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## **The Effectiveness of Banking Supervision**

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# **THE EFFECTIVENESS OF BANKING SUPERVISION**

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**ABSTRACT**

Banking supervision is an essential aspect of modern financial systems, seeking crucially to monitor risk-taking by banks so as to protect depositors, the government safety net and the economy as a whole against systemic bank failure and its consequences. In this context, this paper seeks to explore the relationship between risk indicators for individual banks and the different approaches to banking supervision adopted around the world. This is the first work to make use of the currently available cross section series data on bank supervision from the World Bank to carry out empirical investigations in a panel data framework, gaining all the advantages in increased efficiency and information that comes from estimations combining longer time series and a wide range of countries. We find wide-ranging effects of design features of banking supervision on risk taking which raise important policy issues.

## **Introduction**

Banking supervision has been generally set the tasks of helping to prevent the occurrence of systemic risk to the banking sector, as well as to increase the transparency and effectiveness of the banking sector and contribute to the protection of small depositors (Kasiak 2000). The Basel Committee on Bank Supervision have recently revised and extended the Basel Accord making the second pillar of the Accord focus explicitly on enhancing official supervisory practices of banks. And the sub prime crisis has cast light on potential shortcomings in supervisory practice in many countries. Whereas some researchers have in recent times sought to test the degree to which supervision is successful in these tasks, aided by first dataset on banking supervision made available by Barth et al (2001), such research on banking supervision and its economic and financial impact is still in its infancy.

In this paper we seek to address the question of how best to supervise banks in a new empirical framework which we contend is superior to earlier work. For example, whereas Barth et al (2006) did make use of bank level data in relating bank supervisory policies to bank performance and efficiency, we go further by being the first to explore the direct relationship between the financial soundness indicators (based on individual bank balance sheet and profit and loss ratios) and the different approaches to banking supervision, without losing the effects of other supervision variables in the process of moving to more narrowly constructed indices for bank supervision. This is also the first work to make use of the currently available cross section data on bank supervision to carry out empirical investigations in a panel data framework, using a variant of the Hausman and Taylor (1981) framework. We thereby gain the advantages of increased efficiency and information that comes from estimations combining longer time series and a wide range of countries.

This paper is structured as follows: Section 1 is a theoretical background that explains necessary basic concepts. Section 2 reviews the existing empirical literature. Section 3 explains the data used, the model and methodology employed. Section 4 outlines the results and interprets them. Section 5 concludes with a summary, policy suggestions and recommendations for future research.

### **1. Theoretical Framework**

#### **1.1 Theories Of Bank Supervision**

When it comes to encapsulating the relationship between politics, government and bank supervision, there exists two main approaches. In some countries, the government tries to ameliorate possible market failures by choosing to directly regulate banks in nearly every aspect, from ownership to entry and from restriction of activities to types of lending. Such governments set up powerful supervisory agencies that have the power to completely oversee and discipline banks. In others there is a light

touch of regulation and banks are generally free to operate in a range of markets; they may actually capture the supervisors and make the system act in their own interests. Barth et al (2004) refer to the former approach as the “**public interest view**” and the latter as the “**private interest view**”.

Other economists have proposed different competing, albeit related, theories. One is the “**official supervision view**” derived from Becker (1968) and Becker and Stigler (1974), which is based on the assumption that the government, in the form of a powerful supervisory agency, has the incentive and expertise to reduce the information asymmetries, agency issues and transaction costs associated with banking, thereby improving the corporate governance of banks especially as private agents most times lack the resources and capabilities to properly monitor powerful banks.

The “**political/regulatory capture view**” is the closest to the general public interest view. According to Hamilton et al (1988), Buchanan and Tullock (1962) and Becker (1983), this view argues that politicians do not maximize social welfare and may induce banks to channel credit to politically connected firms. However, following the “private interest” view, banks can also “capture” official supervisors who will then act in the best interest of the banks instead of society. Rajan and Zingales (2003), suggest that this may reduce the efficiency with which banks allocate capital.

Beck et al (2003), point to a compromise to the theories above which is referred to as the “**independent supervision view**”. This theory is based on the view that creating an official supervisory agency that is independent of the government with supervisors that have the right incentives for social welfare, will indeed overcome the problems of poor allocation of bank credit as well as the supervisor “capture” problem, while at the same time retaining the benefits of ameliorating information asymmetry, agency issues and monitoring for the private agents.

Finally there is the “**private empowerment view**”. This is the closest to the general “private interest view”. Hay and Shleifer (1998) and Grossman and Hart (1980) explain that this theory implies limiting the powers of a supervisory agency, but seeks to provide the supervisor with sufficient powers to force accurate disclosure of banks so that private agents can monitor the banks much more easily and at the same time enhance the incentives of the bank management to allocate funds more efficiently, as bank creditors are far less susceptible to “capture by banks or politicians”.

## 1.2 Structures Of Supervision.

There are different aspects to banking supervision, all aimed at checking different aspects of banking practise. The major aspects of supervision are highlighted below<sup>2</sup>.

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<sup>2</sup> We provide a summary of these aspects. A detailed exposition of the different aspects of supervision can be found in Barth et al (2006), from which we obtain most of the summary we provide.

In terms of the way supervision is structured, the decision of whether it is optimal **for the task of bank supervision to go with the Central Banks or instead with another agency** is a key policy issue. The contention is that Central Banks already have the key responsibility of monetary policy and that adding the extra job of bank supervision may risk overstretch. There is also the concern that if central banks also supervise bank activities, there could develop a conflict of interest between the execution of both jobs, especially during a downturn where the central bank may adopt an overly loose monetary policy to contain adverse effects on bank credit quality and profitability. This puts credibility at risk (Goodhart and Schoenmaker 1995).

The converse argument is that there are significant information and operational advantages to leaving the job of supervising banks within the umbrella of the central bank, making it easier for the central bank to observe anomalies and react in a timely way to curb possible problems. The Central Bank may also find it easier to adopt a systemic or macroprudential view of the banking system rather than a sole focus on individual institutions.

An intermediate option is to split the job of supervision, leaving the central bank with systemic aspects of bank supervisory responsibility and assigning the responsibility of the other aspects such as consumer protection to another agency. The other polar option is to assign bank supervision duties completely to another agency than the central bank, or assign the supervision of different classes of financial institutions to different supervisory agencies. The decision of which aspects to assign to which agency is left for every country to make and up till now, there is no way to decide on which option is better.

In this context, Bernanke (2007), points out that models indeed vary. The Central Bank supervises banks in addition to its monetary policy duties in countries such as the Netherlands and Spain. The United Kingdom and Japan on the other hand have a special agency independent of the central bank whose duty is to supervise banks and other markets and institutions. In the Euro area, where there is a unified System of Central Banks that is responsible for monetary policy, some countries have independently commissioned special agencies charged with the task of the bank supervision within those countries while others retain it in the central banks.

The second decision that policy makers have to make is **whether to have a single supervisory authority or to have multiple authorities for the finance services sector**, which includes both banks and other non-bank financial institutions like insurance companies etc. This decision needs to cater for the ever-widening scope of business activities carried out by financial institutions today that range from banking, securities, insurance services and real estate investments. Institutions may have functions that go well beyond their traditional ones. Financial institutions are also becoming larger

conglomerates, with a range of activities being carried out in-house creating the opportunity for risk to transfer easily across the different sectors of financial services. The need for a single financial services authority that is well versed in the overlapping activities that the different financial institutions can carry out has convinced policymakers in a number of countries. However Barth et al (2003) and Quintyn and Taylor (2004) fear that such a giant authority may exert too much power which can be detrimental to the health of the financial system or suffer diseconomies of scale, giving support to the idea of having multiple supervisory authorities that supervise financial institutions depending on what type of activities they are licensed to carry out.

Another equally important aspect is **how independent the supervisory agency is** in carrying out its duties. For supervision to be effective, Quintyn and Taylor (2004) suggest that bank supervisors must be independent from: (i) politicians; bank supervisors must be appointed on merit, preferably by the majority of the legislative body of a country and not just by an autocratic head of state, to work for his/her personal benefit; (ii) the banks they supervise. Bank supervisors should for example be protected from law suits issued by the banks they supervise for any decisions that they take to ensure prudence in the banking sector; (iii) the possibility of the head of the supervisory agency being fired unreasonably. S/he should be given a realistic and fixed minimum term of office, that will allow the effective application of policies and follow up of corrective actions where necessary without the possibility of being fired mid-term. Obviously, the degree of independence that bank supervisors have is closely linked to the overall standards of governance and accountability in a country generally.

