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Supervision
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*By Choudhry Tanveer Shehzad
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The Impact of the Organization of Bank Supervision on Banks' Risk-Taking Behavior

Choudhry Tanveer Shehzad^a and Bert Scholtens^{b,c *}

^a *Lahore University of Management Sciences, Lahore, Pakistan*

^b *Department of Economics, Econometrics and Finance, University of Groningen,
Groningen, The Netherlands*

^c *School of Management, University of Saint Andrews, Scotland, UK*

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* Corresponding author: Department of Economics, Econometrics and Finance, Faculty of Economics and Business, University of Groningen, PO Box 800, 9700 AV Groningen, The Netherlands; phone: +31-503637064; email: l.j.r.scholtens@rug.nl.

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Abstract

We investigate the effect on banks' risk-taking of having the central bank as the single banking supervisor versus other specialized banking supervisory authorities. We use data for more than ten thousand banks from 92 countries for the period 2005-2011. Our results suggest that increasing supervisory powers is not a panacea for reducing moral hazard problems. Instead, separating supervision from central banking seems to be a more effective tool as it reduces moral hazard problems. These results remain robust after accounting for the endogeneity problem of bank supervision and risk-taking and after several sensitivity tests. However, in the case of emerging market economies assigning more supervisory power does help to reduce the moral hazard problem.

1. Introduction

Bank supervision can be conducted by the central bank of a country or it is possible to delegate supervisory powers to specialized organizations. Both of these supervisory structures have their merits and challenges. These have been discussed extensively in the literature (see e.g. Abrams and Taylor, 2001; Masciandaro, 2004; Masciandaro and Quintyn, 2009). In this paper, we analyze the effectiveness of the design of bank supervision in controlling bank risk-taking. We compare the effectiveness of the supervisory power being assigned to the central bank only with that of assigning the same powers to specialized supervisory bodies. This topic is relevant both from an academic and from a policy perspective. Academically, this question furthers the work of Barth et al. (2002), Beck et al. (2006) and Masciandaro (2009), which is primarily concerned with the organization or structure of supervisory authorities. From a policy perspective, it is very timely in especially the European context where several proposals are being discussed to arrive at a more unified bank supervision authority.

There are a few studies that relate to the issue we investigate. Masciandaro (2009) uses a dataset with 102 countries for 1998-2009 to investigate trends in bank supervision. The data shows a trend for the separation of the central bank functions of monetary policy control from financial and supervisory regulations. This seems to result from the growing need for specialization where central banks have full responsibility for monetary policy alone. The literature presents mixed evidence about the effects of a central bank's supervision of the financial system. For example, Albuлесcu (2009) argues that central bank supervision as a combined monetary policy and banking-control regime can have various advantages. More specifically, he mentions there are economies of scale and scope in the cooperation between different departments controlling financial systems and in the ease of information flows and consequently in forecasting and managing bank risks. Hasan and Mester (2008) relate institutional features of central banks to macroeconomic performance. They also investigate if these relationships differ across central banks operating in countries at different stages of economic development. They do not find any strong and conclusive evidence regarding the relationship between central bank supervisory structure and economic performance. However, they show that the relationship between performance and the organization of bank supervision differs among countries at different stages of economic development. They also discover that the effect of the central bank's structural form is interesting enough to merit further explorations.

The literature on having the central bank or specialized agencies as the supervisory authority is mostly theoretical in nature. Masciandaro (2004) gives an overview of the effectiveness of having either unified financial supervision or employing multiple supervisory authorities. Safety and soundness, costs to supervisory authorities, and costs to market participants are discussed in detail as the potential benefits of having a single supervisory authority in Barth et al. (2002). Disadvantages of having a unified regulator include diseconomies of scale, excessive power, and less experience by a single authority. Abrams and Taylor (2001) perform a theoretical analysis by highlighting the advantages and disadvantages of having unified financial industry supervision. They find that country-specific factors, such as the development of the financial system, play an important role in determining the optimal model of financial supervision. The issue of the connection between regulation and bank risk-taking has been studied in several papers (e.g., Laeven and Levine, 2009; Caprio et al., 2007). In this respect, Basel II and Basel III especially focus on the supervisory review process as a separate pillar to optimize bank risk-taking in addition to capital adequacy regulations (see e.g. Podpiera, 2006; Demirgüç-Kunt et al., 2008).

In this paper, we pick up the suggestion of Hasan and Mester (2008) and connect the literature on the organization of bank supervision with that of the relationship between regulation and bank risk. To this extent, we specifically relate the organization of prudential bank supervision to banks' risk taking behavior. In particular, we proxy bank risk-taking by the impaired loans to gross loans ratio for more than 10,000 banks from both OECD countries and emerging markets for the period 2005-2011. Our basic findings suggest that supervision appears to be more effective in countries where central banks are kept away from supervisory functions. This specifically relates to developed markets. These findings help explain the trend of more separation of regulatory powers as reported by Masciandaro (2009). The reasons for the success of other supervisory authorities may result from specialization, reduction in excessive powers in well-developed economies held by a single authority, and from reduced diseconomies of scale as faced by a single authority.

Our paper complements the existing literature in two important ways. Firstly, to the best of our knowledge, it is the first paper which investigates the impact of having a central bank as the single supervisor on bank risk-taking from an empirical perspective in a large number of countries for a large sample of banks. Secondly, most work on the research question has been undertaken in the context of mature economies, where we also account for emerging market economies.

The remainder of this paper is organized as follows. In Section 2, we discuss the main studies after the functions attributed to central banks from the perspective of mono- or multi-purpose organizations. Section 3 presents our model and introduces the data. Section 4 gives the main results and sensitivity tests. Section 5 concludes the paper.

2. Background

Several studies try to explain why countries assign or do not assign supervisory functions to central banks. Masciandaro (2009) explains that countries' decisions regarding having a unified approach to supervision or not primarily relates to the role of politicians. He tests his model on 91 countries for the period 1986-2006. The findings suggest that if the bureaucracy of the country is of the "helping-hand" type and works for the welfare of the country, it will opt for a situation where the central bank is not responsible for prudential supervision. On the other hand, if the governance is more of the "grabbing hand" type, a single financial regulator with central bank dependency will be implemented to accommodate the financial sector. Albulescu (2009) analyzes the issue of unification of supervisory agencies for the case of Romania. He finds that the unified financial supervision structure does not represent an optimal solution to this country's problems. Other papers provide a discourse of the theoretical debate on whether one should assign supervisory powers to central banks. As it is not our purpose to fully reproduce this debate, we just briefly outline the main issues at stake below.

Di Noia and Di Giorgio (1999) discuss the feasibility of assigning the responsibility of banking supervision to the (single) central bank or to multiple institutions. Pros of having the central bank involvement in supervision of the banking system include: (i) the availability of first-hand information about the overall state of the economy; (ii) reduced risks, as there is a unified agency responsible for the supervision; (iii) as a protective measure, the central bank can initiate risk-reduction policies to improve stability of the banking system. The drawbacks of such an approach include: (i) inconsistency among the central bank's objectives as there can be a trade-off between monetary stability and the stability of financial intermediaries; (ii) reduced credibility of the central bank in case it is not successful in one of its functions; (iii) the cyclical effects of micro and macro policies tend to conflict. Di Noia and Di Giorgio (1999) conclude that monetary policy is sub-optimal when a central bank is assigned all the functions including prudential supervision of banks.

