level including the European Union candidate countries. Another novelty is that we apply several different criteria to our sample based on region,

institutional size, the income level of the country, time of entrance into the EU and bank specialization. Our study uses both pre and post crisis data on all these measures making it possible to examine the effect of the recent economic crisis on the EU banking sector.

The rest of this paper is organized as follows. Section 2 presents a review of some of the literature pertaining to economic freedom, transparency and corruption. Section 3 outlines the data set. Section 4 outlines our empirical research methodology. Section 5 presents some summary statistics and section 6 the results of the panel data analysis while section 7 concludes.

2. Literature Review

While regulatory and supervisory framework of the banking sector has been extensively studied, the role of economic freedom has only recently attracted the interest of researchers. In the period before the subprime crisis, a consensus was built around the idea that if the burden of regulation was reduced the banking system would operate more efficiently and perform better. In addition, there was a misplaced tendency to believe that self-regulation generally works better in the financial system than external regulation. This idea fell into disrepute as a result of the crisis, which showed that bankers left largely unregulated can cause havoc to the banking sector with resulting financial instability. The post-crisis literature has tended to emphasize the need for regulatory and supervisory reforms to ensure banking and financial stability with enhanced regulation, monitoring and improved bank disclosure. In their study Chortareas *et al.* (2012b) evaluate bank supervision, regulation and efficiency among a sample of 22 EU countries. Their results show that an increased regulatory and supervisory framework has a positive impact on bank profitability, through various channels, including a decline in the likelihood of financial distress, a reduction of agency problems and reduced market power.

The impact of Economic Freedom

While the impact of economic freedom on the wider economy has been extensively studied (see for example Adkins, Moomaw and Savvides, 2002; Altman, 2008; Bergh and Karlsson, 2010; Heckelman and Knack, 2009) its impact on the banking sector has only recently attracted the attention of researchers and only then in the context of developing countries (see Sufian and Habibullah, 2010a and 2010b). There are a number of reasons to think that economic freedom can have a positive impact on bank profitability. In the first instance, banks are likely to lend more as there are more firms competing in the economy and this means banks have the capacity to lend more funds to a wider range of domestic companies. Also greater economic freedom means that there will be more scope for banks to lend to foreign companies and foreign financial institutions which should ensure greater diversification and a better risk return trade-off for the banking system. Greater economic freedom is likely to lead to a better environment for business and hence better economic growth and therefore better banking performance

as measured by profitability and stability. In addition, countries with higher levels of economic freedom generally have higher levels of real income (see Holmes *et al.*, 2008), this should in turn lead to a higher demand for banking services. Also, a higher degree of economic freedom should lead to lower inflation and more stable macroeconomic environment. In the context of developing countries, it has been noted that there tends to be greater state control of bank lending decisions and this ultimately means banks tend to lend more to less creditworthy companies than would happen in a private sector controlled banking system and this ultimately undermines banking performance.

Of course, there could be some ways in which greater economic freedom might undermine banking performance. Easier entry into the sector and greater competition within the sector could undermine the average profitability of banks. In addition, greater economic freedom may allow for greater competition for the banking sector from other financial intermediaries such as hedge funds, shadow banks and private equity which may also impact on banking profitability since they compete for banks deposits and also to fund businesses which could in turn lower bank profitability. So the impact of economic freedom on banking profitability and stability is essentially an empirical matter. The empirical studies by Sufian and Habibullah (2010a and 2010b) indicate a positive relationship between economic freedom and profitability in the cases of both China and Malaysia but there are no studies for developed nations.

The Impact of Regulation

Many studies have emphasized the positive impact of regulation, especially the role of capital adequacy requirements in preventing bank failures, protecting customers and the entire economic system from detrimental externalities (see for example, Rochet, 1992; Dewatripont and Tirole, 1993; Gorton and Winton, 1995; Hovakimian and Kane, 2000; and Chortareas *et al.*, 2012b).

Despite the benefits of regulation it is important to find an optimal level since excessive regulation can obstruct the efficient operation of banks by increasing costs and restricting useful bank's activities. In this respect, Jalilian *et al.* (2007) point out that banks may try to counteract the pressure of a severe regulatory framework by engaging in riskier operations and investments and finding ways to circumvent regulation which can negatively impact upon bank performance and bank stability. A study by Barth *et al.* (2004) evaluates the impact of a specific regulatory and supervisory strategy on bank development, performance and stability using survey data for an international sample of 107 countries. Their results indicate that restrictions on bank activities can be damaging for bank profitability and increase the probability of a banking crisis. Similarly, Dermirgüç-Kunt *et al.* (2004) examine the impact of bank regulations, market structure and institutions on net interest margin (NIM) and the cost of financial intermediation using an international dataset based on over 1,400 banks from 72 countries. The results obtained indicate that tighter regulation on banking activity will generate an increase in the cost of

financial intermediation, which can adversely affect net interest margin and bank soundness. Moreover, Barth *et al.* (2012) evaluate the evolution and impact of bank regulations on a dataset of 125 countries. Based on an extended analysis of the pros and cons of a wide range of regulations, they argue that the existing evidence does not suggest that a tighter regulatory framework will improve bank stability, enhance the efficiency of intermediation or reduce the level of corruption. By contrast, Fernandez and Gonzalez (2005) who use the same time span and a similar sample show that in countries with low accounting and auditing requirements, more control by supervisory authorities can decrease the predisposition to risk taking on the part of managers and that increased restrictions on bank activities can decrease the probability of a banking crisis. Similarly Agoraki *et al.* (2011) who focus on a sample of 546 European banks suggests that increased regulation, through higher capital requirements and activity restrictions in combination with a higher level of market power reduces both credit risk and the risk of default.

The Impact of Corruption

In the banking sector financial corruption relates to the dishonest practices of bank managers and/or bank officials. A significant number of economists argue that corruption has a negative impact upon the banking and economic system. At the macroeconomic level, corruption can deform the structure of public expenditure, dampen potential foreign direct investment, increase unproductive foreign debts, lessen the efficiency of economic activity and result in a lower level of national income and higher rates of poverty (see for example, Mauro, 1995; Gastanaga *et al.*, 1998; Asiedu, 2003; and Kunieda *et al.*, 2014). Additionally, at the microeconomic level, corruption is accompanied by low institutional quality, inefficient institutions in terms of performance and stability, and higher costs of doing business (see for example Asiedu, 2003; Méndez and Sepulveda, 2006; and Diaby and Sylwester, 2015). Consequently, the level of corruption has the potential to undermine bank profitability and stability. Mongid (2007) shows that banking crises are positively related to a higher level of corruption and poor legal enforcement. On the other hand Pagano (2008) shows that corruption together with a high participation of government in the banking environment significantly influences bank lending rates, with increased government participation raising lending rates while corruption lowers lending rates and that corruption helps to explain the cross-sectional dispersion of the lending rates sensitivities in the banking sector.

When it comes to corruption the literature is more mixed on the issues of profitability and stability. Generally speaking a higher level of corruption can negatively influence the functioning of the entire financial sector and economy. La Porta *et al.* (2002) argue that countries with higher government ownership of banks are associated with lower levels of GDP per capita, to the extent that greater government control of the banking system is associated with higher levels of corruption; this suggests a

negative impact from corruption on banking profitability. More recently, Park (2012) evaluates the influence of corruption on the soundness of the banking sector using an international dataset. The results show that corruption can be associated with a higher proportion of bad loans in the banking sector. In addition, corruption increases the allocation of bank funds from normal to bad projects which as well as undermining bank soundness will also negatively influence the economic activity. Similar conclusions are reached by Weill (2011a) and Zheng *et al*. (2013). However, Lalountas *et al.* (2011) and Weill (2011a and 2011b) point out that in countries with a high degree of risk aversion in the banking sector there could be benefits in terms of increased bank lending from an increase of corruption and in the short term corruption can potentially increase bank profitability. However, the observation, that corruption can positively influence bank lending, does not necessarily mean that corruption will bring welfare gains. For instance, if an expansion of banking activity is accompanied by an increase in low productivity non-performing loans it increases risk and ultimately raises the cost of borrowing for a bank and its customers. In general, the legal system is the main source of variation in corruption levels across the regions studied, the higher the effectiveness of the judicial system, the less corruption there will be. For example, the higher occurrence of corruption in some developing European countries can be partly explained by deficiencies in their regulatory and institutional infrastructure. Corruption can also be aided by a lack of transparency and poor financial education which enables providers of financial services to exploit their customers. For example, Papademos (2008) and Blinder *et al.* (2008) debate the potential harm that a lack of transparency can have on individuals with poor financial education or lack the ability to understand and interpret financial information provided. In addition, Kolstad and Wiig (2009) argue that a lack of transparency makes corruption less risky and implicitly more attractive, leading to certain employees in the financial sector exploiting their positions at the expense of established social norms and trust.

The Impact of Transparency

We argue that regulation is highly related to the issue of *transparency* in the financial sector. In the financial system, transparency plays an important role, in terms of increasing the effectiveness of monetary and fiscal policies, increasing the predictability of Central Bank actions and promoting the independence of the Central Bank and that more transparency can play a role in linking executive pay to performance in the banking sector. Transparency is important both for Central Banks with regard to communicating monetary policy (see Winkler, 2000), and the banking sector as a whole not only because it augments democratic responsibility, but also because it improves public confidence regarding the financial sector. For example, Diamond and Verrecchia (1991) develop a theoretical model, which demonstrates that diminishing asymmetric information by revealing information to the public lessens a firm's cost of capital. Other papers, such as Baumann and Nier (2004), Nier and Baumann (2006), Akhigbe *et al.* (2013), and Barakat and Hussainey (2013) estimate the impact of transparency on the

banking sector by constructing a bank disclosure index. Overall increased transparency can translate into better financial performance, reduces the chance of severe banking problems, enhances overall bank stability, and better link senior executive remuneration to bank performance.

In the literature there are various concepts regarding transparency, particularly concerning the impact of transparency in relation to the moment in time when it is promoted. As explained by Nier (2005), transparency can be beneficial *ex ante* by enhancing market discipline. By contrast, *ex post* disclosure can have a negative impact on bank performance and bank stability by highlighting when a financial institution is already in difficulty. This latter situation was observed in the recent financial crisis period when banks were forced to become more transparent during the financial crisis. A higher level of transparency by helping to overcome information asymmetry can improve liquidity in a bank's shares and can reduce a financial institution's cost of capital as shown in Diamond and Verecchia (1991). In addition, Lang and Lundholm (1993) show that increased disclosure by firms by reducing information asymmetry can also help reduce stock price volatility and hence improve a firms' cost of capital. Tadesse (2006) argues that higher bank disclosure has benefits for the stability of the financial system and because it improves market efficiency by facilitating price discovery it can help uncover concealed costs and provide protection for investors by permitting better understanding of the risks in the banking sector associated with financial products.