Even though it is important for the supervisory authority to be independent from adverse influence, in order to use its powers to appropriately supervise the financial system, **exactly how much power it has** and how it uses it is equally important. There are three main areas that determine how much power the supervisory authority needs, and how the effect of such power may be limited or in some cases reversed; (i) the supervisory authority must have powers that enable it to take prompt corrective action when it observes deterioration in bank solvency levels, to restructure and reorganise a troubled bank and in extreme circumstances, declare a seriously troubled bank insolvent; (ii) when violations in regulation and legal requirements or imprudent behaviour by banks are observed, the supervisory authority should have the discretion to address these issues; (iii) the supervisory authority should have the power to act without undue involvement from the courts. The courts should complement and buttress the power of the supervisors, not undermine it by for example overruling their decisions unreasonably. Overall, a balance of power between the supervisory authority and the institutions they supervise as well as between the courts and the supervisory authority is needed for effective supervision and financial system stability.

The individual bank supervisors employed by the supervisory authority may vary in terms of the level of supervisory experience they possess, their job satisfaction and employment guarantee, their

expected mode of operation and their liabilities, as well as the numbers employed overall. These are all factors that affect the quality of bank supervision and point to the importance of **supervisory personnel and practice** in effective supervision.

### **1.3 The Basel Accord And Banking Supervision**

The failure of an international banking institution – Herstatt Bank in 1974, as well as an increase in cross border banking and problems with unfair international competition between banks facilitated the setting up of the Basel Committee for Banking Supervision. The committee was charged with reaching a consensus for the approaches of banking supervision. In 1988, the Basel Committee established the first Basel Accord (Basel 1) that produced an international standard for capital adequacy, with risk weights assigned for different classes of risks (Powell 2004). In 1997, following the Mexican and Asian Crises, it became clear that capital requirements alone were not sufficient. In that year, the Basel Committee, after consultation with industrialised and developing countries alike, issued a set of supervisory principles termed - the Basel Core Principles for banking supervision (BCP). It has since become accepted as the code of best practices for supervision.

Even shortly after its completion, Basel 1 received many criticisms, such as the arbitrary assignments of risk weights (ESFRC 1999), and the lack of focus on diversification of a banks loan portfolio. In response to such criticisms and in line with the continually changing financial environment, Basel 1 was revised and Basel 2 came into operation. Basel 2 consists of three pillars, focused on capital adequacy, the supervisory review process and market discipline respectively. In this revised framework, capital still dominates albeit potentially assessing risk by using banks' own internal risk models. However, the inclusion of bank supervision into the new framework does raise the profile on the importance of the structure and effectiveness of banking supervision in the international financial terrain, which is our focus in this paper.

A certain amount of research has been carried out to assess which aspects of bank supervision give rise to a more stable or efficient banking sector, but only a few have been empirical in nature. We review some of these below.

## **2 Recent Research Into The Effectiveness Of Banking Supervision**

The focus of economic and financial research on bank supervision is a rather recent phenomenon. It was brought to the fore when the enhanced Basel Accord incorporated it into its core by making it the second pillar. In this context, until recently, bank supervision has always been discussed in the context of crisis prevention, however, Beck et al (2003) point out that banking crises is not the only criterion

for supervision. This implies a need to also focus on the relationship between bank supervision and the macroeconomy.

For example, Peek et al (1999) show that supervisory information, gathered through bank examinations can improve the conduct of monetary policy. They use a measure of supervisory information based on the CAMEL ratings and forecast error data for unemployment and inflation, obtained from a combination of commercial forecasters that comprised of datasets compiled by Data Resources Inc, Georgia State University and the University of Michigan Research Seminar in Quantitative Economics, for the periods between 1978 and 1997. They carry out OLS regressions and find a positive and significant relationship between the CAMEL variable and the forecasts for both employment and inflation, proving that bank supervisory information is a valid predictor of macroeconomic forecasts.

Wall and Eisenbeis (1999), Bernanke (2001) and Greenspan (1994) encourage the idea of a single agency having the inter-dependent macroeconomic and supervisory goals on the grounds of better overall efficiency and an absence of bias against risk taking and innovation in the long run. Haubrich and Thomson (2005) contend that the issue boils down to economies of scope. Simply put, if the information gathered from supervisory activities is hugely important in carrying out monetary policy functions, then it is best that the central bank is singly in charge of both monetary and supervisory functions. However, if there are far greater advantages to specialization arising from better organisational focus, specialised expertise or a reduction in regulatory overlap, then a more efficient decision will be to separate supervisory functions from central banking.

Diamond and Dybvig (1983) point out generally that financial crises and panics involve problems of coordination and collective action. In defending the continuance of the Federal Reserve in playing the roles of banking system supervisor, payment systems regulator as well as monetary policymaker, Bernanke (2007) highlights the benefits of the multiple roles of the Federal Reserve in times of financial panics or crisis, as for example the Federal Reserve was able to provide appropriate liquidity to the banking system and prevented logjams to the payment systems during the failure of Drexel Burnham Lambert in 1990, the collapse of the Long Term Capital management Fund (LTCM) in 1998 and more recently in the wake of the September 11 bombings, simply because it had prior knowledge of the liquidity management practices of key institutions through its supervisory practices. On the other hand, Goodhart and Schoenmaker (1995) show there is no difference in financial stability between countries choosing the different models.

Beck et al (2003), using firm level data of about 5000 firms across 49 countries, carry out an ordered probit econometric analysis to find out how different approaches to bank supervision influence the obstacles that firms face in raising external capital. The firm level data used was obtained from the

1999 World Business environment survey, while the bank supervisory data come from Barth, Caprio and Levine (2003). After controlling for firm-specific factors (such as ownership, type of business engaged in, competition and sales volume), shareholder rights, regulatory restrictions, and political system as well as country-specific factors, Beck et al (2002) find that contrary to the “official supervisory power” approach, lesser financing obstacles are associated with the “independent supervision” approach to bank supervision. Countries with stronger bank agencies who can intervene into bank activities, replace managers, and stop dividends tend to have firms that face greater obstacles when seeking external finance.

Beck et al (2003) also find that in countries where bank supervision forces accurate disclosure of information, firms tends to face lower obstacles in obtaining finance as is consistent with the “private empowerment view”. In the same light, Beck et al (2005), in a further study that sought to assess which supervisory policies eased or worsened the obstacles firms faced in raising external capital, found that traditional supervisory approaches to bank supervision where official supervisory agencies are empowered to directly monitor banks do not improve bank integrity. Rather the private monitoring of banks through increased disclosure lowers the degree to which corruption of bank officials is an obstacle to firms obtaining external financing.

Using a variety of econometric methods and employing series of cross-country bank level data, Barth et al (2004) find that supervisory practices favouring increased disclosure and transparency were synonymous with a boost in the development of the banking system as indicated by the ratio of private credit to GDP and an increase in the efficiency of intermediation as measured by lower net interest margins and overheads. In contrast, their findings do not support the “public interest view”. Since most countries do not have the proper institutional framework that induces politicians and government official to act in the best interest of their citizens, the heavy handed supervision of banks may become a form of abuse of power that will simply divert the flow of credit to the leaders and their associates.

Barth et al (2006) sought to empirically address the issue of what works best with bank supervision. Since there is no single definition for “work best”, they examined the impact of the approaches to bank supervision on a variety of empirical indicators for bank development, bank stability, bank fragility, bank efficiency, bank performance and integrity in bank lending. Using data for bank supervision from their own dataset on regulation and supervision around the world for 2001, they carried out preliminary cross – country correlation exercises between the supervision variables and bank development. The correlation results show that greater government ownership of banks is positively related to policies that reduce competition and restrict international financial integration. This is because foreign ownership of domestic banks is restricted and is also negatively associated with policies that promote transparency and private sector monitoring of banks.

There was no indication that countries with higher levels of private monitoring equally had lower levels of official supervisory power, indicating that some countries rely exclusively on supervisory oversight whereas other countries emphasise private monitoring without necessarily reducing official supervision. However, countries with official supervisory power (governments that restrict entry to new banks', restrict bank activities, prohibit banks from making foreign loans, and have a high level of ownership in domestic banks) tend to lack regulations that force information disclosure by banks and thus have low levels of private monitoring. The correlations also reveal that in countries where the government plays a large role in supervising, regulating and owning banks, there are usually poorly developed banks and higher levels of corruption.