Barth et al. (2002), however, argue that there is more safety and stability when the central bank is also responsible for financial supervision. This is because central banks will have access to more information, and will have a relatively high degree of independence. If central banks are successful in maintaining bank stability, this will benefit society in terms of less financial crises. Resource allocation will also be conducted more efficiently by the central bank. Cons of central bank supervision include conflicts of interest, reputation risk, access to information, and political pressure due to independence.

Briault (2002) presents the case for unified financial sector regulation. In his view, it especially is the growing similarity between different financial products offered in the market, which leads to the need for regulation of banks to be concentrated in one hand. Apart from economies of scale and scope, also credibility and accountability is easier to achieve in such a case. A single regulatory authority will be more consistent in achieving its objectives. Disadvantages of a single supervisor would be: (i) conflict of interest; (ii) loss of credibility; and (iii) risk of submission to political pressures. Briault (2002) argues that the unified supervisory structure in the UK as undertaken by the FSA has led to better banking supervision.

Abrams & Taylor (2001) see as the main advantages of unification: (i) more consolidation in supervision as there is no room for 'gaps'; (ii) a unified system allows for more flexibility in regulation as compared to a multiple-body supervision system; (iii) more regulatory efficiency; (iv) development of professional staff, and; (v) improved accountability under unification. Disadvantages mentioned are: (i) diseconomies of scale; (ii) unclear objectives; (iii) limited synergies; and (iv) moral hazard problems. Abrams & Taylor (2001) conclude that if the boundary between different financial institutions is blurred, it will be useful to combine the supervisory functions in a single authority.

To summarize, there are several arguments to decide either in favor or against both approaches of structuring supervision. On *a priori* grounds, however, there seems to be no reason to accept that one of the two supervisory systems is superior to the other. Therefore, an empirical investigation which concentrates on how the supervisory regime affects bank risk-taking would be helpful. Apart from analyzing the effectiveness of supervisory regimes, it can also help us to appraise the role of bank supervision in mitigating or optimizing bank risk-taking. We outline the research design in the next section.

3. Model and Data

We hypothesize that bank risk-taking can be proxied by the ratio between impaired loans and gross loans (Im_{it}) for bank i at time t (see e.g. Shehzad et al., 2010) and is dependent on bank supervision (Sup_j) in country j , a matrix of country-specific variables (X_{jt}) in country j at time t and a matrix of bank-specific characteristic (Y_{it}) of bank i at time t .

$$Im_{it} = \alpha_i + \beta_1 * Sup_j + \beta_2 * X_{jt} + \beta_3 * Y_{it} + \varepsilon_{it} \quad (1)$$

where α_i is an unobserved panel-level random effect with zero mean and finite variance independently and identically distributed (i.i.d) over panels, while ε_{it} is an idiosyncratic error with zero mean and finite variance i.i.d. over all observations.

To examine if assigning supervisory powers to the central bank or to some other specialized body does actually matter, we check if α_i is significantly different for both subsamples with the same list of all other variables. Moreover, we check if β_1 for the banks under a central bank as the single supervisory authority is different from those which are supervised by other specialized authorities. For this purpose, we estimate equation (1) for both samples separately and test if the coefficients are significantly different from zero. In addition, we examine whether the effect of supervision is different across the two regulatory regimes by comparing the two models. The reason for separating the samples is that we do not want to let any possible collinearity between supervision and supervisory structures complicate the results as we treat bank supervision as an endogenous variable. Secondly, a Hausman test was conducted to check whether we may really pool the data. The results indicated at a one percent level of significance that both samples are different indeed. Hence, instead of pooling the data, we have to analyze the two samples separately and check if the constants are significantly different when keeping all other variables the same across the two samples. As such, financial supervision itself should be regarded as endogenous.¹ Demirgüç-Kunt et al. (2008) point out that countries with sound banks may face less opposition in enacting more rigorous regulation and supervision than countries with distressed banks. A consequence of such a reverse causality problem might be that β_1 and α_i are

¹ We want to thank our reviewers for stimulating us to investigate the problem in this setting.

correlated and that any random effects model will become inconsistent; the fixed effects within estimators remove them without estimating them. We therefore will use Hausman-Taylor (1981) regressions which may be used to estimate in a consistent manner in the case at hand. This technique has been used extensively in the banking literature to control for endogeneity problems (see e.g. Degryse et al., 2012; De Haas and Lelyveld, 2006). Under this approach, first within estimations are performed. From these within estimates, we get within residuals and by regressing our within residuals on the explanatory variables, we arrive at intermediate yet consistent estimates. Next, residual variances are used to obtain Feasible Generalized Least Squares (FGLS) weights and we perform GLS transformations for all the variables. Finally, weighted instrumental variable estimators are used to obtain the coefficients. As such, we fully account for the possibility that the supervisory regime is endogenously determined.

The bank-specific control variables include several key characteristics. We include a dummy variable to reflect whether a bank is listed on a stock exchange or not, following Loderer and Waelchli (2010). Bank size is measured as the logarithm of bank assets, following Beck et al. (2006). We use banks' cost-to-income ratio as a proxy for managerial efficiency (see Caprio et al., 2007). We also include a dummy for the presence of a deposit insurance scheme, which is regarded as an important institutional feature of the financial system (Demirgüç-Kunt and Detragiache, 2002). Our macroeconomic control variables include real GDP growth and GDP per capita, following Beck et al. (2006) and Laeven and Levine (2009). We analyze these variables for the period 2005 to 2011, which is characterized by a couple of tranquil years and by the financial crisis. We will specifically account for these crisis years in our estimations.

The data about impaired loans to gross loans ratios, whether a bank is listed or not, about bank size, ownership and the cost-to-income ratio is derived from Bureau van Dijk's BankScope, a data provider that is widely used in the banking literature. The data on bank supervision, single, vs. multiple supervisory authorities, and deposit insurance schemes is derived from Barth et al. (2008). It may be important to mention here that our construction of the supervisory strength variable as explained in Appendix A.1 is largely² inspired by Beck et al. (2006). We gathered data on real GDP growth and GDP per capita from the IMF's World Economic Outlook. It is important to mention here that we winsorized data on the BankScope variables at the top and bottom one percentile to avoid the problem of outliers

² All the questions involved are the same except for one question on the disclosure of off-balance sheet items that we do not include in our supervisory strength variable.

(see also Beltratti and Stulz, 2012). Some of the banks in our sample ceased to exist because of bankruptcy and mergers and acquisitions during the sample period. However, we do not drop these banks in order to avoid a survivorship bias in the sample. In our sensitivity analysis, we will present a test where we engage in the estimations for active banks only (see also Hallahan and Faff, 2001).

Table 1 shows the distribution of the countries in our sample. It appears that in 41 countries the central bank is responsible for prudential bank supervision, whereas in 51 countries it rests with other specialized supervisory authorities. Summary statistics of our variables are presented in table 2. The definitions and data sources of the variables are given in the Appendix in table A.1. Table A.2 in the Appendix gives the correlation matrix of the variables.