While transparency potentially generally has a positive impact on banking activity; too much transparency can have negative effects. Bushee and Noe (2000) argue that increased disclosure can affect the level of institutional holding of a firm's shares but at the same time increase the percentage of "transient" institutional holders of the firm's shares which can actually increase the price volatility of a bank's shares. Cordella and Yeyatti (1998) and Furman and Stiglitz (1998) argue that the disclosure of financial information can also have negative implications at times when a financial institution is already in distress by increasing the risk of bank runs. Excessive transparency can also lead to confusion if the level of financial education is poor due to the risk that the general public does not understand or cannot process very detailed information provided by financial institutions. It is important to mention that one of the main benefits of greater regulation and transparency strategy is that it helps limit the scope for corruption and financial fraud in banking. The complexities of modern financial institutions, the greed and naivety of some bank clients and the lack of financial education among ordinary people can facilitate financial fraud and corruption.

Due to the recent financial crisis of 2008-2010 and subsequent Eurozone crisis substantial institutional and regulatory changes have been enacted, forcing bank supervisors and regulators to rethink their approach to the banking sector. In particular, the need to ensure a proper level of regulation and transparency in the banking and financial sector has been a high priority. Consequently, the role of

regulation and transparency in evaluating bank performance and bank stability is a topic of interest for different actors in the financial system, especially for policy makers, bank managers and bank customers, but also for the general public.

3. The Data Set and Measurement of Bank Profitability, Bank Stability, Economic Freedom, Regulation, Corruption and Transparency

The Data Set

The main source of our data is Bankscope and World Bank databases. However, in several cases the data were extracted from the annual reports of the financial institutions and were converted into euros to ensure accounting uniformity. Wherever possible, we have used consolidated banking data. After excluding financial institutions and/or periods with missing or zero values, we were left with a sample of 681 financial institutions. The sample covers the period 2000-2012 on an annual basis for 33 European countries. The time period was selected to ensure coverage of the recent financial crisis period on bank performance and bank stability. In many of the selected countries the banking sector plays a very important role, being the main component of their financial systems, see for example, Demirgüç-Kunt and Maksimovic (2005), and Rajan and Zingales (2003).

Measurement of Profitability

In many academic studies, for example, Bourke (1989), Molyneux and Thornton (1992), Staikouras and Wood (2004), Park and Weber (2006), Pasiouras and Kosmidou (2007), Athanasoglou *et al.* (2008), Albertazzi and Gambacorta (2009), Millon Cornett *et al.* (2010), Dietrich and Wanzenried (2011), Kanas *et al.* (2012), among others, the concept of performance is related to the notion of profitability. Profitability can be represented by three indicators; namely Return on Average Assets (ROAA), Return on Average Equity (ROAE) and Net Interest Margin (NIM). ROAA indicates the returns generated by bank's assets and is calculated as a ratio of net income to average total assets. ROAE shows the return on shareholder's funds and is calculated as net income to average total equity. NIM is defined as the difference between the interest income produced by banks or other financial institutions and the volume of interest paid out to their lenders relative to the volume of their assets. We use all three measures of financial performance in our study to check for the robustness of our results. The first two variables are extensively used in the literature as profitability ratios, representing a financial institution's ability to generate earnings from its investments (see for example, Nier, 2005; Demirgüc-Kunt *et al.*, 2004; Pasiouras, 2008; and Naceur and Omran, 2011). In addition, we include in our analysis the NIM as used in the studies by Demirgüc-Kunt *et al.* (2004) and Chortareas *et al.* (2012a).

Measurement of Bank Stability the Financial Soundness Index and alternative Z-score

The issue of bank stability relates to bank's capability to endure adverse events, such as banking crises, major policy changes, financial sector liberalization and natural disasters (IMF). Among the academic writings, the most commonly used variable to assess the soundness of a financial institution or of a banking system, is the Z-score. The Z-score is inversely related to the probability of a bank's insolvency, see Boyd and Runkle (1993). More specifically, the Z-score exposes the number of standard deviations that a bank's return has to drop below its expected value, to deplete equity and make the bank insolvent (see Boyd and Runkle, 1993; Lepetit *et al.*, 2008; Laeven and Levine, 2009; Chortareas *et al.*, 2012b; Sufian and Habibullah, 2012; Bertay *et al.*, 2013; Bourkhis and Nabi, 2013; Pasiouras and Gaganis, 2013; Tabak *et al.*, 2013; Anolli *et al.*, 2014; and Fu *et al.*, 2014). The probability of insolvency is defined as the probability that losses π exceed equity *E*, as we can see in the following:

$$P[\pi \leq -E] = P[ROAA \leq -CAR] = \int_{-\infty}^{-K} f(ROAA)d(ROAA) \qquad (1)$$

where ROAA is the return on average assets; *CAR* is the share of equity capital in total asset and $d(ROAA)$ is the volatility of the mean return on average assets.

According to De Nicolo (2000) this probability satisfies the following inequality:

$$P[ROAA \leq -CAR] \leq \frac{d(ROAA)^2}{(ROAA+CAR)^2} = \frac{1}{Z^2} \qquad (2)$$

Consequently, a rise of the Z-score corresponds to a reduced risk of insolvency. The value of the Z-score increases with a higher profitability and market capitalization and decreases with income volatility (see Boyd and Runkle, 1993; Demirgüç-Kunt *et al.*, 2004; Beck *et al.*, 2006; Mercieca *et al.*, 2007; Lepetit *et al.*, 2008; Laeven and Levine, 2009; Schaeck *et al.*, 2009; Shih *et al.*, 2007; and Fu *et al.*, 2014). Theoretically, the Z-score permits a time-varying measure of bank stability that does not experience endogeneity issues. However, since $ROAA$ and the standard deviation $d(ROAA)$ are mined from different distributions, this could generate an inconsistency issue. We differentiate our paper from the current literature by employing an alternative measure for bank stability that overcomes this problem and leads to more robust result. We have computed an alternative Z-score (Z_{alt}) similar to Yeyati and Micco (2007) and Fiordelisi and Salvatore Mare (2014) which was computed as in equation (3):

$$z_{alt} = \frac{\mu(ROAA)+CAR}{d(ROAA)} \qquad (3)$$

where, $\mu(ROAA)$ is the mean of return on average assets within each financial institution in a country over a given period of time; ROAA is the return on average assets; *CAR* is the share of equity capital in total asset and $d(ROAA)$ is the volatility of the mean return on average assets. We follow Laeven and Levine (2009) and Houston et al. (2010) who advocate the use of the natural log of the Z-score (lnZ) over the simple Z-score on the basis that the latter's distribution is heavily skewed, whereas the former's is not. As they state "the log of the Z-score in particular emerges from our refinement as an insolvency risk measure that is attractive and unproblematic to use (even as a dependent variable in standard regression analysis), providing more rigorously founded support to its emerging use in the literature."

Another strand of the literature has focused on various measures of bank stability such as financial strength ratings or on banks' stock prices (for example, Bharath and Shumway, 2008; Nier, 2005; Demirgüç-Kunt *et al.*, 2006; Fiordelisi *et al.*, 2011; Huang *et al.*, 2012; Elliot *et al.*, 2013; and López-Espinosa *et al.*, 2013). Other researchers have examined the role of financial fragility, which is proxied by two different measures. One strand of the literature has used the financial stress indices (for example, Illing and Liu, 2006; Hakkio and Keeton, 2009; Misina and Tkacz, 2009; Hollo *et al.*, 2012; and Park and Mercado, 2014). A different strand has focused on bankruptcy prediction by employing the probability of bankruptcy as an indicator of individual bank fragility, for example, Bharat and Shumway (2008) and Fu *et al.* (2014). In their paper, Fu *et al.* (2014) compute the probability of bankruptcy using the Black and Scholes (1973) and Merton (1974) contingent claims approaches and they conclude that the market-based measure of stability has more advantages than the accounting-based models which provide variable information depending on the firms' accounting policies. For our second measure of bank stability we use the Financial system soundness index ($FSSI_{ij}$) was developed by Das *et al.* (2004) and measures the degree of soundness of a specific system as well as providing an *ex ante* measure of soundness. This index is composed of two main variables, the capital adequacy ratio plus the inverse of the ratio of nonperforming loans to total loans both of which are weighted to reflect the country's degree of financial intermediation. The index takes the following form:

$$FSSI_{ij} = \frac{TL_i}{GDP_i}\left[\frac{1}{2}(CAR_{ij} + 1/NPL_{ij})\right] \qquad (4)$$

where TL_i is the total loans granted by financial institutions in country *i*; GDP_i is the gross domestic product for a specific country *i*; CAR_{ij} is the capital adequacy ratio for a financial institution *j* in country *i*; NPL_{ij} is the ratio of nonperforming loans of a financial institution *j* in country *i*. A higher FSSI indicates greater bank soundness and therefore greater bank stability.

Measurement of Economic Freedom

For the purposes of the analysis that follows we use a set of control variables in our models as outlined in Table 1. To examine the role of economic freedom we have used the Heritage index which is commonly used in the literature and is composed of ten dimensions grouped into four pillars, of economic freedom: (i) Rule of Law (property rights, freedom from corruption); (ii) Limited Government (fiscal freedom, government spending); (iii) Regulatory Efficiency (business freedom, labour freedom, monetary freedom); and (iv) Open Markets (trade freedom, investment freedom, financial freedom). These 10 factors are equally weighted to create a composite index taking values from zero to 100, with a higher number indicating greater economic freedom.

Measurement of Business Regulation

To measure the impact of regulation in the economy as a whole, we have used two variables. The first regulation variable (REG1) is based on the World Business Environment Survey (WBES) which uses a scale of one to four, with one being no business regulation obstacles and four representing major obstacles that limit business entry, diminish competition and may also influence bank profitability and bank stability through spill-over effects. Regulatory obstacles to entry can result in a reduced level of competition by reducing new companies entering into a business (see for example, Ciccone and Papaioannou, 2007; Klapper *et al.*, 2006; Pasiouras, 2008; Barth *et al.*, 2009; Mamatzakis *et al*., 2013). Severe business regulations and an excessive amount of laws and regulations can also have harmful implications for the overall performance of companies and adversely affect debt service repayments to the banking sector. Secondly, we use the WBES availability of laws and regulations measure (REG2) which uses a scale of one to six to measure the degree of regulation with a low score representing a low level of regulatory development and a high score a higher level of regulation.