Such correlations are by no means conclusive, so Barth et al (2006), carried out ordinary least squares and two-stage least squares cross-section regression analysis on the impact of bank supervision on the various economic indicators. They use the instrumental variable approach for further robustness and to control for econometric issues such as heteroscedasticity and serial correlation.

They first examined the effect of bank supervision on bank development, as measured by bank credit as a proportion of GDP. It in effect measures the intermediation of society's savings to private firms and may also predict a country's long run economic growth, as suggested by Levine, Loyoza and Beck (2000). They also include dummies for countries' legal origin as exogenous determinants of bank development (La Porta et al 1998)<sup>3</sup> as well as religious composition (Landes (1998), Putnam (1993) and Weber (1958))<sup>4</sup>, and Latitudinal distance from the equator (Diamond (1997), Engerman and Sokolof (1997), Acemoglu et al (2001), Easterly and Levine (2003))<sup>5</sup> as instruments for bank supervision.

They found that supervisory policies that empower the public sector to monitor banks are associated with higher levels of bank development even in countries where the legal and accounting systems may be unreliable. However, powerful supervisors (strong official supervisory power) have a negative influence on bank development, a finding that corroborates with that of Shleifer and Vishny (1998)

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<sup>3</sup> They show that historical differences in legal origin help explain financial development today. For instance, whereas the English common law evolved to protect private property owners against the crown, the French and German civil codes were designed to solidify state power.

<sup>4</sup> Catholic and Muslim religions they argue, tend to produce comparatively centralised hierarchical, and powerful governments, which may exert a powerful influence on the banking sector through tight regulations and an official regulatory agency.

<sup>5</sup> They all emphasise the impact of geography on economic institutions that in turn influence banking development. Diamond (1997) states that countries in area with poor agricultural yield, such as those in the tropics (countries close to the equator) ,do not support large scale farming and so are unlikely to develop institutions associated with upholding private property and economic interactions.Engerman and sokolof (1997) , Acemoglu et al (2001) and Easterly and Levine (2003) all agree the extractive regimes set up by the colonial Europeans n countries with unfavourable tropical climates still endure till today, long after the end of coloniaton . Those regimes were run using a small indigenous elite who extracted natural resources for the colonial masters with slave labour. This practise fostered the creation of institutions in those countries that protect the small elite from the general population, no property rights and zero competition.

and Djankov et al (2002) who all stress that powerful supervisors may use their powers for selfish benefits to the detriment of the overall banking system. However for countries with sufficiently high degrees of democracy, the negative impact of strong official supervisory power on bank development is reduced. In line with the indications of the correlation, the regression results show that indeed, government ownership of banks, restrictions on banks activities, restrictions to entry of new banks reduce the overall level of bank development. They however find no relationship between supervisory agency independence and multiple supervisory agencies per country and the level of a country's bank development.

One major objective of bank supervision is to reduce bank fragility and so avoid systemic bank failures. Barth et al (2006) also investigate the effects of bank supervision on systemic banking crises. They utilize data on episodes of banking crises from Lindergreen et al (1996) and Caprio and Klingebiel (1999) for the period between 1988 to 1999. Using a logit probability model regression with banking crisis as the dependent variable, they find that restricting bank activities and strong official supervision are associated with an increased probability of suffering a major crisis even in the presence of a very generous deposit insurance scheme. This result holds even for countries that highly uphold the rule of law and for countries with weak official supervisory powers, and where banks can diversify their income sources through non-lending activities. They do not find that private monitoring of banks reduces banking system fragility. This runs contrary to the finding of Tadesse (2004) whose conclusions support the view that more timely and comprehensive information disclosure enhances banking system stability. It is also contrary to Basel 2's Pillar 3 of "market discipline" which has also been criticised by Turner (2009) in the wake of the sub prime crisis.

To investigate the connections between the approaches to bank supervision and the efficiency of individual banks as captured by the net interest margin and the ratio of overhead cost to total assets, Barth et al (2006) carry out a cross country generalised least squares regression analysis with a random effects estimator using bank level data for the net interest margin and overhead costs, averaged over the period between 1995 and 1999. They also include country-specific control variables like GDP growth, the level of voice and accountability in a country, the absence of graft (capturing the level of corruption in the country), the degree of political openness and the number of government owned banks in a country. They further control for some bank – specific variables such as the ratio of liquid assets to total assets, bank size, the ratio of bank equity to total assets and market share, measured by the ratio of a bank's assets to total bank assets in the economy.

They find mixed results for the argument that strong supervisory power will improve bank efficiency. Their results show that private monitoring of banks lowers net interest margins and overhead costs, thereby improving bank efficiency. They also show that restrictions on bank activities do not improve

bank efficiency. The relationship between the two cease to exist when institutional variables like the level of corruption and the level of government accountability is controlled for.

We contend that the conclusions drawn from the papers highlighted above are somewhat in support of the “private interest view” of bank supervision, where empowering private monitoring of bank activities through increased disclosure and transparency is a better path to follow as against strong official supervisory agencies. However, irrespective of what view of supervision is seen as optimal, one factor that cannot be overlooked and indeed plays a major role in realizing the benefits of efficient banking supervision is the quality of supervision that is carried out.

A detailed analytic investigation of the relationship between regulatory governance, (proxied by indices representing independence, accountability and transparency) and the quality of banking supervision was carried out by Arnone et al (2007). Their work also assesses countries’ compliance with the Basel Core Principles (BCP) and the IMF’s Monetary and Financial Policy Transparency Code (MFP). The empirical analysis is based on quantitative indices derived from the BCP and MFP datasets both containing information for 116 and 53 countries respectively, with 51 countries common to both. They find a positive and significant correlation between the transparency of the supervisor and the effectiveness of bank supervision. They also show that better accountability and integrity of supervisors are associated with higher independence as well as better compliance with the Basel Core Principles of Banking Supervision

One specific part of the world continually faces challenges with achieving effective banking supervision, namely the developing countries. Work on such countries is relevant given the high proportion of developing countries in our sample. According to Polizatto (1990), during the Colonial period in Africa, many banks operated as branches in the colonies and were subject to the same level of supervision as those in Britain. After Independence, the colonies inherited the British legal system, and banks were incorporated under the provisions of the Companies Act as other companies and were subject to the same bankruptcy proceedings. This poses a problem for supervision since the power to quickly intervene in insolvent banks is lacking. He also highlights the problems with another colonial legacy in Africa, which is the reliance on real estate as collateral for lending. This practice has ensured that mainly land -owners have access to bank financing. It also means that a lot of banks in Africa are saddled with either huge non-performing loans as a result of the illiquidity of the collateral assets or huge non-earning assets that arise after the successful disposal of the collateral. To enhance growth, Polizatto (1990) recommends that developing countries must move away from collateral based lending and embrace modern credit principles.

Alawode (2003) carried out an evaluation of banking supervision in Africa and warns that strengthening bank supervision in that region will be a long-term endeavour that involved taking

action from various fronts. He considers a legal and regulatory reform, instituting an annual needs assessment, addressing problem banks and the supervision of non-bank financial institutions as some of the immediate priorities that should be addressed to get the continent on the road to better supervision.

Crockett (2001) identifies that one of the important international trends continues to be a shift away from regulation and toward supervision. He advises that policy discussions should specifically focus on addressing important issues for establishing and maintaining effective supervision such as who should supervise banks (the structure of bank supervision), should there be a single financial sector supervisory authority (the scope of supervision) and how independent should the supervisor authority be of pressure and influence from politicians and banks (independence of supervision). In the present turbulent financial and economic climate, this call has never been more important. Providing answers to these issues raised here is the motivation for our work.