- Insert Tables 1 and 2 about here -

4. Results

4.1 Main results

As discussed above, supervision and bank risk-taking behavior can be endogenous. A reason mentioned for this is that countries with sound banks may face less opposition in enacting rigorous regulations (Demirguc-Kunt et al., 2008). Therefore, we estimate equation (1) on the basis of the Hausman-Taylor estimations. The main results are presented in table 3. There are three types of analysis in this table. Model 1 shows the results for the overall sample, whereas Model 2 and Model 3 present results for banks under the single supervision of central bank versus others respectively. In all three estimations, we regress bank risk-taking proxied by impaired loans/gross loans on real GDP growth, GDP per capita, Financial crisis, Cost to income, Bank size, whether a bank is listed or not, bank ownership, deposit insurance scheme, private monitoring and supervision. The 10,500 banks provide more than 56,500 observations for the main analysis. For Model 2 (central bank as the single supervisory authority) we rely on more than six thousands observations, and for Model 3 (other supervisory authorities) we can use more than fifty thousand observations. The Wald Chi-squared test is significant at the 99 percent confidence level, which suggests that our model is non-trivial. In addition, a Hausman chi-squared test was conducted between Model 2 and Model 3. The results clearly indicate that the two

samples behave quite differently at a one percent level of significance. This strongly suggests that the supervisory regime (i.e. central bank versus other supervisory authorities) does matter indeed.

- Insert Table 3 about here -

As can be observed from Model 1, real GDP growth appears with a negative sign. This suggests that when the economy is growing, banks have fewer problems regarding their impaired loans. Similarly, a negative sign for GDP per capita indicates that banks operating in a relatively wealthy economic environment have relatively less impaired loans. The coefficient for financial crisis suggests that in the particular years of the recent financial crisis impaired loans were higher. These intuitive results reconfirm the contemporaneous knowledge found elsewhere. For example, Salas and Saurina (2002) and Louzis et al. (2012) arrive at a negative relationship between GDP growth and non-performing loans. The results for the bank-specific control variables also are in line with the existing literature (e.g. Louzis et al., 2012). A positive sign of the cost-to-income ratio shows that when managerial efficiency is lower, impaired loans tend to be higher. The positive sign of the bank size coefficient reflects the fact that larger banks tend to have more impaired loans. Similarly, publicly listed banks are also prone to have more impaired loans as compared to privately held banks. Banks with dispersed ownership tend to have less impaired loans. Deposit insurance schemes exacerbate the moral hazard problem (see also Demirgüç-Kunt and Detragiache, 2002). Furthermore, our results suggest that private monitoring and more transparency actually increases the moral hazard problem. Apparently, this result is counter-intuitive but there is a literature which shows that excessive private monitoring actually worsens the moral hazard problem. For example, Hyytinen and Takalo (2002) mention that more transparency dilutes the charter value of banks and reduces their private costs of risk-taking.

For the overall sample, supervision comes up with a significantly negative sign. This indicates that better supervision actually reduces the moral hazard problem with banks. In Models 2 and 3 of table 3, we estimate the same equation (1) for banks under supervision of a single supervisory authority of a central bank and for those under supervision of other specialized supervisory regimes respectively. Interestingly, our results dramatically differ between Models 2 and 3. The difference between Model 2 and 3 is substantial and reveals that the structure with specialized supervisory authorities performed better. This effect can best be observed in the constant. The constant is low in magnitude and

insignificant with central bank supervision, however, it is very substantial and highly significant with the other supervisory authorities. In the latter case, the negative sign reveals that bank supervision by other supervisory authorities substantially reduces banks' risk taking behavior. This implies that the other supervisory structures can be associated with a significantly lower portfolio of bad assets. However, the estimation of Model 2 and 3 also suggests that giving strong powers to supervisory authorities might aggravate the moral hazard problem. So, the decomposed results lead to a complete overhaul of the meaning of the estimation results of model 1, where the supervisory structure is not incorporated and where the results are based on supervisory strength only. To further check if the constant terms in both models were significantly different indeed, we conducted seemingly unrelated regression³ followed by a Wald test and the results again indicate that the constant terms of the two groups are significantly different at 1 percent level of significance.

4.2 *Sensitivity Analysis*

Tables 4-6 present several sensitivity test results. In Models 1-3 in table 4, we redo the same analysis as in table 3, but here we have only investment banks in our sample, whereas in Models 4-6, we analyze only active banks. Active banks are defined as those banks which are still operating and have not gone into bankruptcy or liquidation (see Hallahan and Faff, 2001). The information about bank status (i.e. investment or active bank) has been derived from BankScope. In Models 1-3 of table 5, we analyze large banks (featuring in the Top-10,000 in the world, according to the size of total assets). Models 4-6 in table 5 give the estimation results for banks operating only in emerging market economies. In table 6, we redo the main analysis but instead of having impaired loans to gross loans ratio as our dependent variable we have provisioning to gross loans ratio as the dependent in models 1-3. In Models 4-6 in table 6, we have total capital ratios as the dependent variables.

- Insert Tables 4, 5 and 6 about here -

³ It is important to mention here that a better testing would have been conducted with equality constraint imposed on the coefficients of other explanatory variables. However, as far as authors know this is non-trivial for the Hausman-Taylor regressions.

In all sensitivity tests, the main results of our analysis appear to be robust despite significant variations in the sample. A very remarkable finding relates to the sensitivity tests where we analyze banks from emerging markets (Table 5, Models 4-6). In developing countries, especially stronger supervisory powers seem to be more effective in reducing the moral hazard problem compared to the organization of bank supervision, which appears to exacerbate the moral hazard problem (Model 4). When we split the sample, the estimation results suggest that especially assigning more supervisory power to central banks is counter-productive (Model 5). However, if the other supervisory bodies get more supervisory power, this substantially reduces moral hazard problems (Model 6). We suspect that the main reason behind this result is in the institutional framework in emerging markets (see also Fan et al., 2011). It also suggests that internal control systems of banks may be weaker and that supervisors need to play a more effective role.

5. Conclusion

We study whether it is better for countries to have the central bank as the single authority to be held responsible for prudential bank supervision or whether this function should rest with other specialized supervisory authorities. This is an important issue as has been highlighted by the recent financial crisis. It basically is a national issue when a country decides whether to grant supervisory powers to specialized authorities or to have the central bank do the supervision. However, it becomes a supranational issue in for example the European Union. There, the discussion is about having one supranational bank supervisory authority or many state-level authorities that regulate and supervise banks.

We compare the effect of having a central bank versus other supervisory authorities on bank risk-taking behavior using about ten thousand banks from 92 countries during the period 2005-2011. Our results indicate that specialized supervisory authorities tend to reduce the risk-taking behavior whereas central banks are to be associated with more risk-taking. This result remains robust for different sensitivity tests. However, when we differentiate between mature and emerging countries, it shows that in developing economies assigning more powers to other supervisory agencies is more effective as more supervision by the central bank is to be associated with an increase in problem loans. Our findings are in line with the predictions of Abrams and Taylor (2001). They also are congruent with

the stylized facts of financial supervision as detected by Masciandaro (2004, 2009). As such, given that we specifically focus on the structure of the supervisory regime in relation to banks' risk taking behavior, we complement the existing literature with our empirical analysis.