Measurement of Corruption

To measure corruption we use two variables, the corruption level of bank officials (CORR1) and a general value of corruption (CORR2). The corruption of bank officials can be measured either by the Corruption Perception Index developed by Transparency International (see for example, Barth *et al.*, 2009; Lalountas *et al.*, 2011; and Weill, 2011a and 2011b) or by the indices developed by World Business Environment Survey (WBES). In our paper we choose the two indices developed by WBES due to the need to cover our entire sample. The first WBES index CORR1 measures the corruption of bank officials as an obstacle for the operation and growth of business and is used in Beck *et al.* (2006); Barth *et al.* (2009); Houston *et al.* (2011); Weill (2011a); Zheng *et al.* (2013). While the second WBES index CORR2 is a more generalised index of corruption for the country as a whole. A higher level of the corruption indices indicates a higher level of corruption.

Measurement of Transparency

To measure transparency, we have computed a composite disclosure index (DISCL) using the methodology developed by Nier (2005). This index was calculated for each financial institution after extracting the necessary information from Bankscope and annual reports of the financial institutions.[1] The composite disclosure index measures the level of detail which banks provide on 17 dimensions of accounting information in their published accounts relating to both the asset and liability sides of a bank's balance sheet, memorandum items, income statement and sources of funding. The disclosure index is normalized to take a value of between 0 and 1, with a higher value representing a higher level of disclosure. The implications of transparency on the banking market are ambiguous. If applied *ex ante*, disclosure may be beneficial for a financial institution with reference to the reduced likelihood of a crisis, a decreased likelihood of information contagion and a higher level of market discipline. However when applied *ex post* transparency can negatively impact upon bank profitability and bank stability. Table 1 provides definitions and sources of all aforementioned variables used in our econometric analysis.

[Table 1 approximately here]

4. Econometric Modelling

In this section we discuss the econometric approach developed to evaluate the impact of regulation, corruption and transparency on bank profitability and bank stability in Europe. The empirical work on the determinants of bank profitability and bank stability can theoretically suffer from an inconsistency problem, determined by omitted variables, an endogeneity bias or highly persistent revenues (see Poghosyan and Hesse, 2009; and Naceur and Omran, 2011). We used several estimation methods including the Arellano and Bond (1991) and Arellano-Bover/Blundell-Bond (Blundell and Bond, 1998[2]) but ultimately we settled on reporting the results from two-stage lest squares regression (2SLS). We preferred this technique, mainly because we found evidence that the dependent variable's error terms were correlated with the independent variables[3]. After applying a series of tests for cross-sectional dependence, serial correlation, stationarity and heteroscedasticity, we have identified some potential problems with the heteroscedasticity test (Modified Wald test) mainly caused by measurement errors[4]. The two basic estimated models are defined as follows:

[1] The methodology for constructing this index is analytically described in Table A1 in the Appendix.

[2] Build on the work of Arellano and Bover (1995)

[3] Furthermore, to make sure that our empirical analysis does not suffer from problematic multicollinearity, correlation matrices for all variables were calculated. Table A2 in the Appendix shows the correlation matrix for the case of Eurozone, which suggests no evidence of high correlations among the variables. Similar were the results for all other cases. Tables and results are not reported here for economy of space but are available from authors upon request.

[4] However, we should bear in mind that our data may suffer from a drawback, observing that when inferences are drawn from the Bankscope database, there can be an implicit selectivity bias (De Bandt and Davis, 1999; Corvoisier and Gropp, 2001).

$$Prof_{ik,t} = \alpha_i + \beta_0 Prof_{ik,t-1} + \beta_1 Stab_{ik,t} + \beta_2 EF_{i,t} + \beta_3 REG_{i,t} + \beta_4 CORR_{i,t} + \beta_5 BT_{ik,t} + \varepsilon_{it}, \quad (5)$$

$$Stab_{ik,t} = \alpha_i + \beta_0 Stab_{ik,t-1} + \beta_1 Prof_{ik,t} + \beta_2 EF_{i,t} + \beta_3 REG_{i,t} + \beta_4 CORR_{i,t} + \beta_5 BT_{ik,t} + \varepsilon_{it}, \quad (6)$$

where $Prof_{ik,t}$ is the profitability of the financial institution *k* in country *i* during the period *t*, and is measured in our study by three alternative measures (ROAA, ROAE and NIM); $Stab_{ik,t}$ is the stability of the financial institution *k* in country *i* during the period *t*, and is measured in our analysis by the natural log of the Z-score and the financial system soundness index; $EF_{i,t}$ stands for Economic Freedom, expressed through the Fraser index, general business regulation REG and availability of laws and regulation represented by two variables REG1 and REG2; $CORR_{i,t}$ stands for corruption and is measured by two alternative indexes; corruption of bank officials CORR1 and general corruption CORR2; $BT_{ik,t}$ represents bank transparency for financial institution *k* in country *i* during the period *t* being represented by the disclosure index.

We conduct an empirical analysis on the overall sample, but for reasons of robustness of the analysis we also break the sample to five different sub-samples by:

(i) *Region.* The sample was divided in three main regions, namely the Eurozone (N=379 financial institutions), the non-euro EU countries (N=181 financial institutions), and the EU candidate countries (N=121 financial institutions) [5].

(ii) *Size of a financial institution*. This indicator was computed as the natural logarithm of total assets according to the last available year. We then took the maximum and minimum values of the logarithm of total assets (4.41 and 18.2) divided this into three equal intervals to obtain three groups, namely small institutions (N=178), medium institutions (N=326) and large institutions (N=177).

(iii) *Country income level*. In this case, the countries were classified in two sub-categories using the World Bank definition, namely: high income countries (N=528 financial institutions) and upper middle income countries (N=153 financial institutions).

(iv) *Timing of entrance into the EU enlargement process*. We had the following four groups: founding members including the first enlargement of UK, Ireland and Denmark (1957-73,

[5] The countries selected are the Eurozone countries (Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, Spain), the non-euro EU countries (Bulgaria, Croatia, the Czech Republic, Hungary, Poland and Romania, Denmark and United Kingdom), and the EU candidate countries (Albania, Macedonia, Iceland, Montenegro, Serbia and Turkey). Sweden was not included in the analysis due to data unavailability.

N=270), EU enlargement group A (1981-95, N=91), and EU enlargement B (2004- 2014, N=199) and candidate countries i.e. those that had candidate status in 2014 (N=121).

(v) *Specialization of a financial institution*. According to this, we classified the financial institutions in the following groups: commercial banks (N=423), cooperative banks (N=39), investment banks (N=34), real estate and mortgage banks (N=38), savings banks (N=55), and other financial institutions[6] (N=92).[7]

The idea behind the above categorization is that the European Banking sector is quite heterogeneous with banks operating in countries with different degrees of economic freedom, income levels, different banking models and banks themselves varying in size as measured by total assets.

5. Summary statistics

In Table 2 we report the summary statistics of the key variables used in our analysis for all the countries in the sample. Within our sample, the profitability indicators suggest that, on average, the profitability of the analyzed financial institutions is characterized by positive returns. The indicators of stability are represented by log Z-score and FSSI. The economic Freedom indicator has a wide range from 43.5 in the case of Montenegro and Serbia in 2003, to 82.6 in the case of Ireland in 2007. The two regulation variables have similar means given that they use different scales. The level of corruption in the banking sector seems to be on average significantly lower than in the economy as a whole. Finally the disclosure variable is quite high giving a reading of 0.82 on a scale of 0 to 1.

[Table 2 approximately here]

6. Results of the Panel Data Analysis

The results of the empirical analysis are presented in Tables 3 to 8, for the overall sample, for the three different regions, for the size of the financial institutions, for high and middle income countries, for the timing of entrance into the EU enlargement process and for the specialization of the financial institution, respectively.

The Relationship between Bank Profitability and Stability

First, we concentrate on the results regarding the relationship between bank profitability and bank stability reported in Table 3. Models (1) to (5) use different dependent variables. More specifically,

[6] Other financial institutions comprise bank holding and holding companies, clearing institutions, finance companies, Islamic banks, micro-financing institutions, private banking and asset management, specialized governmental credit and other credit institutions.

[7] For a detailed description of the various sub-samples and the countries that were included in each case see Table A3 in Appendix.

models (1), (2) and (3) are estimated versions of equation (5) using for the $Prof_{ik,t}$ dependent variable three alternative proxies: ROAA, ROAE and NIM respectively. While models (4) and (5) are estimated versions of equation (6) that have as the dependent variable the stability of the banks ($Stab_{ik,t}$) using the natural log Z-score and the FSSI respectively. The results from models (1), (2) and (3) clearly indicate a positive relationship between bank profitability and bank stability using the lnZ-score regardless of looking at ROAA, ROE or NIM. There may be particular reasons for this result, as European Banks with less risk of bankruptcy were able to perform better during the period under consideration as they had access to cheaper capital and better quality loan books. Our results are in line with those reported in the literature showing that profitability ratios are important determinants of bank distress as discussed in Bongini *et al.* (2001). The results also extend to the FSSI measure of financial stability which shows a similar significant impact on ROAA, ROAE or NIM. On the other hand, regarding models (4) and (5) we also find that profitability as measured by the ROAE and NIM impact positively on bank stability as measured by the lnZ-score and FSSI measures.

[Tables 3, 4 and 5 approximately here]

It is important to mention that we find similar results when we divided our sample into sub-samples. Similar to Andrieș and Căpraru (2014), we have applied a regional differentiation criterion to our sample, although different from the one applied by the aforementioned researchers[8]. Table 4 shows the results of the same models for the three regional sub-samples: Eurozone, non-euro EU and EU candidate countries (including in our sample Croatia, which is a member of EU since July 2013). Bank stability has a significant positive role in the profitability of the banking sector in all three regions in all cases for models (1), (2) and (3) but the results are somewhat stronger for Eurozone and Non Eurozone countries than for the EU candidate countries (where the FSSI measure is deemed as non-significant). Also, we observe that the profitability indicators have a positive effect on the degree of bank stability for the Eurozone and for the non-euro EU countries depicted in models (4) and (5) as was observed for the overall sample. However, ROAA is significant only for the non-euro EU group; ROAE affects significantly all groups but only for the lnZ-score case; while NIM is non-significant for the Eurozone countries.