### **3 Methodology And Data**

#### **3.1 Overall Approach**

We see that the work done by Barth et al (2006) focuses mainly on the effects of supervisory power aspect of bank supervision. This work is limited in three distinct ways. First in the sense that they are unable to conduct time-series or panel data estimations and use averages of data for all the years available to create single observation variables (as in their work with banking crises) or data for only a single year (as in their work for bank development). They are also not able to control for the different aspects of bank supervision in their regressions. This is because the available data for bank supervision is not in time series format. Second, they are also restricted to using mainly ordinary least squares and (OLS) and generalised least squares GLS estimators which do not control for possible endogeneity in the model and even when they occasionally use the instrumental variable IV estimator which is more robust to endogeneity, they point out that they still have problems with confirming the robustness of their results since they are unable to fulfil the “having equal or greater proportion of exogenous regressors to endogenous regressors”( over identifying restrictions) requirement for efficient IV estimation. Third, they construct indices of banking supervision from the answers to selected questions of choice from their database. These indices may not totally capture all the necessary effects of the varying approaches to supervision. They also mask the effects of the individual approaches that have been used in their construction.

We try to address all these shortcomings in our work by using an estimator that allows us to carry out panel data studies and we construct special indices that enable us study the effects of the different aspects of bank supervision controlling for the effects of the other aspects. The estimator we use is

robust to endogeneity in the model and we are able to overcome the over identifying restrictions requirement. Our work is the first to empirically study the effects of the different aspects of bank supervision on bank risk taking, not just as indices, but also to study the individual effects of the underlying approaches that form the supervision indices.

We now go on to explain in detail the data and methodology we use for our work.

### **3.2 Data And Variables**

For this work, a sample of sixty- four (64) nations was used, which as shown in Appendix Table A1 are evenly divided geographically and in terms of stages of development. This study covers the period between 1995 and 2003 - the limit of availability of data in the Bankscope database.

The dependent variables for this work are ratios derived from banks' financial statements, which are proxies stipulated by the IMF as part of the "core" set financial soundness indicators (FSI's), see Appendix Table A2. They were chosen because of their ability to reflect different measures of bank risks. Four of the five categories of FSI's are represented in this work, which are capital adequacy, asset quality, earnings and profitability and liquidity. The fifth, which is sensitivity to market risk, is not employed as a result of the sheer absence of any representative data. Poor disclosure levels prevent the availability of information on banks foreign currency positions, duration of assets and liabilities as well as liabilities (tier 2 capital) as is required to obtain the ratio that indicates sensitivity to market risk. This paper focuses on data from individual bank financial statements, so we prefer to stick to the official IMF indicators, rather than attempt to create possible market proxies for the unavailable variables. The data for the bank risk ratios are derived from balance sheet and profit and loss statements of banks as posted in the Bankscope database.

The selection criteria used for bank choice in each country was along similar lines to that used by Cavallo and Majnoni (2002) but was slightly modified to ensure that we capture an adequate picture of each country's banking system and to accommodate the dynamics of the data available to us. First, every country's central bank was excluded. We then chose the 20 largest banks in terms of asset size in each country for countries with more than 50 banks, the 10 largest banks for countries with up to 50 banks, the 5 largest banks for countries with less than 20 banks and all the banks for countries with 5 banks or less in total, giving rise to total of 914 banks. We made use of the unconsolidated statements of the banks as marked in the Bankscope database, to ensure uniformity and also include as much countries in the sample as possible. It is known that the accounting practices of most countries across the world favors the reporting of unconsolidated financial statements. We are aware that this raises the double counting issue with subsidiaries but this is the trade off for an inclusion of a lot more banks and countries in the sample to ensure a truly bank based and cross-country investigation We placed no

restrictions on the inclusion of other kinds of banks- type financial institutions as long as they met with afore - mentioned requirements. Finally, we eliminated all banks with less than 4 years data of the 8-year sample

The FSI variables are:

<b>LOANAST:</b>	The ratio of total loans to total assets
<b>ROAA:</b>	The return on average assets
<b>LEVRATIO:</b>	The leverage ratio. (Total on-balance sheet assets to own funds <sup>*</sup> )
<b>LIQUID:</b>	The ratio of liquid assets to total assets

The ratio of loans to assets is a predictor of the quality of a bank's assets and highlights the proportion of a banks total balance sheet asset that is issued out as loans, Davis and Zhu (2005) note that loans carry a higher level of risk in comparison to other assets that may be in a bank's asset portfolio such as government bonds etc. A clearer indicator could have been impaired loans or problem loan to gross loans ratio. However obtaining data for those variables proved very difficult for the range of countries that we seek to investigate.

The rate of return on average assets is a good indicator of the earnings and profitability of banks. It captures the risks associated with high leverage in a way the return on equity may not.

The leverage ratio, the ratio of on – balance sheet assets to own funds is an indicator of capital adequacy and availability, which determines the robustness of banks to sudden shocks to their balance sheets. Note that this is the simple value based leverage ratio and it is not adjusted for risk.

The ratio of liquid assets to total assets is the indicator of liquidity and can indicate the degree of maturity mismatches by bank management and as such the ability of banks to withstand shocks. It can also reflect the degree of customer confidence in the long-term survival of a bank. Note that it omits the scale of wholesale funding on the liabilities side, which is another indicator of liquidity risk.

An adverse trend in leverage, return on average assets and liquidity ratios is a pointer to potential banking stress as a result of increased risk. An increase in the loan to asset ratio is an early warning signal of risk to the soundness of a bank. Meanwhile on the right hand side were a number of control variables, seeking to avoid omitted variables bias and inappropriate attribution of effects to our variables of interest, the structure of banking supervision.

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<sup>\*</sup>Equity was used as a proxy for own funds because of unavailable data on total liabilities.

First, as in Demirgüç-Kunt and Detragiache (2001), **macroeconomic variables** were included in the analysis to control for the general state of the economy. **STAGFINDEV**, the Ratio of domestic credit to the private sector to GDP, an indicator of the level of financial development of a country. **GDPGROWTH** is the rate of Growth of Real GDP, and **REALINTRATE**, the real Interest rate, and **STAGDEV**, the ratio of GDP per capita, a measure of how rich or poor a country is thus controlling for the “rich country –poor country” bias. Data for these are obtained from the World Bank Development Indicators (WDI) database.

Second, three of the four dependent variables, **LOANAST ROAA LIQUID** and **LEVRATIO** above were included in the estimation procedure as **bank specific variables** when they did not act as the dependent variable for a particular regression. In this case, they are treated as endogenous time varying variables in the regression.

Third, certain time varying explanatory variables have been included that are thought to be exogenous to the model as is required by the estimation procedure. We believe that they may have an effect on the bank risk dependent variables but not the other way round, therefore eliminating the endogenous problem of reverse causality between these variables and the bank risk ratios. They are **VOICE**, **CORRUPT** and **RULELAW** which are **governance variables** that represent the degree of voice and accountability, level of corruption and the degree to which the rule of law is enforced in a country, respectively. They are specially derived index scores, assigned for each year in the sample, obtained from the Kauffman et al (2005) “Governance Matters” database.

Fourth, **LATITUDE**, stands for the latitudinal distance from the equator, an **institutional variable** obtained from the LaPorta et al database (1998) and used in Caprio et al (2007). They are time invariant throughout the sample. It is thought to be relevant to governance also.

Finally, we have the main variables of interest which are supervision characteristic variables. These variables are obtained from the Bank Supervision section of the World Bank dataset on Banking Regulation Survey 111, carried out by Caprio et al (2007). They are specific answers to specific questions given by the bank supervision authorities of different countries, designed to ascertain the characteristics of banking supervision for each country. This dataset was first compiled in 2001 and has been regularly updated since then.

In the same database, it is stated that policies on the method of bank supervision is not changed regularly and as such it is fair to conclude that the answers given in the dataset must be valid for at least the 10 years prior to the initial date of collection. This is the basis for which these variables are used. They are time invariant variables, constant for every year for each country in the sample. These variables are all treated as endogenous to the model. The supervision variables have been broken

down into the five major categories of supervision (supervisory structure, supervisory scope, supervisory independence, supervisory personnel and practise, and supervisory power). This work focuses on the effects of the first four which have never to our knowledge been empirically studied. Indexes are created for each category that consists of the aggregate of one or more variables relevant to the index. Each index is defined below as well as the individual variables that form the aggregate for the index itself.