We suggest three main reasons why specialized authorities may be more successful in regulating the banks. Firstly, specialized authorities can delve deep into the financial profiles of the banks according to the mandate assigned. Secondly, in case of a central bank as the single supervisory agencies, the higher the number of banks to be regulated, the higher are the chances of being overlooked. Thirdly, it may be easier to use pressure-group or lobby power to influence the policy-making of a central bank as the single supervisory authority. An empirical study which focuses upon why supervisory frameworks may differ in altering bank risk-taking can be highly useful and we leave it for future research to detect the exact reasons behind our observations.

References

- Abrams, R.K., Taylor, M.W., 2001. Issues in the Unification of Financial Sector Supervision. IMF Working Paper 213.
- Albulescu, T.K., 2009. Central bank or single financial supervision authority: The Romanian case. *Megatrend Revija*. 6 (2), 327-353.
- Barth J.R., Caprio Jr. G., Levine R., 2008. Bank Regulations are Changing: For Better or Worse? World Bank Policy Research Working Paper 4646.
- Barth, J.R., Dopico, L.G., Nolle, D.E., Wilcox, J.A., 2002. Bank safety and soundness and the structure of bank supervision: a cross-country analysis. *International Review of Finance*. 3 (3-4), 163-188.
- Beck, T., Demirgüç-Kunt, A., Levine, R., 2006. Bank supervision and corruption in lending. *Journal of Monetary Economics*. 53 (8), 2131-2163
- Beltratti, A., Stulz, R.M., 2012. The credit crisis around the globe: Why did some banks perform better? *Journal of Financial Economics*. 105 (1), 1-17
- Briault, C., 2002. Revisiting the Rationale for a Single National Financial Services Regulator. Financial Services Authority, Occasional Paper 16, London.
- Caprio, Jr. G., Laeven, L., Levine, R., 2007. Governance and bank valuation. *Journal of Financial Intermediation*. 16 (4), 584-617.
- De Haas, R., Lelyveld, I. van, 2006. Foreign banks and credit stability in Central and Eastern Europe. A panel data analysis. *Journal of Banking and Finance*. 30 (7), 1927-1952.
- Degryse, H. Havrylchyk, O., Jurzyk, E., Kozak, S., 2012. Foreign bank entry, credit allocation and lending rates in emerging markets: Empirical evidence from Poland. *Journal of Banking and Finance*. 36 (11), 2949-2959.
- Demirgüç-Kunt, A. Detragiache, E., 2002. Does deposit insurance increase banking system stability? An empirical investigation. *Journal of Monetary Economics*. 49 (7), 1373-1406
- Demirgüç-Kunt, A. Detragiache, E., Tressel, T., 2008. Banking on the principles: Compliance with Basel Core Principles and bank soundness. *Journal of Financial Intermediation*. 17 (4), 511-542.
- Di Noia, C., Di Giorgio, G., 1999. Should banking supervision and monetary policy tasks be given to different agencies? *International Finance*. 2 (3), 361-378.
- Fan, J. P.H., Wei, J. K.C., Xu, X., 2011. Corporate finance and governance in emerging markets: A selective review and an agenda for future research. *Journal of Corporate Finance*. 17 (2), 207-214.
- Hallahan, T.A., Faff, R.W., 2001. Induced persistence or reversals in fund performance? The effect of survivorship bias. *Applied Financial Economics*. 11 (2) 119-126.

Hasan, I., Mester, L.J., 2008. Central bank institutional structure and effective central banking: Cross-country empirical evidence. *Comparative Economic Studies*. 50 (4), 620-645.

Hausman, J. A., Taylor, W.E., 1981. Panel data and unobservable individual effects. *Econometrica*. 49 (6), 1377-1398

Hyytinen, A., Takalo, T., 2002. Enhancing bank transparency: A reassessment. *European Financial Review*. 6 (3), 429-445.

Laeven, L., Levine, R., 2009. Bank governance, regulation and risk taking. *Journal of Financial Economics*. 93 (2), 259-275.

Loderer, C., Waelchli, U., 2010. Protecting minority shareholders: listed versus unlisted firms. *Financial Management*. 39 (1), 33-57.

Louzis, D.P., Vouldis, A.T., Vasilios L.M., 2012. Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking and Finance*. 36 (4), 1012-1027.

Masciandaro, D., 2004. Unification in financial sector supervision: the trade-off between central bank and single authority. *Journal of Financial Regulation and Compliance*. 12 (2), 151-169.

Masciandaro, D., 2009. Politicians and financial supervision outside the central bank: why do they do it? *Journal of Financial Stability*. 5 (2), 124-147.

Masciandaro, D., Quintyn, M., 2009. Reforming financial supervision and the role of the central banks: a review of global trends, causes and effects (1998-2008), *CEPR Policy Insight*. 30, 1-11.

Podpiera, R., 2006, Does compliance with Basel core principles bring any measurable benefits. *IMF Staff Papers*. 53 (2), 306-325

Salas, V., Saurina, J., 2002. Credit risk in two institutional regimes: Spanish commercial and savings banks. *Journal of Financial Services Research*. 22 (3), 203-224

Shehzad, C.T., Haan, J. de, Scholtens, B., 2010. The impact of bank ownership concentration on impaired loans and capital adequacy. *Journal of Banking and Finance*. 34 (2), 399-408.

Table 1: Supervisory Structure

Central Bank as Single Supervisor	Other Supervisory Authorities
AUSTRALIA	ARGENTINA
BAHRAIN	AUSTRIA
BELGIUM	BANGLADESH
BENIN	BELIZE
BOLIVIA	BOTSWANA
BOSNIA-HERZEGOVINA	BRAZIL
CANADA	BULGARIA
CHILE	CROATIA
CHINA-PEOPLE'S REPUBLIC	CYPRUS
COLOMBIA	CZECH REPUBLIC
COSTA RICA	EGYPT
DENMARK	ESTONIA
EL SALVADOR	GERMANY
FINLAND	GHANA
FRANCE	GREECE
HONDURAS	HONG KONG
HUNGARY	INDIA
ICELAND	INDONESIA
IRELAND	ISRAEL
IVORY COAST	ITALY
JAPAN	JAMAICA
KAZAKHSTAN	JORDAN
LATVIA	KENYA
LEBANON	KUWAIT
LUXEMBOURG	LIECHTENSTEIN
MALAYSIA	LITHUANIA
MALTA	MACEDONIA (FYROM)
MEXICO	MAURITIUS
NETHERLANDS	MOLDOVA
NICARAGUA	MOROCCO
NIGERIA	NEW ZEALAND
NORWAY	OMAN
PANAMA	PAKISTAN
PERU	PHILIPPINES
POLAND	PORTUGAL
SAUDI ARABIA	ROMANIA
SWEDEN	RUSSIAN FEDERATION
SWITZERLAND	SAINT LUCIA
UNITED KINGDOM	SINGAPORE
USA	SLOVAKIA
ZAMBIA	SLOVENIA
	SOUTH AFRICA
	SPAIN
	SRI LANKA
	ST. KITTS AND NEVIS
	SURINAME