Table 5 presents results regarding the size of a financial institution. For all categories of financial institutions (large, medium and small), the results reveal a significant positive impact of profitability indicators on bank stability (with the sole exemption of ROAA for the large sub-sample). Similar results are obtained concerning the influence of bank stability indicators on bank profitability (there is only one

[8] Andrieș and Căpraru (2014) investigated competition in the EU27 banking systems for the period 2004-2010, outlining the results for old members compared with new members, and also Eurozone compared to non-euro countries.

negative non-significant coefficient for FSSI on ROAA for the large group). Finally, after dividing the sample into the other three cases: by country income, moment of entrance into the EU and specialization of the financial institution (see Tables 6, 7 and 8); our overall results seem to be very robust on all alternative cases suggesting a very strong positive relationship as it was expected from the theoretical predictions.

The Role of Economic Freedom

Regarding the economic freedom variable, the overall results in Table 3 suggest a significant negative impact on bank profitability as measured by ROAA and NIM but a significant positive impact on ROAE. When looking at Financial Stability we detect mixed results, since there is a significant negative impact on the risk of bankruptcy, but also a significant positive impact on financial stability as measured by the FSSI.

When it comes to splitting the sample into Eurozone, EU non Euro and EU candidate countries in Table 4; the results suggests no impact of economic freedom to the Eurozone countries; negative impact for two cases of the EU non-Euro (for ROAA and NIM) but positive for ROAE; while for the EU candidates it is negative for ROAA and positive for NIM. The results for Financial Stability are less mixed. In general economic freedom is found to be strongly positive for all regional cases and for both specifications (ln-Z and FSSI) with the exemption of the Eurozone where for the ln Z-score it is found to be negative and significant.

When we divide the sample between large, medium and small banks (see Table 5) we see a negative impact of economic freedom on bank profitability using ROAA for large banks (the other two cases are non-significant), a positive impact for medium size banks on ROAE but a negative impact on NIM; while for smaller banks we find no effect on profitability on any of the three measures. Thus, economic freedom seems to be non-significant for smaller banks but with a mixed effect for the other two cases. The impact of economic freedom on financial soundness is also mixed for large and medium size banks, since it is negative using lnZ for medium banks but positive using FSSI for both large and medium banks. Again for the small case no significant impact was detected.

When we divide the sample into high income and upper middle income countries (see Table 6) we observe mixed results again. Economic freedom for high income countries has a negative impact when measuring profitability by ROAA and NIM and a positive impact when using ROAE. For upper middle income countries we detect a negative impact on ROAA and ROAE and a positive impact on NIM. Also, when we check the impact of economic freedom on the stability measures, for high income countries it is positive when using FSSI but negative when using lnZ; while we detect positive effects for both lnZ and FSSI for upper income countries.

Table 7 divides the EU by founding members, Enlargement A and B. The results for Economic Freedom on profitability are positive for the ROAE but negative for NIM for the founding members; negative for NIM for the enlargement group A and positive for both ROAE and NIM for enlargement group B. The results for economic freedom on stability for the founding members are negative using lnZ but positive using FSSI for both the founding members and enlargement group B but the reverse is true for enlargement group A. This suggests very mixed results for the impact on economic freedom for both profitability and stability in the European area.

Finally, the results reported in Table 8 are again quite mixed. For commercial banks it is negative for ROAE and NIM but positive for ROAA; for cooperative banks it is positive using ROAA and ROAE but negative using NIM; while for investment banks we have positive effects for ROAE and NIM only. For real estate banks we have a negative effect on ROAA and for savings banks a positive effect for ROAE but a negative effect for NIM. Finally for other banks we detect a negative effect on both ROAA and NIM. In terms of the impact on financial stability Economic freedom has a negative impact on lnZ and a positive effect on FSSI for commercial banks, a negative impact on FSSI for investment banks, and a positive impact for both lnZ and FSSI for savings and other banks.

The Role of Regulation

When it comes to the impact of regulation we generally detect a strong negative impact of regulation on profitability from both the REG1 and REG2 variables, there is however one exception and that is when we use ROAE where the REG1 has a significant positive impact. Overall, our results are in line with those obtained by Demirgüç-Kunt and Huizinga (1999) showing that higher levels of regulation impose higher expenses on financial institutions and/or limit revenues raising activities. In addition, an effective regulatory framework may also reduce the risk *premia* on bank lending which can negatively affect bank profitability. The impact of regulation on financial stability is positive using the lnZ-score but negative using the FSSI coefficient in the overall sample showing the importance of different definitions of stability.

The negative results of regulation on profitability (as shown in Table 4) are particularly strong in the case of the Eurozone economies but mixed results are obtained in the case of the non euro EU and EU candidate countries. For the EU non-Euro group REG1 is significant and negative for ROAE, significant and positive for NIM and non-sginificat for ROAA; while REG2 two has a significant positive effect for the two first measures (ROAA, ROAE) but significant negative effect for NIM. For the EU candidate countries we detect a positive impact from REG1 on ROAA but a negative impact on NIM and REG2 is now non-significant for all cases. When it comes to stability for the Eurozone we have a positive impact from both REG1 and REG2 using the lnZ-score but a negative impact using FSSI.

For the non Eurozone group countries we obtain non-significant effects of both REG1 and REG2 on lnZ, while for FSSI it is significant and positive for the case of REG1 and significant but negative for the case of REG2. Finally, for the EU candidate countries we detect a positive impact of REG1 on both lnZ and FSSI while REG2 appears to be non-significant.

Regulation has mixed effects on profitability when we examine at institutions by size in Table 5. We observe a negative impact on NIM using both REG1 and REG2 though we detect a positive impact on ROAA and ROAE from the REG2 variable for large institutions. For medium size institutions REG1 has a positive impact on ROAE and negative for NIM; while REG2 is non-significant for all three profitability definitions. For smaller banks the REG2 definition has a negative impact on all three measures of profitability; and REG1 is significant and negative only for NIM. When it comes to stability there are some differences, for large banks REG1 has a positive impact on FSSI, while for medium and small banks the impact is negative. The REG2 variable also has a significant negative impact on FSSI for medium and small banks but no effect is detected for larger banks. However for the lnZ measure of stability we detect a positive impact for small banks only.

When it comes to high income level countries the results are again mixed as depicted in Table 6. For the high-income group, using the REG1 variable there is a significant negative impact on both ROAA and NIM but a positive effect on ROAE. While using the REG 2 variable gives a negative impact on all three measures of profitability. This contrasts somewhat with the results from middle income countries where regulation using REG1 seems to have a significant positive effect on profitability as measured by ROAA and ROAE and positive effect on all three measures of profitability for REG2. With regards to stability, REG1 and REG2 are significant positive for the lnZ-score but significant and negative for FSSI and for high-income countries; while for the middle-income ones REG1 is positive and REG2 is negative only for the FSSI case (the effect on NIM is totally non-significant).

Additionally, regulation seems to negatively impact profitability for REG2 in the case of the founding members of the EU in Table 7 with less clear results for the Enlargement groups A and B. For EU enlargement group A we find a positive impact from REG1 on ROAA and ROAE but a negative impact on these two measures of profitability using REG2. However for Enlargement group B for REG2 we find a positive impact on ROAA and ROAE showing that regulation may or may not undermine bank profitability. Regulation seems to have no impact on financial stability for either the founding members or enlargement groups A and B.

When it comes to bank specialization (Table 8) we again see mixed results concerning the impact on profitability. For commercial banks there is negative impact of REG1 on ROAA and NIM but a

positive impact on ROAE. We also see that REG1 impacts positively on ROAA and ROAE for cooperative banks but REG2 has a negative impact on ROAA and NIM for investment banks. We also detect negative impacts of regulation on profitability using REG1 on NIM other financial institutions but a positive effect on ROAE for savings institutions (all other cases are non-significant), while REG2 has a negative impact on NIM for real estate and mortgage banks and on ROAE for other financial institutions (all other cases are non-significant). When it comes to financial stability we find REG1 has a significant negative impact on lnZ only for commercial banks, while a negative impact was registered for FSSI when considering commercial, real estate and mortgage and other banks. The REG2 variable definition has a negative effect on FSSI for commercial and cooperative banks but a positive impact on FSSI for investment banks and on lnZ for other banks.

[Tables 6, 7 and 8 approximately here]

The Role of Corruption

Corruption exists in varying degrees in every country worldwide and it is generally regarded as having adverse effects on an economy and the profitability and stability of the banking sector. However, the academic literature suggests that corruption can actually raise bank profitability and soundness. When we check the overall sample (see Table 3) we can see that the results on corruption on ROAE are negative for general corruption (CORR1) and corruption of bank officials (CORR2) but positive on NIM using the CORR2 variable. We also detect a negative impact on lnZ for CORR1 but a positive effect on lnZ for CORR2 making it hard to conclude how corruption affects banking sector stability.

When looking at the results by region in Table 4 we can see that CORR1 has a negative impact on ROAE for the Eurozone area, non Euro EU and EU candidate countries but a positive impact on ROAA for the non Eurozone EU countries, and for NIM for the EU candidates. In terms of stability the CORR1 has a negative impact on lnZ for the Eurozone but a positive impact on FSSI for EU candidate countries; while CORR2 has a positive impact on lnZ for the Eurozone countries and negative for the EU candidate countries. For the non Eurozone group there is no discernible impact stemming from neither of the two corruption variable definitions.

When we look at bank size in Table 5 we find the CORR1 has a negative impact on ROAE for large and medium size banks but a positive effect on ROAA for large banks. The CORR2 produces mixed results having a positive impact on NIM for large and medium size banks but a negative effect in the case of small banks. When it comes to financial stability we find very mixed results as well with CORR1 having a negative impact on lnZ for large, medium and small banks, while a positive impact of CORR2 on lnZ was observed for large banks. Though, we have obtained a negative impact of CORR2 on FSSI for large and small banks.

In Table 6 we observe that the influence of CORR1 is negative for all three alternative measures of profitability for upper income countries with no discernible effects for upper middle income countries. CORR2 is negative for ROAE but positive for NIM in high income countries; while it is consistently negative for ROAA and ROAE for the upper middle income countries. When it comes to financial stability we get a negative effect of CORR1 on lnZ but a positive effect from CORR2 and a positive effect of CORR1 on FSSI for the high income countries; while neither of the corruption variables seem to play a role on the stability of upper middle income countries.

In Table7 we detect a strong negative impact of corruption as measured by CORR1 in founding members on NIM, while for Enlargement group B, apart from NIM a negative impact was also observed for ROAE. However, when we use the CORR2 we find a positive effect for the founding members on ROAE and mixed results for Enlargement group B with a negative effect on ROAE but a positive effect on NIM. The effects of corruption on stability are mixed with CORR1 having a negative effect on lnZ for the founding members but when it comes to enlargement group B we find CORR2 has a positive effect on lnZ but a negative effect on FSSI.