The **structure of bank supervision** asks the question, who supervises banks? The index variable that represents supervisory structure is made up of a single variable **SSTRUCT**: Is the central bank the agency that supervises banks? A binary variable (1 if yes, 0 if no)

The **scope of supervision** deals with the issue of how many agencies should supervise banks. The index variable for supervisory scope is **SSCOPE** and is formed from the sum aggregate of the following component variables outlined below. **SS1b**: Are banks supervised by a single supervisory agency other than the central bank? (1 if yes, 0 if no) **SS1c**: Are banks supervised by multiple supervisory agencies? (1 if yes, 0 if no) **SS2**: Is there a single supervisory agency, for all the main financial institutions, including insurance companies, contractual savings institutions and banks. (1 if yes, 0 if no) **SS3**: Is there a main supervisory agency for all the activities that banks are allowed to carry out. (1 if yes, 0 if no)

The **independence of the supervisory independence** is subdivided into three different components:

First there is **political independence**. This index variable captures the degree to which the supervisory agency is free from political pressure from the state. The index is termed **SINDPOL** and the sum aggregate of the following variables: **SS4a**: Are the supervisory bodies responsible or accountable to the president or prime minister. (1 if yes, 0 if no) **SS4b**: Are the supervisory bodies responsible or accountable to the Finance Minister. (1 if yes, 0 if no) **SS4c**: Are the supervisory bodies responsible to a legislative body, e.g. parliament or congress. (1 if yes, 0 if no) **SS4d**: Are the supervisory bodies responsible to a special committee or task force. (1 if yes, 0 if no) **HSA1a**: Is the appointment of the head of the supervisory agency solely the decision of a government officer like the head of state or president. (1 if yes, 0 if no) **HSA1b**: Is the appointment of the head of the supervisory agency solely the decision of a government officer like the Finance Minister. (1 if yes, 0 if no) **HSA1c**: Is the appointment of the head of the supervisory agency the result of a simple majority of the legislative body e.g. Parliament or congress. (1 if yes, 0 if no) **HSA1d**: Is the appointment of the head of the supervisory agency the result of a super majority of the legislative body e.g. Parliament or congress. (Dropped from regressions for collinearity) **HSA1e**: Is the appointment of the head of the supervisory agency the decision of a special committee or task force. (1 if yes, 0 if no) **HSA3a**: Can the head of the supervisory agency be removed solely by the decision of the head of state? (1 if yes, 0 if no)

**HSA3b:** Can the head of the supervisory agency be removed solely by the decision of the Finance Minister? (1 if yes, 0 if no) **HSA3c:** Can the head of the supervisory agency be removed solely by the decision of a simple majority (less than 60%) of a legislative body e.g. parliament or congress. (1 if yes, 0 if no) **HSA3d:** Can the head of the supervisory agency be removed solely by the decision of a super majority (60- 75%) of a legislative body e.g. parliament or congress. (Dropped from regression for collinearity) **HSA3e:** Can the head of the supervisory agency be removed solely by the decision of a special committee or task force? (1 if yes, 0 if no)

Second, there is independence based on the **fixed term of office** of the head of supervision. This index variable captures the degree to which the supervisory officers have independence from getting fired impromptu. It is made up of just one variable **SINDFIXED:** Does the head of the supervisory agency have a fixed term? (1 if yes, 0 if no)

Third, there is **independence from banks**. This index variable captures the degree to which the supervisory authorities are independent from the bank they supervise. This variable is termed **SINDBANK** and is made up of a sum aggregate of the following variables: **SPP7:** Can individual supervisors be held liable for damages to a bank caused by their actions or omissions in the good faith exercise of their duties? (1 if yes, 0 if no) **SPP8:** Can the supervisory agency as a whole be held liable for damages caused to a bank as a result of its action? (1 if yes, 0 if no)

For **supervisory personnel and practise**, there is an index variable termed **SPPRACT**. It covers all other factors relating to the bank supervisory staff and how banks are supervised. The index is a sum aggregate of the following variables: **SPP1:** How many professional bank supervisors are there in total? **SPP2:** How many onsite inspections per bank were carried out in the last 5 years? **SPP3:** How frequently are inspections carried out in small and medium sized banks? **SPP4:** What proportion of the total bank supervisors have more than 10years experience in bank supervision. **SPP5:** What Is the average tenure of supervisors.

Finally regarding **supervisory power**, these variables are ready made indices that capture the power the supervisory agency has, to enable it carry out its duties. They are previously the focus of the study by Caprio et al (2007). These variables are not the focus of this work and are mainly included for control purposes. They are: **OSPOWER:** an index for official supervisory power, that captures the power that supervisory agencies have to take corrective action when faced with imprudent behaviour by banks. **SFDISCR:** an index for supervisory forbearance and discretion, that captures the power that the supervisory bodies have, to engage in forbearance. **COURT:** an index variable representing court involvement. This captures the power of the courts to intervene, limit or reverse the actions of the supervisory authorities.

To control for the effects of bank regulation, we generate index variables for both deposit insurance and the Basel Accord, as follows: For the **adoption of the Basel Accord** (Basel 1 and Basel 11) on banks. This variable is termed **BASEL** and is a sum aggregate of the following variables below.

**BAS1:** Has your country adopted BASEL1? (1 if yes, 0 if no) **BAS2a:** Is your country adopting BASEL 11? (1 if yes, 0 if no) **BAS2b:** Is your country adopting the standardised approach variant? (1 if yes, 0 if no) **BAS2c:** Is your country adopting the foundation internal ratings based approach (IRB) of BASEL11? (1 if yes, 0 if no) **BAS2d:** Is your country adopting the Advanced IRB variant of BASEL11? (1 if yes, 0 if no)

Regarding **deposit insurance** we have an aggregate index variable termed **DIAGGREGATE** which is the sum of eleven (11) the deposit insurance design features as obtained from the World Bank deposit insurance dataset (Demirguc-Kunt et al 2005). The design features were initially constructed as individual 1 to 11 dummy variables and then summed up to create the **DIAGGREGATE** index variable. This variable is better than a simple Deposit Insurance present / absence dummy because the latter will result in perfect collinearity for deposit insurance in the study as all the countries in the sample had instituted deposit insurance in the years included.

Complementary aggregate variables were created that serve as controls in the regressions. They help to prevent the loss of degrees of freedom from excess dummy variables but still retain the effects of those dummies in the estimations. This makes it easier to test for the individual effects of each supervision index / individual variable while adequately controlling for the corresponding effect of the other supervision indices / individual variables. They are time varying variables. **ALLSUP:** is the aggregate variable for overall supervision. It is the sum of the index variables that make up supervision, including the three Caprio et al (2007) indexes for supervisory power – **SSTRUCT**, **SSCOPE**, **SINDPOL**, **SINDFIXED**, **SINDBANK**, **SSTRUCT** as well as, **OSPOWER**, **SFDISCR** and **COURT**. There is then a full set of aggregate controls for supervision indices and individual supervision variables. These are along the following lines: **ALLLyyyyy:** is **ALLSUP** less **YYYYY** and captures the effect of other components of supervision, except **YYYYY** So for example, **ALLLsstruct:** is **ALLSUP** less **SSTRUCT** and captures the effect of other components of supervision, except **SSTRUCT**. This was done for all the variables listed from the supervision database above.

### 3.3 Model And Methodology

This work investigates how the characteristics of banking supervision affects bank risk. We propose the static panel data model below:

$$Y_{it} = \beta X_{it} + \gamma Z_i + \varepsilon_t \quad (i = 1, \dots, N; t = 1, \dots, T) \text{ and } \varepsilon_t = (\alpha_i + \eta_{it}).$$

Where:

$Y_{it}$  = is the dependent variables, in this case, the bank risk ratios.

$\beta X_{it}$  = is a vector of time-varying variables

$\gamma Z_i$  = is a vector of time-invariant variables

$\varepsilon_{it}$  = is the error term which is a combination of  $\alpha_i$ , the latent individual effect, assumed to be a random time invariant variable distributed across the panels, and  $\eta_{it}$ , the disturbance term assumed to be uncorrelated with the columns of  $X$ ,  $Z$  and  $\alpha$  and has a constant mean and variance.

The variables of importance here remain the supervision characteristic variables that are all time-invariant. Since there is potential correlation between the individual latent effects  $\alpha_i$  and the vectors of variables in  $X$  and  $Z$ , ordinary least squares (OLS) and the generalised least squares (GLS) or random effects estimators will yield biased and inconsistent estimated of  $\beta$  and  $\gamma$ .