	SYRIA
	THAILAND
	TRINIDAD AND TOBAGO
	UGANDA
	URUGUAY

Source: Beck et al. (2008)

Table 2: Summary Statistics

Variable	Mean	Standard Deviation	5th Percentile	95th Percentile	Observations
Impaired Loans/Gross Loans	2.4024	3.8800	0.00	10	61244
Central Bank Supervision	0.1795	0.3838	0.00	1.00	71184
Real GDP Growth	1.9711	3.0407	-2.44	7.3	72552
GDP/Capita	38.9792	16.5598	4.028	50.00	72552
Financial Crisis	0.6545	0.4755	0.00	1.00	75028
Listed	0.0848	0.2786	0.00	1.00	75028
Ownership	0.0777	0.2676	0.00	1.00	75028
Cost/income	72.0752	30.1568	37.51	114.07	74470
Bank Size	12.496	1.9036	9.90	16.31	75028
Deposit Insurance	0.9698	0.1711	1.00	1.00	71342
Private Monitoring	0.6532	0.0866	0.625	0.88	69331
Supervision	0.7672	0.1061	0.533	0.93	69279

Impaired loans/gross loans is our dependent variable and has been winsorized at top and bottom 1 percentile. Central Bank Supervision is a dummy which takes a value of 1 if the country has central bank as a unique supervisory authority and zero otherwise. Real GDP growth is the logarithmic difference of real GDP. GDP/capita is GDP divided by total population. Crisis year is a dummy which takes a value of 1 for crisis years (2007-2010) and zero otherwise. Listed is a dummy which takes a value of one for publicly listed banks and zero otherwise. Cost/income ratio of a bank is winsorized at top and bottom one percentile. Bank size is a logarithm of bank assets winsorized at top and bottom one percentiles. Ownership is a dummy which takes a value of one if bank is having no owner with greater than 24.9 percent ownership stake and zero otherwise. Deposit insurance is a dummy which takes a value of one if there is an explicit deposit insurance scheme and zero otherwise. Private monitoring is a variable which assigns a value of 1 for each positive answer to the following questions: Are accounting practices for banks in accordance with International Accounting Standards (IAS)? Are accounting practices for banks in accordance with U.S. Generally Accepted Accounting Principles (GAAP)? Is an external audit a compulsory obligation for banks? Are auditing practices for banks in accordance with international auditing standards? Is it required by the regulators that bank audits be publicly disclosed? Are specific requirements for the extent or nature of the audit spelled out? Are auditors licensed or certified? Are bank regulators/supervisors required to make public formal enforcement actions, which include cease and desist orders and written agreements between a bank regulatory/supervisory body and a banking organization? Supervision is a variable which assigns a value of 1 for each positive answer to the following questions: Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? Can the supervisory agency suspend the directors' decision to distribute bonuses? Can the supervisory agency suspend the directors' decision to distribute management fees? Can the supervisory agency suspend the directors' decision to distribute dividends? Can the supervisory authority force a bank to change its internal organizational structure? Can supervisory agency legally declare---such that this declaration supersedes some of the rights of shareholders that a bank is insolvent? According to the Banking Law, does supervisory agency has authority to intervene that is, suspend some or all ownership rights a problem bank? Regarding bank restructuring and reorganization, can the supervisory agency supersede shareholder rights? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace management? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace directors? Do supervisors get a copy of the auditor's report? Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? 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? Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank? Can supervisors take legal action against external auditors for negligence? For last two variables, total scores have been divided by the total number of questions in each variable.

Table 3: Main Results

	Model 1 Full Sample	Model 2 Central bank supervision	Model 3 Other supervisory authorities
Real GDP Growth	-0.057***	-0.063***	-0.068***
	0.005	0.009	0.006
GDP/Capita	-0.037***	0.032*	-0.056***
	0.006	0.018	0.006
Financial Crisis	1.264***	0.216*	1.249***
	0.035	0.118	0.035
Cost/income	0.028***	0.028***	0.033***
	0.001	0.002	0.001
Bank Size	0.438***	-0.651***	1.385***
	0.021	0.094	0.045
Listed	0.906***	1.235***	-0.865
	0.17	0.43	0.683
Ownership	-1.120***	-0.037	-0.697
	0.218	0.433	0.851
Deposit Insurance	0.886***	-1.186*	10.780***
	0.292	0.714	1.914
Private Monitoring	12.627***	-10.898*	2.539
	1.167	5.594	5.504
Supervision	-7.603***	27.893***	20.485**
	1.912	5.893	9.899
Constant	-7.426***	-0.033	-44.252***
	0.803	1.793	4.746
Observations	56672	6484	50048
Banks	10537	1528	8972
Panel Standard Errors	2.647	5.464	10.521
Wald Chi-Squared	8839.35	413.864	9762.513

The first line after each variable shows the coefficient and the second line presents standard errors. *** represents significance at 1 percent level while ** and * represent the same at 5 and 10 percent level. Impaired loans/gross loans is our dependent variable and has been winsorized at top and bottom 1 percentile. Real GDP growth is the logarithmic difference of real GDP. GDP/capita is GDP divided by total population. Crisis year is a dummy which takes a value of 1 for crisis years (2007-2010) and zero otherwise. Listed is a dummy which takes a value of one for publicly listed banks and zero otherwise. Cost/income ratio of a bank is winsorized at top and bottom one percentile. Bank size is a logarithm of bank assets winsorized at top and bottom one percentiles. Ownership is a dummy which takes a value of one if bank is having no owner with greater than 24.9 percent ownership stake and zero otherwise. Deposit insurance is a dummy which takes a value of one if there is an explicit deposit insurance scheme and zero otherwise. Private monitoring is a variable which assigns a value of 1 for each

positive answer to the following questions: Are accounting practices for banks in accordance with International Accounting Standards (IAS)? Are accounting practices for banks in accordance with U.S. Generally Accepted Accounting Principles (GAAP)? Is an external audit a compulsory obligation for banks? Are auditing practices for banks in accordance with international auditing standards? Is it required by the regulators that bank audits be publicly disclosed? Are specific requirements for the extent or nature of the audit spelled out? Are auditors licensed or certified? Are bank regulators/supervisors required to make public formal enforcement actions, which include cease and desist orders and written agreements between a bank regulatory/supervisory body and a banking organization? Supervision is a variable which assigns a value of 1 for each positive answer to the following questions: Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? Can the supervisory agency suspend the directors' decision to distribute bonuses? Can the supervisory agency suspend the directors' decision to distribute management fees? Can the supervisory agency suspend the directors' decision to distribute dividends? Can the supervisory authority force a bank to change its internal organizational structure? Can supervisory agency legally declare---such that this declaration supersedes some of the rights of shareholders that a bank is insolvent? According to the Banking Law, does supervisory agency has authority to intervene that is, suspend some or all ownership rights a problem bank? Regarding bank restructuring and reorganization, can the supervisory agency supersede shareholder rights? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace management? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace directors? Do supervisors get a copy of the auditor's report? Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? 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? Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank? Can supervisors take legal action against external auditors for negligence? For last two variables, total scores have been divided by the total number of questions in each variable.