When we look at the impact of corruption by bank type in Table 8 we find a negative impact of CORR1 on ROAE for commercial banks; for ROAA and NIM for cooperative banks and for RAA for savings banks (all other effects are non-significant). However, the effect of CORR2 is negative only for the case of ROAE of commercial banks and positive for NIM of commercial banks; ROAA and NIM of cooperative banks and others; NIM of real estate and mortgage, and savings banks. When it comes to financial stability CORR1 has a negative impact on lnZ for commercial and real estate and mortgage banks, while a positive impact was observed for cooperative banks using the same profitability measure. Moreover, CORR2 has a positive impact on lnZ for commercial banks, while for real estate and mortgage banks the positive impact was observe for FSSI using the same corruption indicator.

Our mixed results for the impact of corruption contrast with those obtained by Aburime (2008) who shows that an increase in the corruption index implies a decrease in bank profitability for the Nigerian banking market. Likewise, Pagano (2008) finds that corruption is a significant determining factor in evaluating bank lending rates and that at relatively low levels of corruption an increase in corruption leads to a fall in lending rates which decreases bank profitability. However, at high levels of corruption an increase in corruption can actually raise lending rates.

The Role of Transparency

The last issue we discuss refers to the importance of transparency in the banking sector, and its impact on bank profitability and banks. The overall results in Table 3 clearly show that transparency as

measured by DISCL has a negative impact on profitability using all three measures. This negative impact is surprisingly robust across all the tables. There are a few exceptions where DISCL has a positive impact: (i) first, on ROAE for EU candidate countries; (ii) second on ROAE for cooperative banks and on ROAA for real estate and mortgage banks. With reference to stability the results suggest that disclosure has a strongly positive impact upon stability using both the lnZ and FSSI measures. The only instances of negative effects on financial stability are in the case of EU candidate countries, small banks and cooperative banks when measuring bank stability by lnZ coefficient.

Thus, the obtained results overall support the hypothesis that disclosure and information sharing can help reduce adverse selection and moral hazard and can thereby reduce default rates. Financial institutions are often unable to notice the particularities of each borrower which raises the adverse selection issues; therefore there is an inability to control general risks, such as the behaviour of the borrower after receiving a loan. In our analysis, the empirical results suggest that there is an overall negative relationship between bank disclosure and bank profitability and a positive impact on financial stability.

7. Conclusions

The role of the banking sector in the events of recent years shows the importance looking at how banks are affected by the degree of economic freedom, a sound regulatory framework, reducing corruption and increasing transparency in helping to ensure a return to profitability and stability. The purpose of this paper has been to provide some empirical evidence on how these variables impact upon bank performance and bank stability. Overall, our results clearly indicate that there is a clear trade-off between increasing financial stability and bank profitability. However the impact of increasing economic freedom, increasing regulation, reducing corruption and increasing transparency is less clear-cut and more nuanced at the empirical level. In general, greater economic freedom can decrease or increase profitability or stability depending on the measure used. Increased regulation appears to have a detrimental impact on bank profitability and a tendency to reduce the risk of bankruptcy. There was less evidence at the aggregate level that reducing corruption improved bank profitability and no evidence that it increased bank stability. We did, however, detect evidence at the aggregate level that increased disclosure adversely affected bank profitability and surprisingly seems to increase the risk of bankruptcy.

The main contribution of this paper has been to show that conclusions obtained using aggregate data do not necessarily hold when the data is disaggregated. We find that results at the aggregate level can hide significant and even contradictory results once the data is disaggregated. In the case of greater economic freedom we find that it adversely affects financial stability in middle income countries but is good for financial stability in low income countries. We find that for large financial institutions there is

some evidence to suggest that greater regulation can improve financial stability but this is not necessarily the case for medium and small size institutions. Corruption is more of a problem for small and medium size institutions than for larger ones. For the Eurozone plus countries, the results show that excessive regulation can adversely affect the profitability indicators of the financial sector and that there may be significant gains in increasing financial disclosure rather than in increasing regulation.

In response to the financial crisis and the Eurozone crisis, Europe has begun a process of improving the regulation and supervision of European financial institutions. For example, in December 2010 the European Systemic Risk Board (ESRB) was created as an independent body of the EU with responsibility for macro-prudential supervision of the financial system, and for preventing or reducing risks in the EU financial sector. In addition, in 2011 the European System of Financial Supervision (ESFS) was created, as a decentralized and multilayer group of micro and macro-prudential organizations, with its main objective being to ensure a harmonized and consistent supervision and regulatory framework in the EU. Our results suggest that the impact of changes in the regulatory and supervisory framework and the greater degree of harmonization of regulations can have significantly differential impacts on the Eurozone plus and enlargement groups A and B. These differential effects on bank profitability and bank stability mean that the harmonization of regulation and supervision needs to be done in a way that recognizes the differential impact. In addition, when stress testing banks across the EU prospective changes in the regulatory environment need to borne in mind, especially as they impact large, medium and smaller size banks in different ways.

Finally, we should note that our analysis has some limitations. The European banking industry has been developing rapidly in the last 15 years in a continuously changing regulatory and economic environment. As such, our results capture a key period in which there was a massive expansion of the sector followed by a major crisis and a prolonged period of dealing with that crisis. Results in the future might be very different should the sector stabilize and bank operations move away from some of the riskier operations of the past. There may also be risks to the financial system as a whole if greater regulation of the banking sector shift activities to the less regulated shadow banking sector.

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TABLES

Table 1: Variable definition and sources

Variables		Definition	Data sources
Bank performance	Return on average assets (ROAA)	Net income divided by average total assets	Bankscope Annual Reports
	Return on average equity (ROAE)	Net income divided by average total equity	Bankscope Annual Reports
	Net interest margin (NIM)	The difference between the interest income produced by banks or other financial institutions, and the volume of interest paid out to their lenders relative to the volume of their assets	Bankscope Annual Reports
Bank soundness	Z score (Z)	(Equity/Assets + ROAA)/ Volatility of ROAA	Authors calculations
	Alternative Z score (Z_{alt})	The sum of capital adequacy ratio and average return on asset ratio, over the dispersion of the return on asset ratio.	Authors calculations
	Financial System Soundness Index (FSSI)	This index is assessing the degree of soundness of a given system, and provides an *ex ante* measure of soundness. The index is composed of 2 variables: capital adequacy ratio and the inversed ratio of NPLs, weighted by the intermediation ratio. It was computed using the methodology of Das *et al* (2004).	Authors calculations
Economic freedom	Economic Freedom (EF)	The heritage index of economic freedom an index from 0 to 100 measuring economic freedom based on 10 dimensions, with higher number corresponding to greater economic freedom.	Heritage
Regulation	Business Regulation (REG1)	The degree to which business regulation represents and obstacle to the overall economic activity(1-no obstacle, 2-minor obstacle, 3- a moderate obstacle, 4-major obstacle)	WBES
	Availability of regulation (REG2)	Availability of laws and regulation. It takes values from 1 to 6, from a reduced level of laws to a developed level of laws and regulation	WBES
Corruption	Corruption (CORR1)	Corruption of bank officials as an obstacle for the operation and growth of the business (1-no obstacle, 2-minor obstacle, 3- a moderate obstacle, 4-major obstacle)	WBES
	General constraint-corruption (CORR2)	Represents the overall value of corruption, and it takes values form 1 to 4 (1-no obstacle, 2-minor obstacle, 3- a moderate obstacle, 4-major obstacle)	WBES
Transparency	Disclosure index (DISCL)	Measures the level of detail which banks provide on 17 dimension of accounting information in their public accounts. For each sub-index, a 0 was assigned if there was no entry in any of the corresponding categories and a 1 otherwise. The variables were computed using the methodology of Nier (2005) as explained in Nier Table 1, Appendix.	Authors calculations

Note: *WBES stands for World Business Environment Survey (2000), WDI stands for World Development Indicator.*

Table 2: Descriptive statistics

Variable	Obs.	Mean	Min	Max
ROAE	6093	4.88	-87.59	84.97
		(9.69)		
ROAA	6096	0.62	-43.68	36.00
		(2.74)		
NIM	6094	3.23	-3.01	50.88
		(3.05)		
Z	6204	19.27	-9.66	243.15
		(22.16)		
Z alt	6204	19.27	-10.66	241.92
		(22.11)		
FSSI	6197	0.24	-13.86	30.17
		(0.94)		
EF	8564	66.37	43.50	82.60
		(7.43)		
REG1	3900	2.08	1.00	4.00
		(1.15)		
REG2	3922	3.09	1.00	6.00
		(1.47)		
CORR1	3922	1.58	1.00	4.00
		(1.01)		
CORR2	3922	2.17	1.00	4.00
		(1.15)		
DISCL	6098	0.82	0.00	1.00
		(0.16)		

Note: *Obs. stands for the number of observations; in parentheses we have standard errors.*
Source: Authors calculations.