Traditionally, this problem can be corrected in the panel data analysis framework by eliminating the individual effects, using a within-between or fixed effects transformation of the model. The problem of this method is that it not only gets rid of the individual effects, it also eliminates all time invariant variable from the model during the transformation, making it impossible to obtain parameter estimates for  $\gamma$ . Girma (2008), notes that a random effects panel estimation will not eliminate time invariant variables, but the coefficient estimated obtained from such an estimation will not be efficient and consistent since the underlying endogeneity problems have are not addressed in this framework.

As a solution to the problem, Hausman and Taylor (1981) propose the Hausman –Taylor (HT) estimator, which is essentially an Instrumental Variable procedure that has a random effects component also known as a Filtered Instrumental Variable (FIV) estimator, that allows for the possibility of obtaining both efficient and consistent estimates of the coefficients of the time-invariant variables  $Z$  by: First, assuming that some of the time –varying variables in column  $X$  is uncorrelated with  $\alpha_i$ , and as such is exogenous. Second, making use of those exogenous components of  $X$  as sufficient instruments for the columns of  $Z$  in the model.

A necessary condition here is that there be at least as many exogenous time varying  $X$  variables as there are endogenous time-invariant  $Z$  variables (exogTV in  $X$  = endogTI in  $Z$ ). In this case, the model will be just identified. If there are a greater number of exogenous variables in column  $X$  than there are endogenous variables in column  $Z$  in the model (exogTV in  $X$  > endogTI in  $Z$ ), then the model is over identified and so parameter estimates are more efficient. Ahn and Schmidt (1999) show that the HT estimator yields parameter estimates equivalent to that produced by the within –between {????} estimator (referred to above as a corrective method for obtaining consistent parameter estimates, but with the disadvantage of eliminating time invariant variables) when the HT model is

just identified (exogTV in  $X = \text{endogTI in } Z$ ) and is more efficient than the within estimator when the HT model is over identified (endogTV in  $X > \text{endogTI in } Z$ ). Amemiya and MaCurdy (1986) and Breusch et al (1989) both propose improved variations to the Hausman Taylor Estimator, by imposing stricter assumptions. However, the extra assumptions make their variants less flexible and more difficult to apply especially when dealing with restricted data availability as in this work.

Note that we were not able to control for the effects of the presence of deposit insurance per se as every country in this work has deposit insurance present in the years for which data on supervision and other variables are present. The variable was dropped as a result of perfect collinearity, and instead we use DIAGGREGATE which summarises the scope of the system that exists.

For the purpose of this study, the endogenous time invariant variables are each of the supervision characteristics variables, while the exogenous time varying variables are **CORRUPT**, **RULELAW** and **VOICE** for the following reasons: First the level of corruption in a country, how the rule of law is extended and the degree of voice and accountability the citizens of a particular country affect the bank risk variables, mainly through their effect on the supervision variables in the model. They are potentially exogenous instruments. Second, countries with less corruption, satisfactory rule of law and a high level of voice and accountability of its citizens should generally supervise their banks better. They are potentially correlated with the bank supervision variables therefore relevant instruments. Since these variables intuitively satisfy the conditions for instrument validity (instrument exogeneity and instrument relevance) as outlined in Girma (2008), we believe they can serve as sufficient instruments for obtaining consistent parameter estimates of  $\beta$  and  $\Upsilon$  in our model therefore boosting the underlying assumptions of the HT estimations we carry out.

As regards procedure, first, we estimate an initial base regression with the **OVERALLSUP** variable for all four dependent variables, to determine the general effect of bank supervision on the FSI's. Then separate regressions are run with all three exogenous time varying regressors but each time, inserting only one (1) of the supervision variables per regression- (endogenous time invariant regressors). This makes sure that model is always over identified (a ratio of 3: 1) and that the parameter estimates obtained are of greater efficiency.

Since we are unable to have all the supervision variables in one regression, we have separate regressions for each supervision variable. This also helps curb the problem of collinearity among the variables – a real possibility when working with binary variables. However, to enable us to control for the effects of the other aspects of supervision in each regression, a corresponding aggregate supervision control variable is inserted (Overall supervision less the particular variable of focus). For each of the four dependent variables, we carry out two sets of estimations. First for each supervision

index variable and then another for each of the individual supervision variables that make up the index, in the format below.

Specification 1: BASELINE +BASEL+ DIAGGREGATE + INDEX VARIABLE + ALL LESS THE INDEX VARIABLE

Specification 2: BASELINE +BASEL+ DIAGGREGATE + INDIVIDUAL VARIABLE + ALL LESS THE SINGLE VARIABLE

This procedure is more informative as it allows us to see the group impact of the different supervision indexes, as well as study the effects of the individual variables that make up the index too.

For a further robustness check, we ran random effects regressions for the model (not reported), and conducted a Hausman test, comparing the output of the random effects estimation to those of the Hausman-Taylor estimation. The HT estimators prove to be superior as expected. All outliers in the dataset are removed using the Grubbs test / maximum normed residual test developed by Grubbs (1969). The estimations also employ the more robust jackknife standard errors. Efron (1981) points out that Jackknife standard errors are very similar to bootstrapped standard errors in efficiency but are more suited to panel data than bootstrapping which is better for time series models. The jackknife calculates standard error estimates by simultaneous iteration for every panel observation in the data.

#### 4 Results And Interpretation

The results of the estimations carried out are shown in Table 1.1 through 1.5. We provide full details for the first two overall regressions and then only the supervision variables for the others, to save space.

As shown in Table 1, in the baseline regressions with the **OVERALLSUP** variable, there are varying results for the **time varying exogenous variables**. The degree of voice and accountability (**VOICE**), the level of corruption (**CORRUPT**) and the rule of law (**RULELAW**) have no effect on the level of liquidity banks keep. Stronger adherence to the rule of law (**RULELAW**) increases both the amount of loans banks issue relative to their assets as well as the level of profitability (**ROAA**). While there is slight evidence that a higher degree of voice and accountability reduces the capital adequacy (**LEVRATIO**) of banks.

Concerning **time varying endogenous variables**, as is evident from the initial base regression results, a high loan to asset ratio (**LOANAST**) reduces bank liquidity (**LIQUID**) as well as capital adequacy ratios (**LEVRATIO**), but has no significant effect on the profitability level of banks (**ROAA**). High liquidity levels (**LIQUID**) boosts the capital adequacy of banks. Higher profitability levels (**ROAA**)

reduces the level of capital that banks keep (LEVRATIO), and in turn, high capital adequacy levels (LEVRATIO) lowers bank profitability (ROAA). Banks in richer countries (STAGDEV) are usually less liquid (LIQUID) than banks in poorer countries, perhaps due to access to liquid wholesale markets. Banks in more financially developed countries (STAGFINDEV) tend to lend more relative to their assets (LOANAST). Banks in fast growing economies (GDPGROWTH) tend to lend more relative to their assets (LOANAST). The real interest rate has no effect on the bank risk ratios.

The adoption of the Basel Accord - which includes Basel 1 and 11 (BASEL) reduces bank liquidity levels (LIQUID) and profitability levels (ROAA). Basel adoption however encourages banks to keep adequate capital (LEVRATIO) but at the same time, gives banks the incentive to lend more relative to their assets (LOANAST), possibly in an attempt to increase profitability to offset perceived costs of equity capital. The deposit insurance aggregate variable, encourages banks to lend more relative to their assets (LOANAST) as well as causing a reduction in bank profit levels since it has an inverse relationship with the return on average assets ratio (ROAA). These are consistent with problems of moral hazard from deposit insurance.

As regards **time invariant exogenous variables**, banks in countries farther away from the equator (LATITUDE) lend more relative to their assets (LOANAST), are more profitable (ROAA) and have more liquidity (LIQUID). However we find weak evidence that banks in countries farther away from the equator keep less capital. (LEVRATIO).

Finally in terms of the **supervision characteristics variables**, as is evident from the initial base results shown in Table 1, we deduce that overall supervision as summarised causes banks to lend less in relation to their assets (LOANAST), indicating more cautious balance sheets, however, it also reduces bank profitability (ROAA) and also gives banks the incentive to be less liquid. The OVERALLSUP variable used in the initial base regression is an aggregate variable and so gives us a general view of the effects of supervision. This general effect can change if the different components of bank supervision are re-arranged, hence the need to understand the individual effects of the components on our bank risk variables.