Table 4: Sensitivity Results 1

	Investment banks			Active banks		
	Model 1 Overall sample	Model 2 Central bank supervision	Model 3 Other supervisory authorities	Model 4 Overall sample	Model 5 Central bank supervision	Model 6 Other supervisory authorities
Real GDP Growth	-0.056***	-0.060***	-0.066***	-0.047***	-0.062***	-0.047***
	0.005	0.009	0.006	0.005	0.009	0.005
GDP/Capita	-0.031***	0.045**	-0.055***	-0.040***	0.02	-0.050***
	0.006	0.019	0.006	0.005	0.017	0.006
Financial Crisis	1.247***	0.125	1.253***	1.219***	0.176	1.219***
	0.035	0.119	0.035	0.034	0.117	0.033
Cost/income	0.028***	0.029***	0.033***	0.022***	0.027***	0.025***
	0.001	0.002	0.001	0.001	0.002	0.001
Bank Size	0.451***	-0.675***	1.404***	0.375***	-0.563***	1.174***
	0.021	0.096	0.045	0.021	0.09	0.042
Listed	0.862***	1.085**	-0.948	0.958***	1.190***	-0.548
	0.168	0.469	0.697	0.167	0.405	0.616
Ownership	-1.213***	-0.21	-0.738	-0.999***	-0.183	-0.471
	0.213	0.469	0.862	0.213	0.407	0.757
Deposit Insurance	1.212***	-1.047	12.108***	0.394	-1.373**	7.842***
	0.302	0.817	2.054	0.287	0.665	1.678
Private Monitoring	13.054***	-8.998	6.716	11.321***	-7.501	-1.545
	1.156	6.116	5.775	1.118	5.096	4.857
Supervision	-8.503***	26.605***	12.328	-6.572***	23.791***	23.966***
	1.87	6.418	10.203	1.828	5.382	8.687
Constant	-7.741***	-0.527	-41.946***	-5.627***	-0.365	-38.736***
	0.781	1.917	4.726	0.793	1.709	4.179
Observations	56227	6241	49859	55170	6394	48640
Banks	10415	1463	8920	10178	1500	8643
Panel Standard Errors	2.525	5.817	10.417	2.629	5.106	9.209
Wald Chi-Squared	8822.532	406.042	9890.518	7294.8	410.751	7524.418

The first line after each variable shows the coefficient and the second line presents standard errors. *** represents significance at 1 percent level while ** and * represent the same at 5 and 10 percent level. Impaired loans/gross loans is our dependent variable and has been winsorized at top and bottom 1 percentile. Real GDP growth is the logarithmic difference of real GDP. GDP/capita is GDP divided by total population. Crisis year is a dummy which takes a value of 1 for crisis years (2007-2010) and zero otherwise. Listed is a dummy which takes a value of one for publicly listed banks and zero otherwise. Cost/income ratio of a bank is winsorized at top and bottom one percentile. Bank size is a logarithm of bank assets winsorized at top and bottom one percentiles. Ownership is a dummy which takes a value of one if bank is having no owner with greater than 24.9 percent ownership stake and zero otherwise. Deposit insurance is a dummy which takes a value of one if there is an explicit deposit insurance scheme

and zero otherwise. Private monitoring is a variable which assigns a value of 1 for each positive answer to the following questions: Are accounting practices for banks in accordance with International Accounting Standards (IAS)? Are accounting practices for banks in accordance with U.S. Generally Accepted Accounting Principles (GAAP)? Is an external audit a compulsory obligation for banks? Are auditing practices for banks in accordance with international auditing standards? Is it required by the regulators that bank audits be publicly disclosed? Are specific requirements for the extent or nature of the audit spelled out? Are auditors licensed or certified? Are bank regulators/supervisors required to make public formal enforcement actions, which include cease and desist orders and written agreements between a bank regulatory/supervisory body and a banking organization? Supervision is a variable which assigns a value of 1 for each positive answer to the following questions: Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? Can the supervisory agency suspend the directors' decision to distribute bonuses? Can the supervisory agency suspend the directors' decision to distribute management fees? Can the supervisory agency suspend the directors' decision to distribute dividends? Can the supervisory authority force a bank to change its internal organizational structure? Can supervisory agency legally declare---such that this declaration supersedes some of the rights of shareholders that a bank is insolvent? According to the Banking Law, does supervisory agency has authority to intervene that is, suspend some or all ownership rights a problem bank? Regarding bank restructuring and reorganization, can the supervisory agency supersede shareholder rights? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace management? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace directors? Do supervisors get a copy of the auditor's report? Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? 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? Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank? Can supervisors take legal action against external auditors for negligence? For last two variables, total scores have been divided by the total number of questions in each variable.

Table 5: Sensitivity Results 2						
	Model 1 Overall sample	Model 2 Central bank supervision	Model 3 Other supervisory authorities	Model 4 Overall sample	Model 5 Central bank supervision	Model 6 Other supervisory authorities
Real GDP Growth	-0.110***	-0.171***	-0.096***	-0.089***	-0.053***	-0.303***
	0.008	0.013	0.009	0.009	0.01	0.03
GDP/Capita	-0.047***	0.151***	-0.081***	0.082***	0.054**	-0.203**
	0.006	0.034	0.006	0.025	0.025	0.082
Financial Crisis	1.356***	-0.282	1.566***	-0.167	-0.026	-0.764***
	0.048	0.174	0.048	0.121	0.141	0.275
Cost/income	0.039***	0.020***	0.043***	0.025***	0.029***	0.017**
	0.001	0.003	0.001	0.002	0.003	0.008
Bank Size	0.291***	-0.681***	0.789***	-0.635***	-0.462***	0.044
	0.034	0.168	0.054	0.1	0.093	0.294
Listed	0.851***	2.313	-0.693	0.058	0.727	-1.124
	0.185	1.66	0.435	0.429	0.464	1.099
Ownership	-0.783***	-1.849	0.518	0.378	-0.197	5.645***
	0.246	2.329	0.513	0.425	0.461	2.143
Deposit Insurance	-0.006	-4.856*	7.087***	0.262	-0.936	4.633***
	0.311	2.72	1.016	0.635	0.902	1.714
Private Monitoring	12.881***	16.517	16.696***	-1.699	-4.655	25.395***
	1.87	23.525	2.818	2.406	6.409	6.851
Supervision	-13.584***	-10.627	-15.972***	26.818***	22.138***	74.122***
	3.569	27.809	5.148	3.881	6.647	26.077
Constant	-0.378	12.118	-13.299***	-6.980***	-2.912	46.577***
	1.57	8.834	2.762	1.917	1.87	16.045
Observations	27473	3478	23924	7352	5841	1371
Banks	5068	774	4279	1745	1376	332
Panel Standard Errors	2.687	21.749	5.466	5.882	5.363	8.715
Wald Chi-Squared	5440.766	270.94	5889.702	397.117	372.06	145.2