Table 3: Empirical results for the entire sample (2SLS)

Variables	Model specification				
	(1) ROAA	(2) ROAE	(3) NIM	(4) ln Z	(5) FSSI
ROAA					0.04#
					(0.01)
ROAE				0.03#	0.01
				(0.01)	(0.01)
NIM				0.03#	0.03#
				(0.01)	(0.01)
LNZ	0.48#	2.01#	0.24#		
	(0.05)	(0.15)	(0.04)		
FSSI	0.41#	1.82#	0.74#		
	(0.08)	(0.67)	(0.14)		
EF	-0.03#	0.13#	-0.06#	-0.04#	0.03#
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
REG1	-0.09#	0.48#	-0.32#	0.08#	-0.02#
	(0.03)	(0.12)	(0.04)	(0.01)	(0.01)
REG2	-0.03	-0.17*	-0.14#	0.04#	-0.03#
	(0.02)	(0.08)	(0.03)	(0.01)	(0.01)
CORR1	0.03	-0.61#	-0.01	-0.06#	0.01
	(0.04)	(0.12)	(0.06)	(0.02)	(0.01)
CORR2	0.04	-0.65#	0.53#	0.03*	-0.01
	(0.03)	(0.12)	(0.05)	(0.02)	(0.01)
DISCL	-0.88#	-1.64#	-1.39#	0.94#	0.29#
	(0.19)	(0.69)	(0.37)	(0.14)	(0.02)
C	1.52#	-5.70#	7.37#	1.98#	-0.48#
	(0.41)	(1.44)	(0.53)	(0.20)	(0.07)
R sq	0.09	0.10	0.11	0.10	0.05
F test/Wald Chi2	203.38	772.89	556.73	295.74	242.91
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Obs.	3893	3891	3892	3895	3892

Note: *Instrumental variables (2SLS) regression; * denotes statistical significance at 5% and # denotes statistical significance at 1%. Values of standard errors in parentheses.*
Source: Authors calculations

Table 4: Empirical results by region (2SLS)

	Model specification														
	EUROZONE					EU NON-EURO					EU CANDIDATE				
Variable	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**
ROAA					0.01					0.03#					0.01
					(0.01)					(0.01)					(0.01)
ROAE				0.02#	0.01				0.04#	-0.01				0.13#	0.01
				(0.01)	(0.01)				(0.01)	(0.01)				(0.02)	(0.01)
NIM				0.01	0.01				0.04#	0.03#				0.09#	0.03#
				(0.01)	(0.01)				(0.01)	(0.01)				(0.01)	(0.01)
LNZ	0.33#	1.82#	0.10#			0.58#	1.89#	0.28#			1.12#	1.84#	1.39#		
	(0.04)	(0.23)	(0.03)			(0.07)	(0.28)	(0.08)			(0.32)	(0.18)	(0.19)		
FSSI	0.28#	1.81*	0.27#			0.94#	0.55	3.16#			-0.18	0.26	1.18		
	(0.08)	(0.83)	(0.08)			(0.15)	(0.72)	(0.35)			(0.43)	(0.47)	(0.73)		
EF	0.01	0.02	-0.03	-0.06#	0.03#	-0.03#	0.17#	-0.08#	0.03#	0.04#	-0.11*	-0.07	0.16#	0.03#	0.02*
	(0.01)	(0.06)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.05)	(004)	(0.04)	(0.01)	(0.01)
REG1	-0.06*	0.06	-0.18#	0.06#	-0.06#	-0.04	-0.64#	0.26#	0.04	0.01*	0.52#	0.21	-0.74#	0.11*	0.07#
	(0.03)	(0.18)	(0.03)	(0.02)	(0.01)	(0.05)	(0.16)	(0.10)	(0.03)	(0.01)	(0.18)	(0.18)	(0.20)	(0.06)	(0.03)
REG2	-0.08#	-1.07#	-0.05	0.06#	-0.03#	0.12#	0.54#	-0.18#	-0.02	-0.01*	0.02	-0.02	-0.06	0.04	0.01
	(0.03)	(0.16)	(0.03)	(0.02)	(0.01)	(0.04)	(0.08)	(0.06)	(0.03)	(0.01)	(0.08)	(0.09)	(0.12)	(0.03)	(0.01)
CORR1	-0.07	-0.85#	0.07	-0.12#	-0.01	0.18#	-0.36#	-0.01	0.02	0.01	-0.14	-0.44#	0.46#	-0.04	0.06#
	(0.04)	(0.28)	(0.06)	(0.03)	(0.01)	(0.05)	(0.09)	(0.11)	(0.03)	(0.01)	(0.19)	(0.14)	(0.16)	(0.05)	(0.02)
CORR2	-0.01	0.44	-0.09	0.15#	-0.02	-0.01	-0.07	0.39#	0.05	-0.01	-0.43#	-0.31	0.25	-0.10*	-0.03
	(0.04)	(0.27)	(0.05)	(0.03)	(0.01)	(0.05)	(0.12)	(0.10)	(0.03)	(0.01)	(0.14)	(0.19)	(0.17)	(0.05)	(0.02)
DISCL	-0.78*	-4.71	-2.20#	0.99#	0.61#	-1.26#	-3.05#	-1.29#	1.05#	0.21#	1.40	2.34#	1.26	-0.67#	0.15#
	(0.40)	(2.73)	(0.59)	(0.31)	(0.09)	(0.23)	(0.75)	(0.43)	(0.16)	(0.02)	(0.78)	(0.72)	(1.15)	(0.24)	(0.05)
C	0.50	8.95*	6.16#	4.91#	-1.12#	1.41#	-10.57#	8.92#	1.19#	-0.30#	5.02	1.39	-9.89#	0.54	-1.14#
	(0.52)	(4.22)	(0.76)	(0.40)	(0.27)	(0.50)	(1.17)	(0.75)	(0.24)	(0.05)	(3.85)	(2.07)	(2.86)	(0.83)	(0.30)
R.sq	0.07	0.08	0.04	0.12	0.08	0.13	0.17	0.13	0.14	0.11	0.23	0.34	0.29		0.17
Wald χ^2	77.12	177.43	101.88	234.45	95.27	153.03	359.94	441.24	139.14	196.47	51.48	148.65	158.60	176.18	48.24
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Obs.	1999	1998	1999	2000	1999	1533	1532	1532	1534	1532	361	361	361	361	361

Note: *Instrumental variables (2SLS) regression* denotes statistical significance at 5% and # denotes statistical significance at 1%. Values of standard errors in parentheses.*
Source: Authors calculations

Table 5: Empirical results by financial institutions' size (2SLS)

	LARGE					MEDIUM					SMALL				
Variable	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**
ROAA					-0.01					0.01					0.04#
					(0.01)					(0.01)					(0.01)
ROAE				0.06#	0.03#				0.03#	0.02*				0.01#	-0.01
				(0.01)	(0.01)				(0.01)	(0.01)				(0.01)	(0.01)
NIM				0.04#	0.04#				0.01	0.02*				-0.02	0.01
				(0.01)	(0.01)				(0.01)	(0.01)				(0.02)	(0.01)
LNZ	0.69#	2.03#	0.71#			0.43#	2.17#	0.06			0.44#	1.45#	0.02		
	(0.12)	(0.27)	(0.10)			(0.05)	(0.23)	(0.06)			(0.09)	(0.37)	(0.06)		
FSSI	-0.03	2.46#	0.69*			0.30#	2.43#	0.26#			1.06#	4.04*	0.93#		
	(0.11)	(0.53)	(0.30)			(0.09)	(1.00)	(0.09)			(0.25)	(1.83)	(0.29)		
EF	-0.05#	0.05	-0.01	0.01	0.03#	0.01	0.22#	-0.10#	-0.04#	0.02*	-0.01	-0.01	0.01	-0.01	0.01
	(0.01)	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.07)	(0.02)	(0.01)	(0.01)
REG1	-0.01	0.02	-0.27#	0.04*	0.04#	-0.04	0.48#	-0.33#	0.01	-0.04#	-0.01	0.18	-0.10*	0.11#	-0.03#
	(0.04)	(0.16)	(0.10)	(0.02)	(0.01)	(0.04)	(0.17)	(0.05)	(0.02)	(0.01)	(0.04)	(0.26)	(0.04)	(0.03)	(0.01)
REG2	0.09#	0.32#	-0.14*	-0.03	0.01	-0.04	-0.22	-0.02	0.03	-0.03#	-0.14#	-1.33#	-0.11#	0.15#	-0.04#
	(0.03)	(0.09)	(0.06)	(0.02)	(0.01)	(0.03)	(0.15)	(0.05)	(0.02)	(0.01)	(0.04)	(0.25)	(0.04)	(0.03)	(0.01)
CORR1	0.16#	-0.26#	-0.08	-0.05*	0.01	-0.02	-0.72#	0.21*	-0.07*	0.01	-0.03	-0.52	0.01	-0.12*	0.02*
	(0.05)	(0.10)	(0.09)	(0.02)	(0.01)	(0.06)	(0.26)	(0.09)	(0.03)	(0.01)	(0.08)	(0.45)	(0.09)	(0.06)	(0.01)
CORR2	-0.07	-0.23	0.39#	0.07#	-0.02#	0.02	-0.41	0.46#	0.04	-0.03	0.01	0.30	-0.18*	0.04	-0.03#
	(0.04)	(0.12)	(0.10)	(0.02)	(0.01)	(0.06)	(0.24)	(0.08)	(0.03)	(0.02)	(0.07)	(0.42)	(0.10)	(0.05)	(0.01)
DISCL	-0.98#	-2.69#	-1.03	1.07#	0.27#	-0.42	0.73	-1.71#	0.92#	0.30#	-1.41*	-16.42#	-2.80#	-0.89*	0.33#
	(0.26)	(0.60)	(0.57)	(0.18)	(0.02)	(0.32)	(1.42)	(0.42)	(0.22)	(0.04)	(0.62)	(4.55)	(1.06)	(0.40)	(0.09)
C	2.82#	-4.11*	3.99#	1.11#	-0.57#	-0.48	-13.64#	9.81#	3.04#	-0.33*	1.36*	21.85#	5.30#	3.42#	-0.15
	(0.64)	(1.96)	(0.95)	(0.29)	(0.08)	(0.68)	(2.22)	(0.74)	(0.31)	(0.16)	(0.64)	(5.35)	(0.85)	(0.52)	(0.14)
R.sq	0.13	0.18	0.06	0.23	0.14	0.07	0.13	0.23	0.09	0.05	0.10	0.08	0.05	0.09	0.11
Wald Chi2	132.60	231.65	92.37	196.08	268.24	82.53	427.76	371.31	129.84	79.45	48.91	104.19	48.14	79.85	48.23
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Obs.	1365	1364	1364	1366	1364	1531	1531	1531	1532	1531	997	996	997	997	997

Note: *Instrumental variables (2SLS) regression; * denotes statistical significance at 5% and # denotes statistical significance at 1%. Values of standard errors in parentheses.*
Source: Authors calculations

Table 6
Empirical results by country income level (2SLS)