To better understand the impact of supervision, we now go on to interpret the results of the regressions which employ the breakdown of the overall supervision aggregate into the four component parts – supervisory structure, scope of supervision, supervisory independence and supervisory personnel and practice, for which we are concerned with in this paper. For each supervisory subgroup, we also analyse further the effects of the individual component variable that make up the subgroup. We provide summary tables for these results and do not repeat the other variables for reasons of space. Tables with full details are available from the authors on request.

Table 2 shows that the **supervisory structure** variable SSTRUCT has a positive relationship with the bank risk variables. Banks tend to have higher liquidity levels (LIQUID), lend more relative to their assets (LOANAST), and are more profitable (ROAA), when the agency that supervises them is the central bank as against when supervised by other agencies. This finding is in line with Wall and Eisenbeis (1999), Bernanke (2001) and (2007), Greenspan (1994) and Diamond and Dybvig (1983). The agency that supervises banks does not have any effect on the level of capital banks keep (LEVRATIO). Meanwhile the effects of the other control variables are in with the same as the outcomes in Table 1.

The rest of the results are provided in summary form in Tables 3-5. Bear in mind that all the other regressors remain present, including the complementary variable that summarises the rest of the questionnaire responses ALLLYYYYY. From Table 3, we see that the **scope of supervision** SSCOPE is significant and positive for three of the four bank risk variables – LIQUID, LOANAST and ROAA. Since the index for scope of supervision is made up of four individual variables, we see what effect each of them have on bank soundness. The number of agencies that supervise banks does not affect the capital adequacy of banks.

Banks have higher liquidity levels, lend more relative to their assets and are more profitable, when they are supervised by a single supervisory agency, other than the central bank(SS1b). The same effects hold, when supervised by multiple agencies (SS1c). There is no change in effect when there is a single supervisory agency for all financial institutions in the economy (SS2) and when there is one main supervisory agency for all the activities that banks are allowed to carry out (SS3).

Turning to **supervisory independence**, Table 4 shows that the variable for political independence, SINDPOL is significant for three of the bank risks variables- LIQUID, LOANAST and ROAA, albeit consistent with higher risk on the asset portfolio. This political independence index variable was constructed from fourteen individual variables, whose effects we now go on to trace.

For example. when supervisory agencies are accountable to the president / prime minister (SS4a) or a special committee / task force (SS4d), banks tend to lend more (LOANAST), but are more liquid (LIQUID) and more profitable (ROAA). When the appointment of the head of the supervisory agency is solely the decision of the head of state or president (HSA1a) or the decision of a small majority of parliament or congress (HSA1c), banks tend to have increased liquidity, lend more relative to their assets and have greater returns on their assets. Complementarily, when the head of the supervisory agency can be fired by the sole decision of the head of state (HSA3a), Finance Minister (HSA3b) or by the simple majority of the legislature/congress (HSA3c), banks tend to exhibit the same characteristics above.

When the head of the supervisory authority has a fixed tenure, **SINDFIXED**, banks will tend to have higher levels of liquidity **LIQUID**, higher loan to asset ratios (**LOANAST**) and higher return on assets (**ROAA**).

The independence of the supervisory agency from pressure from the banks that they supervise (**SINDBANK**) is important for financial soundness as it is positively correlated with **LIQUID**, **LOANAST** and **ROAA**. This index consists of two individual variables whose effects are stated as follows. Banks have higher liquidity levels (**LIQUID**), higher loan to asset values (**LOANAST**) and higher profitability (**ROAA**), when either the bank supervisors (**SPP7**) or the supervisory agency as a whole (**SPP8**), can be held liable for damages caused to a bank as a result of their actions or omissions.

As regards **supervisory personnel and practise**, shown in Table 5, the index variable **SPPRACT**, which captures the effects of the supervisory staff and how supervisory work is carried out, is negatively correlated to the level of liquidity that banks hold. This is however dominated by the number of supervisors which is dependent on country development and size. The overall index is made up of five individual variables, whose effects on the Financial Soundness Indicators are outlined below.

A high number of total bank supervisors (**SPP1**) reduces the liquidity level (**LIQUID**), the loan to asset ratio (**LOANAST**) and profitability of banks (**ROAA**). Even though frequent inspection visits to banks (**SPP2**), generally have no significant effect on the bank risk variables, frequent inspections carried out in small and medium sized banks (**SPP3**) helps increase their liquidity levels as well as their return on assets (**ROAA**). These small and medium sized banks also tend to lend more as a result (**LOANAST**). The difference between **SPP2** and **SPP3** is consistent with large banks being relatively unaffected by supervision.

A higher number of more experienced bank supervisors in the agency (**SPP4**) causes bank to lend less (**LOANAST**). However, this also reduces their liquidity (**LIQUID**) and profitability (**ROAA**) level as well. Finally, on average, long tenure for bank supervisors (**SPP5**) gives banks the incentive to lend more relative to their assets (**LOANAST**), but still earn higher return on assets (**ROAA**).

## **5 Conclusion**

We find that all aspects of bank supervision – structure, scope, independence, power, personnel and practice are significant for how banks operate and their soundness as indicated by the financial soundness indicators.

Banks lend more and maintain higher liquidity levels, when the role of bank supervision is left under the umbrella of the central bank. Where this is not the case, there is no evidence to show that having either a single or multiple bank supervisory agency is particularly better for supervising the varied activities carried out by banks or the financial service sector in general. This suggests that the information advantage which comes with having monetary policy making as well as the responsibility of supervision all under one roof is crucial for the health of the system. However, we note that Goodhart and Schoenmaker (1995), on an older dataset, were more agnostic about the relationship of supervisory structure to risks of financial instability more generally

Bank liquidity and profitability is high when the head of the supervisory agency is hired and fired solely by the decision of the head of state or a small majority of the democratic decision makers, and is responsible to the head of state or when a special task force has been set up to oversee the activities of the supervisory agency. The same effects obtain when the head of the supervisory authority has a fixed term of office but the whole supervisory agency as well as its staff can be held liable by the banks for damages caused by their errors. These effects on supervisory independence tend toward suggesting a stronger influence of politics on the supervisory agency may benefit banks too. This may be important to make the supervisory authority more accountable as is the case with central bank independence for monetary policy. It is also important to stress here that just like Beck (2005) who point out that high degrees of democracy reduce the negative impact of strong official supervisory power and Quintyn and Taylor (2004) who highlight the role of governance in helping to stop supervisors from abusing their independence, our results show that a high standard of the rule of law is essential to make this work.

When individual bank supervisors, have long tenure (which may reflect also good salaries), banks are more profitable and small banks benefit from more frequent on-site visits from supervisors. A high number of staff supervisors especially more experienced ones reduces the level of loans issued by banks relative to their assets, which implies lower credit risk, but this also reduces bank liquidity and profitability levels as well. This may be a necessary trade off for achieving sustainable bank stability.

Apart from this last point, many of the significant aspects of bank supervision seem to encourage high bank lending ratios. Banks have an incentive to maintain high loan ratios irrespective of who supervises them, how independent or who they are accountable to. One limitation of our study is that we are unable at this time to discover how much of their increased loan issuances are as a result of increased intermediation or overlending. However, it seems that more efficient supervision in the form of having more experienced supervisors, who understand the job, supervise banks can help keep banks loan portfolios in check. This will greatly reduce the risk of bank insolvency due to an increase in bad loans.

However, we note that the level of capital held by banks as measured by leverage is not affected by supervision at all, consistent with the uniform application of the Basel standard around the world and in line with the significant correlation between the Basel variable and the capital adequacy variable in our results.

Overall, our results support a structure where central banks are sole supervisors of the financial services sector. Politicians should hold the supervisory agency accountable for their job but must also improve in the level of governance in their countries. Banks should not be stripped of their right to seek redress should the supervisory agency make costly mistakes. Most of all, the individual bank supervisors, who are at the forefront of the job of bank supervision should be given proper training with an emphasis on supervisors having longer on the job experience as they better understand the depth the effects that their duty of frequent on site inspections have on the financial system and the wider economy at large.

For further research, we would encourage more empirical studies on the effects of supervision on the different aspects of the financial system, as well as increased availability of micro-level data on banks over a longer time span. Our work has also highlighted the need for a possible yardstick by which to both regularly check the efficacy of bank supervision and better hold supervisory agencies more accountable.