The first line after each variable shows the coefficient and the second line presents standard errors. *** represents significance at 1 percent level while ** and * represent the same at 5 and 10 percent level. Impaired loans/gross loans is our dependent variable and has been winsorized at top and bottom 1 percentile. Real GDP growth is the logarithmic difference of real GDP. GDP/capita is GDP divided by total population. Crisis year is a dummy which takes a value of 1 for crisis years (2007-2010) and zero otherwise. Listed is a dummy which takes a value of one for publicly listed banks and zero otherwise. Cost/income ratio of a bank is winsorized at top and bottom one percentile. Bank size is a logarithm of bank assets winsorized at top and bottom one percentiles. Ownership is a dummy which takes a value of one if bank is having no owner with greater than 24.9 percent ownership stake and zero otherwise. Deposit insurance is a dummy which takes a value of one if there is an explicit

deposit insurance scheme and zero otherwise. Private monitoring is a variable which assigns a value of 1 for each positive answer to the following questions: Are accounting practices for banks in accordance with International Accounting Standards (IAS)? Are accounting practices for banks in accordance with U.S. Generally Accepted Accounting Principles (GAAP)? Is an external audit a compulsory obligation for banks? Are auditing practices for banks in accordance with international auditing standards? Is it required by the regulators that bank audits be publicly disclosed? Are specific requirements for the extent or nature of the audit spelled out? Are auditors licensed or certified? Are bank regulators/supervisors required to make public formal enforcement actions, which include cease and desist orders and written agreements between a bank regulatory/supervisory body and a banking organization? Supervision is a variable which assigns a value of 1 for each positive answer to the following questions: Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? Can the supervisory agency suspend the directors' decision to distribute bonuses? Can the supervisory agency suspend the directors' decision to distribute management fees? Can the supervisory agency suspend the directors' decision to distribute dividends? Can the supervisory authority force a bank to change its internal organizational structure? Can supervisory agency legally declare---such that this declaration supersedes some of the rights of shareholders that a bank is insolvent? According to the Banking Law, does supervisory agency has authority to intervene that is, suspend some or all ownership rights a problem bank? Regarding bank restructuring and reorganization, can the supervisory agency supersede shareholder rights? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace management? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace directors? Do supervisors get a copy of the auditor's report? Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? 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? Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank? Can supervisors take legal action against external auditors for negligence? For last two variables, total scores have been divided by the total number of questions in each variable.

Table 6: Sensitivity Results 3

	Model 1 Overall sample	Model 2 Central bank supervision	Model 3 Other supervisory authorities	Model 4 Overall sample	Model 4 Central bank supervision	Model 6 Other supervisory authorities
Real GDP Growth	-0.067***	-0.066***	-0.027***	0.110***	-0.111**	0.186***
	0.003	0.008	0.002	0.021	0.044	0.024
GDP/Capita	0.079***	0.111***	-0.038***	-0.072***	0.012	-0.087***
	0.004	0.015	0.002	0.027	0.075	0.03
Financial Crisis	-0.322***	-0.590***	0.259***	1.474***	0.492	0.926***
	0.021	0.08	0.013	0.143	0.421	0.157
Cost/income	0.010***	0.038***	0.005***	0.097***	-0.017**	0.108***
	0	0.002	0	0.002	0.008	0.002
Bank Size	0.123***	-0.312***	0.046***	-14.443***	-3.255***	-12.728***
	0.022	0.075	0.012	0.169	0.296	0.164
Listed	5.238***	0.698	0.818***	25.029***	-1.44	21.038***
	0.308	0.451	0.124	2.826	1.328	2.545
Ownership	-7.858***	0.341	-0.03	3.906	-2.12	6.949**
	0.415	0.444	0.154	3.599	1.628	3.13
Deposit Insurance	-6.091***	-1.096	-0.126	-40.396***	2.042	-117.556***
	0.549	0.784	0.284	5.518	1.603	8.12
Private Monitoring	22.740***	-6.097	2.115***	14.803	-28.215**	-107.153***
	1.191	5.457	0.528	10.99	11.61	12.994
Supervision	-80.066***	3.058	9.420***	-243.821***	29.868*	-14.605
	2.621	5.452	1.671	18.132	17.05	29.153
Constant	50.968***	9.400***	-6.445***	415.534***	65.006***	365.946***
	2.238	1.893	1.258	16.381	9.272	19.321
Observations	58579	8712	49719	53439	3735	49664
Banks	10628	1714	8876	9973	1129	8833
Panel Standard Errors	5.539	6.083	1.778	57.382	15.254	34.878
Wald Chi-Squared	2867.147	709.852	2946.715	13749.013	184.452	12276.603

The first line after each variable shows the coefficient and the second line presents standard errors. *** represents significance at 1 percent level while ** and * represent the same at 5 and 10 percent level. Provisioning/gross loans is our dependent variable in models 1-3 and total capital ratio in models 4-6. Both variables have been winsorized at top and bottom 1 percentile. Real GDP growth is the logarithmic difference of real GDP. GDP/capita is GDP divided by total population. Crisis year is a dummy which takes a value of 1 for crisis years (2007-2010) and zero otherwise. Listed is a dummy which takes a value of one for publicly listed banks and zero otherwise. Cost/income ratio of a bank is winsorized at top and bottom one percentile. Bank size is a logarithm of bank assets winsorized at top and bottom one percentiles. Ownership is a dummy which takes a value of one if bank is having no owner with greater than 24.9 percent ownership stake and zero otherwise. Deposit insurance is a dummy which takes a value of one if there is an explicit deposit insurance scheme and zero otherwise. Private

monitoring is a variable which assigns a value of 1 for each positive answer to the following questions: Are accounting practices for banks in accordance with International Accounting Standards (IAS)? Are accounting practices for banks in accordance with U.S. Generally Accepted Accounting Principles (GAAP)? Is an external audit a compulsory obligation for banks? Are auditing practices for banks in accordance with international auditing standards? Is it required by the regulators that bank audits be publicly disclosed? Are specific requirements for the extent or nature of the audit spelled out? Are auditors licensed or certified? Are bank regulators/supervisors required to make public formal enforcement actions, which include cease and desist orders and written agreements between a bank regulatory/supervisory body and a banking organization? Supervision is a variable which assigns a value of 1 for each positive answer to the following questions: Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? Can the supervisory agency suspend the directors' decision to distribute bonuses? Can the supervisory agency suspend the directors' decision to distribute management fees? Can the supervisory agency suspend the directors' decision to distribute dividends? Can the supervisory authority force a bank to change its internal organizational structure? Can supervisory agency legally declare---such that this declaration supersedes some of the rights of shareholders that a bank is insolvent? According to the Banking Law, does supervisory agency has authority to intervene that is, suspend some or all ownership rights a problem bank? Regarding bank restructuring and reorganization, can the supervisory agency supersede shareholder rights? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace management? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace directors? Do supervisors get a copy of the auditor's report? Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? 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? Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank? Can supervisors take legal action against external auditors for negligence? For last two variables, total scores have been divided by the total number of questions in each variable.