Variable	Model specification									
	HIGH INCOME COUNTRIES					UPPER MIDDLE INCOME COUNTRIES				
	(1) ROAA	(2) ROAE	(3) NIM	(4) ln Z	(5) FSSI	(1) ROAA	(2) ROAE	(3) NIM	(4) ln Z	(5) FSSI
ROAA					0.03#					0.01*
					(0.01)					(0.01)
ROAE				0.03#	0.01				0.18#	0.01
				(0.01)	(0.01)				(0.02)	(0.01)
NIM				0.01*	0.03#				0.04#	0.03#
				(0.01)	(0.01)				(0.01)	(0.01)
LNZ	0.38#	2.08#	0.11#			0.94#	1.25#	0.59#		
	(0.04)	(0.20)	(0.05)			(0.15)	(0.11)	(0.10)		
FSSI	0.34#	1.93#	0.46#			0.43*	0.50	2.86#		
	(0.08)	(0.74)	(0.10)			(0.22)	(0.27)	(0.56)		
EF	-0.04#	0.16#	-0.07#	-0.03#	0.02*	-0.03*	-0.02	0.07#	0.03#	0.02*
	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
REG1	-0.10#	0.40#	-0.31#	0.06#	-0.04#	0.27#	0.28#	-0.17	-0.01	0.02#
	(0.02)	(0.15)	(0.04)	(0.02)	(0.01)	(0.08)	(0.08)	(0.10)	(0.03)	(0.01)
REG2	-0.04*	-0.48#	-0.14#	0.05#	-0.03#	0.10*	0.15#	0.18#	-0.01	-0.01
	(0.02)	(0.12)	(0.04)	(0.01)	(0.01)	(0.05)	(0.05)	(0.07)	(0.02)	(0.01)
CORR1	-0.12#	-0.38*	-0.22#	-0.08#	0.02*	0.09	-0.12	0.02	0.01	0.01
	(0.04)	(0.19)	(0.08)	(0.02)	(0.01)	(0.07)	(0.07)	(0.08)	(0.03)	(0.01)
CORR2	0.06	-0.47#	0.56#	0.06#	-0.02	-0.33#	-0.25#	-0.20	0.06	0.01
	(0.03)	(0.16)	(0.07)	(0.02)	(0.01)	(0.08)	(0.09)	(0.11)	(003)	(0.01)
DISCL	-0.91#	-1.43	-1.65#	1.13#	0.33#	-0.80*	-0.88*	-0.84	0.57*	0.22#
	(0.23)	(0.98)	(0.45)	(0.15)	(0.03)	(0.41)	(0.40)	(0.50)	(0.29)	(0.04)
C	1.39#	-6.46#	9.22#	2.86#	-0.42#	1.55	0.64	-0.58	0.10	-0.39#
	(0.34)	(1.89)	(0.67)	(0.23)	(0.10)	(1.11)	(0.72)	(0.87)	(0.38)	(0.07)
R.sq	0.09	0.07	0.12	0.10	0.05	0.16	0.26	0.15	0.29	0.14
F test/Wald $\chi 2$	157.68	357.54	445.19	242.01	207.01	77.11	194.69	181.76	176.98	105.41
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Obs.	2967	2965	2966	2969	2966	926	926	926	926	926

Note: *Instrumental variables (2SLS) regression; * denotes statistical significance at 5% and # denotes statistical significance at 1%. Values of standard errors in parentheses.*
Source: Authors calculations

Table 7: Empirical results by timing of entrance into the EU (2SLS)

	Model specification														
	FOUNDING MEMBERS					EU ENLARGEMENT – A					EU ENLARGEMENT – B				
Variable	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**
ROAA					0.01					-0.03					0.01
					(0.01)					(0.02)					(0.01)
ROAE				0.03#	0.01				0.01	0.03#				0.03#	0.02*
				(0.01)	(0.01)				(0.01)	(0.01)				(0.01)	(0.01)
NIM				0.14#	-0.02#				0.14#	0.01				0.04#	0.01
				(0.03)	(0.01)				(0.04)	(0.01)				(0.01)	(0.01)
LNZ	0.34#	2.73#	0.25#			0.31#	0.67*	0.25#			0.68#	0.95#	0.52#		
	(0.04)	(0.35)	(0.03)			(0.11)	(0.31)	(0.06)			(0.07)	(0.14)	(0.08)		
FSSI	-0.05	-0.62	0.69#			0.22#	3.66#	0.06			0.42#	2.45#	0.34*		
	(0.09)	(1.28)	(0.12)			(0.08)	(0.88)	(0.11)			(0.11)	(0.94)	(0.17)		
EF	0.01	0.16#	-0.05#	-0.04#	0.02*	0.02	0.07	-0.14#	0.16#	-0.02*	-0.01	0.11#	0.02*	-0.03#	0.02*
	(0.01)	(0.06)	(0.01)	(0.01)	(0.01)	(0.04)	(0.25)	(0.06)	(0.03)	(0.01)	(0.01)	(0.04)	(0.01)	(0.01)	(0.01)
REG1	0.01	0.28	-0.11#	-0.04	-0.01	0.10*	1.13#	-0.04	0.01	-0.02	-0.08	0.12	-0.07	0.03	-0.02
	(0.04)	(0.31)	(0.04)	(0.03)	(0.01)	(0.05)	(0.31)	(0.05)	(0.05)	(0.02)	(0.05)	(0.20)	(0.09)	(0.02)	(0.01)
REG2	-0.05#	-1.13#	0.14#	0.02	0.01	-0.12*	-0.89#	0.08	-0.10	0.03	0.14#	0.22*	-0.01	-0.02	-0.01
	(0.02)	(0.25)	(0.03)	(0.02)	(0.01)	(0.06)	(0.38)	(0.07)	(0.06)	(0.02)	(0.04)	(0.10)	(0.06)	(0.02)	(0.01)
CORR1	-0.08	-0.54	-0.14#	-0.15#	-0.01	-0.04	-0.27	-0.12	0.11	-0.01	0.09	-0.58#	-0.25#	-0.02	-0.02
	(0.05)	(0.55)	(0.06)	(0.05)	(0.01)	(0.09)	(0.52)	(0.10)	(0.07)	(0.03)	(0.05)	(0.15)	(0.09)	(0.02)	(0.01)
CORR2	0.07	1.21#	-0.01	0.07	0.01	-0.12	-0.78	0.11	-0.11	0.03	-0.05	-0.69#	0.37#	0.10#	-0.03#
	(0.04)	(0.50)	(0.06)	(0.05)	(0.01)	(0.09)	(0.54)	(0.11)	(0.08)	(0.02)	(0.04)	(0.15)	(0.09)	(0.02)	(0.01)
DISCL	-0.66#	-7.54#	-1.56#	1.14#	0.12#	-1.06	-3.14	-0.40	1.93#	1.45#	-1.18#	-0.08	-0.99*	0.91#	0.31#
	(0.24)	(2.39)	(0.28)	(0.25)	(0.03)	(0.71)	(4.43)	(1.04)	(0.69)	(0.22)	(0.27)	(0.56)	(0.49)	(0.18)	(0.03)
C	-0.21	-2.29	5.86#	3.88#	-0.11	0.08	6.14	10.48#	-9.15#	0.22	-0.05	-4.37*	2.03*	2.12#	-0.77#
	(0.39)	(4.49)	(0.56)	(0.48)	(0.09)	(2.66)	(16.67)	(4.01)	(2.20)	(0.74)	(0.63)	(1.99)	(0.94)	(0.27)	(0.17)
R.sq	0.09	0.09	0.15	0.15	0.04	0.11	0.14	0.07	0.12	0.14	0.12	-4.37*	0.04	0.09	0.10
												(1.99)			
F test/Wald χ^2	113.84	109.36	325.74	175.85	127.72	18.95	73.25	38.87	58.94	88.35	106.93	176.53	73.81	117.13	179.30
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Obs.	1485	1485	1485	1487	1485	392	392	392	392	393	1655	1653	1654	1655	1653

Note: *Instrumental variables (2SLS) regression; * denotes statistical significance at 5% and # denotes statistical significance at 1%. Values of standard errors in parentheses.*
Source: Authors calculations

Table 8
Empirical results by the specialization of a financial institution (2SLS)

	Model specification														
Variable	**COMMERCIAL**					**COOPERATIVE**					**INVESTMENT**				
	(1) ROAA	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**
ROAA					0.03#					-0.08#					0.01
					(0.01)					(0.02)					(0.01)
ROAE				0.04#	0.01				0.03#	0.03#				0.01	-0.01
				(0.01)	(0.01)				(0.01)	(0.01)				(0.01)	(0.01)
NIM				0.03#	0.03#				0.23#	-0.03#				0.35#	-0.01
				(0.01)	(0.01)				(0.05)	(0.01)				(0.04)	(0.01)
LNZ	0.55#	2.16#	0.28#			0.17#	1.77*	0.36#			0.84#	1.65#	0.83#		
	(0.06)	(0.20)	(0.07)			(0.07)	(0.87)	(0.07)			(0.15)	(0.53)	(0.11)		
FSSI	0.35#	1.70*	0.44#			-0.31	3.17	-1.57#			2.36	-5.83	-2.36		
	(0.08)	(0.73)	(0.13)			(0.26)	(3.18)	(0.39)			(2.48)	(22.24)	(2.13)		
EF	-0.03#	0.11#	-0.03#	-0.03#	0.03#	0.03#	0.59#	-0.08#	-0.01	-0.01	0.03	0.38#	0.05*	-0.02	-0.03#
	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.12)	(0.02)	(0.01)	(0.01)	(0.02)	(0.11)	(0.02)	(0.01)	(0.01)
REG1	-0.10#	0.73#	-0.35#	0.06#	-0.03#	0.08#	0.80*	-0.10	0.04	0.01	0.15	0.71	-0.09	-0.05	0.01
	(0.03)	(0.16)	(0.05)	(0.02)	(0.01)	(0.03)	(0.36)	(0.07)	(0.05)	(0.01)	(0.10)	(0.68)	(0.09)	(0.06)	(0.01)
REG2	0.02	0.03	-0.14#	0.02	-0.03#	0.02	-0.44	0.13	-0.04	-0.02*	-0.17*	-1.14	0.15*	-0.04	0.02*
	(0.02)	(0.10)	(0.05)	(0.01)	(0.01)	(0.04)	(0.39)	(0.07)	(0.05)	(0.01)	(0.09)	(0.63)	(0.08)	(0.05)	(0.01)
CORR1	0.07	-0.71#	0.03	-0.06#	0.01	-0.15#	-0.34	-0.66#	0.18*	-0.01	0.34	0.38	-0.18	-0.20	0.01
	(0.04)	(0.14)	(0.08)	(0.02)	(0.01)	(0.06)	(0.55)	(0.18)	(0.09)	(0.02)	(0.27)	(1.29)	(0.20)	(0.13)	(0.01)
CORR2	-0.03	-1.03#	0.51#	0.05#	-0.01	0.14#	0.61	0.59#	-0.12	0.01	0.19	-0.51	0.13	0.02	-0.01
	(0.04)	(0.15)	(0.07)	(0.02)	(0.01)	(0.04)	(0.49)	(0.17)	(0.08)	(0.01)	(0.19)	(0.92)	(0.14)	(0.09)	(0.01)
DISCL	-0.88#	-2.15#	-1.12#	0.85#	0.31#	1.09	13.23*	-0.41	-3.12#	-0.01	-2.65#	-4.51	-1.41#	2.19#	0.03#
	(0.22)	(0.78)	(0.43)	(0.14)	(0.03)	(0.61)	(7.02)	(1.04)	(0.86)	(0.20)	(0.58)	(2.65)	(0.56)	(0.18)	(0.01)
C	1.51#	-4.22#	5.84#	2.05#	-0.56#	-3.46#	-50.31#	6.29#	5.89#	0.21	-0.96	-14.19	-2.23	1.54	0.06#
	(0.50)	(1.80)	(0.68)	(0.23)	(0.10)	(0.96)	(11.63)	(1.62)	(1.33)	(0.25)	(1.39)	(8.56)	(1.52)	(0.97)	(0.02)
R.squared	0.10	0.12	0.07	0.10	0.05	0.16	0.22	0.32	0.20	0.15	0.36	0.10	0.39	0.43	0.08
Wald χ^2	149.48	561.02	239.76	216.70	195.82	40.22	49.33	141.77	67.78	27.37	56.68	39.54	87.72	342.53	28.30
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Obs.	2523	2522	2523	2524	2523	225	225	225	225	225	151	151	151	152	151

Note: *Instrumental variables (2SLS) regression; * denotes statistical significance at 5% and # denotes statistical significance at 1%. Values of standard errors in parentheses.*
Source: Authors calculations

Table 8 (continued)
Empirical results by the specialization of a financial institution (2SLS)

	Model specification														
	REAL ESTATE AND MORTGAGE					SAVINGS					OTHER FINANCIAL INSTITUTIONS				
Variable	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**	**(1) ROAA**	**(2) ROAE**	**(3) NIM**	**(4) ln Z**	**(5) FSSI**
ROAA					-0.01					0.06#					0.01
					(0.01)					(0.02)					(0.01)
ROAE				0.05#	0.01				0.03#	-0.03#				0.03#	0.02*
				(0.02)	(0.01)				(0.01)	(0.01)				(0.01)	(0.01)
NIM				0.27#	-0.04#				-0.03	0.03#				0.08#	0.02*
				(0.04)	(0.01)				(0.02)	(0.01)				(0.02)	(0.01)
LNZ	0.23#	2.06#	0.38#			0.21#	1.20#	-0.16			0.55#	2.07#	0.21#		
	(0.06)	(0.52)	(0.08)			(0.07)	(0.49)	(0.15)			(0.14)	(0.47)	(0.06)		
FSSI	-1.82	7.74	-3.20*			1.77#	-0.39	4.89#			0.49	4.99#	0.62		
	(2.40)	(10.53)	(1.52)			(0.30)	(1.38)	(0.72)			(0.35)	(1.59)	(0.37)		
EF	-0.06#	-0.13	-0.06	-0.01	-0.01	0.01	0.39#	-0.14#	0.05#	0.03#	-0.05*	0.04	-0.10#	0.03#	0.02*
	(0.02)	(0.12)	(0.03)	(0.02)	(0.01)	(0.01)	(0.06)	(0.03)	(0.01)	(0.01)	(0.02)	(0.08)	(0.02)	(0.01)	(0.01)
REG1	-0.27	-1.03	0.05	-0.19*	-0.02*	-0.03	0.51*	-0.13	-0.01	-0.01	0.02	0.54	-0.27#	0.06	-0.03#
	(0.22)	(0.64)	(0.13)	(0.09)	(0.01)	(0.03)	(0.27)	(0.07)	(0.03)	(0.01)	(0.08)	(0.41)	(0.08)	(0.05)	(0.01)
REG2	-0.15	0.13	-0.30#	0.03	-0.01	-0.02	-0.24	0.05	-0.01	-0.01	-0.06	-0.70#	-0.04	0.07*	0.01
	(0.13)	(0.41)	(0.12)	(0.08)	(0.01)	(0.03)	(0.19)	(0.09)	(0.03)	(0.01)	(0.07)	(0.30)	(0.06)	(0.03)	(0.01)
CORR1	-0.22	0.53	0.01	-0.51#	-0.01	-0.01	-0.77*	-0.18	-0.04	0.01	0.04	-0.52	0.02	-0.05	-0.01
	(0.41)	(0.92)	(0.19)	(0.16)	(0.01)	(0.08)	(0.38)	(0.18)	(0.05)	(0.02)	(0.12)	(0.37)	(0.11)	(0.05)	(0.01)
CORR2	0.13	-0.81	0.73#	0.02	0.03#	-0.01	-0.01	0.35*	-0.06	0.02	0.16*	-0.02	0.38#	0.01	-0.01
	(0.10)	(0.65)	(0.20)	(0.10)	(0.01)	(0.07)	(0.40)	(0.16)	(0.05)	(0.02)	(0.08)	(0.32)	(0.09)	(0.05)	(0.01)
DISCL	2.81*	3.40	-0.44	0.86	0.11#	-1.34#	-0.49	-2.29	1.31#	0.39#	-1.38	6.61	-1.31	-0.16	0.39#
	(1.29)	(4.74)	(1.28)	(0.71)	(0.02)	(0.40)	(2.68)	(1.87)	(0.32)	(0.10)	(1.02)	(4.60)	(0.77)	(1.56)	(0.11)
C	2.77	7.38	5.07*	2.11	0.05	0.31	-21.16#	13.20#	-0.83	-1.19#	3.49	-6.21	9.22#	0.72	-0.58#
	(1.90)	(8.56)	(2.42)	(1.50)	(0.05)	(0.75)	(3.46)	(1.70)	(0.61)	(0.15)	(2.02)	(5.46)	(1.17)	(1.21)	(0.22)
R.sq	0.07	0.15	0.36	0.28	0.12	0.26	0.14	0.32	0.21	0.43	0.10	0.10	0.21	0.10	0.10
Wald χ^2	33.01	28.28	105.89	77.75	67.07	67.43	106.84	111.86	72.09	147.59	50.49	93.96	165.98	45.12	23.95
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Obs.	194	194	194	194	194	325	324	324	324	324	475	475	475	476	475

Note: *Instrumental variables (2SLS) regression; * denotes statistical significance at 5% and # denotes statistical significance at 1%. Values of standard errors in parentheses.*
Source: Authors calculations

Table A1. Composite Index of Disclosure

$DISC = \frac{1}{17}\sum_{i=1}^{17} s_i$; where s_i are the sub-indexes of disclosure.

Disclosure indices

		Sub-index – s_i	Categories
Assets			
	Loans	Loans by maturity	Sub three months, three to six months, six months to one year, one to five years, more than five years
		Loans by type	Loans to municipalities/government, mortgages, HP/lease, other loans
		Loans by counterparty	Loans to group companies, loans to other corporate, loans to banks
		Problem loans	Total problem loans
		Problem loans by type	Overdue/restructured/other non-performing
		Securities by type	Detailed breakdown: Treasury bills, other bills, bonds, CDs, equity investments, other investments
	Other earning assets		Government securities, other listed securities, non-listed securities
		Securities by holding purpose	Investment securities, trading securities
Liabilities			
	Deposits	Deposits by maturity	Demand, savings, sub three months, three to six months, six months to one year, one to five years, more than five years
		Deposit by type of customer	Bank deposits, municipal/government
	Other funding	Money market funding	Total money market funding
		Long-term funding	Convertible bonds, mortgage bonds, other bonds, subordinated debt, hybrid capital
Memo lines			
		Reserves	Loan loss reserves (memo)
		Capital	Total capital ratio, tier 1 ratio, total capital, tier 1 capital
		Contingent liabilities	Total contingent liabilities
		Off-balance sheet items	Off-balance sheet items
Income statement			
		Non-interest income	Net commission income, net fee income, net trading income
		Loan loss provisions	Loan loss provision

Source: Nier (2005).

Table A2: Correlations among the selected variables

	ROAE	ROAA	NIM	FSSI	Z	Zalt	EF	REG2	REG3	CORR1	CORR2	DISCL
ROAE	1											
ROAA	0.34	1										
NIM	-0.05	0.19	1									
FSSI	0.08	0.07	0.08	1								
Z	0.12	0.09	0.03	-0.04	1							
Zalt	0.10	0.07	0.03	-0.04	0.99	1						
EF	0.10	-0.08	-0.16	0.11	-0.01	-0.01	1					
REG1	0.09	-0.04	-0.16	-0.07	-0.10	0.10	-0.02	1				
REG2	-0.01	-0.03	-0.10	-0.06	0.06	0.06	0.18	0.08	1			
CORR1	-0.13	0.01	0.09	0.02	-0.05	-0.05	0.03	-0.02	0.08	1		
CORR2	-0.15	0.05	0.23	-0.01	-0.02	-0.02	-0.15	-0.14	0.06	0.53	1	
DISCL	0.03	-0.04	-0.07	0.13	0.06	0.06	0.11	0.07	0.04	0.02	0.01	1

Source: Authors calculations

Table A3: Description of the country samples

HIGH INCOME	UPPER MIDDLE INCOME	FOUNDING MEMBERS	EU ENLARGEMENT A	EU ENLARGEMENT B	CANDIDATE
Austria	Albania	Belgium	Greece	Bulgaria	Albania
Belgium	Bulgaria	Germany	Spain	Croatia	Iceland
Croatia	Hungary	Denmark	Portugal	Czech Republic	Macedonia
Cyprus	Macedonia	France	Austria	Cyprus	Montenegro
Czech Republic	Montenegro	Ireland	Finland	Estonia	Serbia
Denmark	Romania	Italy		Hungary	Turkey
Estonia	Serbia	Luxembourg		Latvia	
Finland	Turkey	The Netherlands		Lithuania	
France		United Kingdom		Malta	
Germany				Poland	
Greece				Romania	
Iceland				Slovakia	
Ireland				Slovenia	
Italy					
Latvia					
Lithuania					
Luxembourg					
Malta					
Netherlands					
Poland					
Portugal					
Slovakia					
Slovenia					
Spain					
United Kingdom					
528 financial institutions	153 financial institutions	270 financial institutions	91 financial institutions	199 financial institutions	121 financial institutions

Notes: *For the 2013 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of $1,045 or less in 2013; middle-income economies are those with a GNI per capita of more than $1,045 but less than $12,746; high-income economies are those with a GNI per capita of $12,746 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of $4,125.*

Founding members: comprise the founding members of 1957 and the first enlargement in 1973. EU Enlargement group A: the 2nd, 3rd and 4th enlargements (1981-1995) EU Enlargement group B: the 5th, 6th and 7th enlargements (2004-2013)