APPENDIX

Table A.1: Variable Source and Definitions

Variables:	Definition and source:
Impaired Loans/Gross Loans	<i>Impaired Loans/ Gross Loans Ratio winsorized at top and bottom 1 percentile</i> <i>Source: Bureau van Dijk BankScope</i>
Central Bank Supervision	<i>A dummy which takes a value of 1 if the country has its central bank as the unique supervisory authority and zero otherwise.</i> <i>Source: Barth et al. (2008)</i>
Real GDP Growth	<i>Real GDP Growth</i> <i>Source: World Economic Outlook</i>
GDP/Capita	<i>GDP/ Capita in thousands US\$</i> <i>Source: World Economic Outlook</i>
Crisis Years	<i>A dummy which takes a value of 1 for crisis years (2007-10) and 0 otherwise.</i>
Listed	<i>A dummy which takes a value of one for listed banks and 0 otherwise.</i> <i>Source: Bureau van Dijk BankScope</i>
Cost/Income	<i>Cost/Income ratio of a bank winsorized at top and bottom 1 percentile</i> <i>Source: Bureau van Dijk BankScope</i>
Bank Size	<i>Logarithm of bank assets winsorized at top and bottom 1 percentile</i> <i>Source: Bureau van Dijk BankScope</i>
Ownership	<i>It takes a value of one if the bank is having no owner with greater than 24.9 percent ownership and zero otherwise.</i> <i>Source: Bureau van Dijk BankScope</i>
Deposit Insurance	<i>A dummy which takes a value of 1 if there is an explicit deposit insurance scheme and 0 otherwise.</i> <i>Source: Barth et al. (2008)</i>
Private Monitoring	<i>A variable which assigns a value of 1 for each positive answer to the following questions and then total score has been divided by total number of questions:</i> <ul style="list-style-type: none"> <i>(i) Are accounting practices for banks in accordance with International Accounting Standards (IAS)?</i> <i>(ii) Are accounting practices for banks in accordance with U.S. Generally Accepted Accounting Principles (GAAP)?</i> <i>(iii) Is an external audit a compulsory obligation for banks?</i> <i>(iv) Are auditing practices for banks in accordance with international auditing standards?</i> <i>(v) Is it required by the regulators that bank audits be publicly disclosed?</i> <i>(vi) Are specific requirements for the extent or nature of the audit spelled out?</i> <i>(vii) Are auditors licensed or certified?</i> <i>(viii) Are bank regulators/supervisors required to make public formal enforcement actions, which include cease and desist orders and written agreements between a bank regulatory/supervisory body and a banking organization?</i> <i>Source: Barth et al. (2008)</i>

Supervision	<p><i>A variable which assigns a value of 1 for each positive answer to the following questions and then total score has been divided by total number of questions:</i></p>
	<ul style="list-style-type: none"> <i>(i) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses?</i> <i>(ii) Can the supervisory agency suspend the directors' decision to distribute bonuses?</i> <i>(iii) Can the supervisory agency suspend the directors' decision to distribute management fees?</i> <i>(iv) Can the supervisory agency suspend the directors' decision to distribute dividends?</i> <i>(v) Can the supervisory authority force a bank to change its internal organizational structure?</i> <i>(vi) Can supervisory agency legally declare---such that this declaration supersedes some of the rights of shareholders that a bank is insolvent?</i> <i>(vii) According to the Banking Law, does supervisory agency has authority to intervene that is, suspend some or all ownership rights of a problem bank?</i> <i>(viii) Regarding bank restructuring and reorganization, can the supervisory agency supersede shareholder rights?</i> <i>(ix) Regarding bank restructuring and reorganization, can the supervisory agency remove and replace management?</i> <i>(x) Regarding bank restructuring and reorganization, can the supervisory agency remove and replace directors?</i> <i>(xi) Do supervisors get a copy of the auditor's report?</i> <i>(xii) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank?</i> <i>(xiii) 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?</i> <i>(xiv) Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank?</i> <i>(xv) Can supervisors take legal action against external auditors for negligence?</i> <p><i>Source: Barth et al. (2008)</i></p>

Table A2: Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
Impaired Loans/Gross Loans	2	1											
Central Bank Supervision	3	0.1067	1										
Real GDP Growth	4	-0.036	0.0457	1									
GDP/Capita	5	-0.2522	0	-0.3588	1								
Financial Crisis	6	0.1656	-0.0306	-0.3508	0.126	1							
Listed	7	0.1682	0.1553	0.1456	-0.3128	0.0014	1						
Ownership	8	0.0862	0.0814	0.1167	-0.3037	-0.0012	0.4006	1					
Cost/income	9	0.1207	-0.0947	-0.1413	0.0685	0.0832	-0.0725	-0.0258	1				
Bank Size	10	0.1584	0.3702	0.0114	-0.0873	0.0531	0.3222	0.0859	-0.2615	1			
Deposit Insurance	11	-0.1177	-0.1724	-0.2218	0.3315	-0.0004	-0.1964	-0.1039	0.0854	-0.1627	1		
Private Monitoring	12	0.1504	0.2972	0.0639	-0.1126	-0.0244	0.1698	0.0079	-0.1056	0.2262	-0.0873	1	
Supervision	13	-0.0194	-0.1034	-0.0126	0.3268	0.0158	0.0266	-0.2628	-0.0166	-0.0343	-0.095	0.1615	1

Impaired loans/gross loans is our dependent variable and has been winsorized at top and bottom 1 percentile. Central Bank supervision is a dummy which takes a value of 1 if the country has its central bank as the unique supervisory authority and zero otherwise. Real GDP growth is the logarithmic difference of real GDP. GDP/capita is GDP divided by total population. Crisis year is a dummy which takes a value of 1 for crisis years (2007-2010) and zero otherwise. Listed is a dummy which takes a value of one for publicly listed banks and zero otherwise. Cost/income ratio of a bank is winsorized at top and bottom one percentile. Bank size is a logarithm of bank assets winsorized at top and bottom one percentiles. Ownership is a dummy which takes a value of one if bank is having no owner with greater than 24.9 percent ownership stake and zero otherwise. Deposit insurance is a dummy which takes a value of one if there is an explicit deposit insurance scheme and zero otherwise. Private monitoring is a variable which assigns a value of 1 for each positive answer to the following questions: Are accounting practices for banks in accordance with International Accounting Standards (IAS)? Are accounting practices for banks in accordance with U.S. Generally Accepted Accounting Principles (GAAP)? Is an external audit a compulsory obligation for banks? Are auditing practices for banks in accordance with international auditing standards? Is it required by the regulators that bank audits be publicly disclosed? Are specific requirements for the extent or nature of the audit spelled out? Are auditors licensed or certified? Are bank regulators/supervisors required to make public formal enforcement actions, which include cease and desist orders and written agreements between a bank regulatory/supervisory body and a banking organization? Supervision is a variable which assigns a value of 1 for each positive answer to the following questions: Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? Can the supervisory agency suspend the directors' decision to distribute bonuses? Can the supervisory agency suspend the directors' decision to distribute management fees? Can the supervisory agency suspend the directors' decision to distribute dividends? Can the supervisory authority force a bank to change its internal organizational structure? Can supervisory agency legally declare---such that this declaration supersedes some of the rights of shareholders that a bank is insolvent? According to the Banking Law, does supervisory agency has authority to intervene that is, suspend some or all ownership rights a problem bank? Regarding bank restructuring and reorganization, can the supervisory agency supersede shareholder rights? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace management? Regarding bank restructuring and reorganization, can the supervisory agency remove and replace directors? Do supervisors get a copy of the auditor's report? Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? 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? Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank? Can supervisors take legal action against external auditors for negligence? For last two variables, total scores have been divided by the total number of questions in each variable.



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School of Management, University of St Andrews
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