**Table 1: Baseline regression with the OVERALLSUP variable**

REGRESSORS	LIQUID	LOANAST	ROAA	LEVRATIO
<b>TV EXOGENOUS</b>	0.37318(0.167)	- .0133717(0.399)	-.6855351(0.379)	-3.402156(0.070)
VOICE				
CORRUPT	-0.003793 (0.779)	.0122744 (0.101)	-.1441137(0.259)	-.3765085(0.659)
RULELAW	.0373868 (0.552)	.0956839 (0.000)***	2.234483(0.001) ***	4.359814(0.105)
<b>TV ENDOGENOUS</b>	-.008175(0.163)	-.0026046(0.121)		-.2285771(0.009)***
ROAA				
LOANAST	-.665687(0.000) ***		-1.677978(0.191)	-5.095077(0.036)**
LIQUID		-.0630769(0.353)	-.4990417(0.358)	1.207481(0.069)*
LEVRATIO	.0002781(0.264)	-.0001112(0.233)	-.0032138(0.066)*	
STAGDEV	-.0075085 (0.000)***	.0023311 (0.342)	.0546799 (0.124)	1.166922(0.293)
STAGFINDEV	-.0543443 (0.115)	.0220905 (0.046))	-.255629 (0.107)	3.383654(0.505)
GDPGROWTH	-.0000667 (0.971)	.0016266 (0.058)*	.0244497 (0.505)	-.0251341(0.733)
REALINTRATE	-.0001421 (0.687)	.000342 (0.474)	.0034601 (0.738)	-.022311(0.494)
OVERALLSUP	-.0001286 (0.004)***	-.0000835 (0.001)***	-.0007791(0.027)**	.0033519(0.648)
BASEL	-.0571349(0.000)***	.0404831 (0.000)***	-1.760939(0.000)***	3.19068(0.000)***
DIAGGREGATE	-.0003043 (0.470)	.0008839 (0.068)	-.0376957(0.002)	.0104437(0.534)
<b>TI EXOGENOUS</b>	2.952975 (0.000)***	.4614723 (0.035)**	28.25552(0.000)***	-34.06313(0.073)*
LATITUDE				
<b>TI ENDOGENOUS</b>				
(none)				
RHO( u_i)	0.999998	0.99999972	0.9999999	0.99999788
NO OF OBSERVATIONS	4056	4056	4056	4056
NO. OF COUNTRIES	814	814	814	814

\*, \*\* And \*\*\* stand for significance at the 10%, 5% and 1% respectively.

**Table 2: Regression with SSTRUCT AND ALLSSTRUCT**

REGRESSORS	LIQUID	LOANAST	ROAA	LEVRATIO
<b>TV EXOGENOUS</b>	.0373173(0.167)	-.0133718(0.399)	-.6855369(0.379)	-3.402207(0.070)*
VOICE				
CORRUPT	-.0037927(0.779)	.0122744(0.101)	-.1441133(0.259)	-.3764943(0.659)
RULELAW	.0373909(0.552)	.0956845(0.000)***	2.23449(0.001)***	4.360017(0.105)
<b>TV ENDOGENOUS</b>	-0081751(0.163)	-.0026046(0.121)		-.2228579(0.009)***
ROAA				
LOANAST	-.6656884(0.000)***		-1.677979(0.191)	-5.09513(0.036)**
LIQUID		-.0630769(0.353)	-.4990418(0.358)	1.207475(0.069)*
LEVRATIO	.0002781(0.264)	-.0001112(0.233)	-.0032138(0.066)*	
STAGDEV	-.0075083 (0.000)***	.002331(0.342)	.0546803(0.124)	1.166936(0.293)
STAGFINDEV	-.0543443(0.115)	.0220905(0.046)**	-.255629(0.107)	3.383652(0.505)
GDPGROWTH	-.0000667(0.971)	.0016266(0.058)*	.0244497(0.505)	-.0251344(0.733)
REALINTRATE	-.0001422(0.687)	.000342(0.474)	.0034601(0.738)	-.0223128(0.494)
ALLSstruct	3.87e-06(0.932)	.0000301(0.274)	.0027469(0.002)***	.0080252(0.266)
BASEL	-.0570481(0.000)***	.0406828(0.000)***	-1.7542(0.000)***	3.191091(0.000)***
DIAGGREGATE	-.0003043(0.470)	.0008839(0.068)*	-.0376958(0.002)***	.0104421(0.534)
<b>TI EXOGENOUS</b>	1.52845(0.014)**	-.7624677(0.036)**	-9718071(0.208)	84.27341(0.222)
LATITUDE				
<b>TI ENDOGENOUS</b>	<b>1.194164(0.011)**</b>	1.024742(0.000)***	-9.718071(0.208)	42.12618(0.339)
SSTRUCT				
RHO( u_i)	.99999917	.99999984	.99999995	.99999883
NO OF OBSERVATIONS	4056	4056	4056	4056
NO. OF COUNTRIES	814	814	814	814

\*, \*\* And \*\*\* stand for significance at the 10%, 5% and 1% respectively.

**Table 3: Results for supervisory structure and supervisory scope**

REGRESSORS	LIQUID	LOANAST	ROAA	LEVRATIO
<b>SSTRUCT</b>	<b>1.194164(0.011)**</b>	1.024742(0.000)***	-9.718071(0.208)	42.12618(0.339)
<b>SSCOPE</b>	.3829649 (0.006)***	.3666444(0.000)***	9.248397(0.000)***	12.80766(0.305)
<b>SS1B</b>	.6752933(0.012)**	.5637369(0.000)***	18.37164(0.000)***	24.11893 (0.356)
<b>SS1C</b>	1.076828(0.043)**	1.239661(0.012)**	20.79067(0.006)***	32.11535 (0.238)
<b>SS2</b>	2.337(0.027)**	1.891379(0.010)***	26.81987(0.161)	17.89201 (0.620)
<b>SS3</b>	1.309939(0.003)***	1.021456(0.000)***	24.51167(0.000)***	32.35109 (0.370)

\*, \*\* And \*\*\* stand for significance at the 10%, 5% and 1% respectively. Note: the results are derived from specifications identical to those in Table 2, but with only the supervision variable quoted.

**Table 4: Results for supervisory independence**

REGRESSORS	LIQUID	LOANAST	ROAA	LEVRATIO
<b>SINDPOL</b>	.1744527(0.007)***	.1609095(0.000)***	4.36703(0.000)***	5.952588(0.317)
<b>SS4A</b>	1.434187(0.001)***	1.144491(0.000)***	20.45629(0.000)***	20.37457 (0.379)
<b>SS4D</b>	1.17856(0.060)***	1.053549(0.049)**	30.30845(0.004)***	40.77847 (0.345)
<b>HSA1A</b>	1.122023(0.000)***	.8923552(0.000)***	16.74154(0.000)***	17.68245 (0.375)
<b>HSA1C</b>	.3674999(0.072)*	.1673937(0.289)	13.49459(0.000)***	15.7246 (0.465)
<b>HSA3A</b>	.4639948(0.000)***	.3839586(0.000)***	3.260782(0.065)*	-1.299094 (0.836)
<b>HSA3B</b>	1.508077(0.093)*	1.099452(0.078)*	45.01908(0.025)**	56.82259 (0.410)
<b>HSA3C</b>	.3650462(0.009)***	.2859628(0.000)***	10.4027 (0.000)***	13.39163 (0.366)
<b>SINDFIXED</b>	.6092327(0.008)***	.4781296(0.000)***	17.33714(0.000)***	22.32753(0.363)
<b>SINDBANK</b>	.4382632(0.007)***	.3797909(0.000)***	11.57594(0.000)***	15.3966(0.335)
<b>SPP7</b>	1.669355(0.005)***	1.293722(0.000)***	33.20425 (0.000)***	45.86529 (0.376)
<b>SPP8</b>	.6523609(0.001)***	.4356229(0.000)***	13.4345 (0.000)***	15.15524 (0.349)

\*, \*\* And \*\*\* stand for significance at the 10%, 5% and 1% respectively. Note: the results are derived from specifications identical to those in Table 2, but with only the supervision variable quoted.

**Table 5: Results for supervisory personnel and practice**

REGRESSORS	LIQUID	LOANAST	ROAA	LEVRATIO
<b>SPPRACT</b>	-.0000901(0.025)**	-.0000198(0.322)	-.0005995(0.106)	.0041777(0.558)
<b>SPP1</b>	-.0021975(0.064)*	-.0023422(0.001)***	-0.03192 (0.002)***	-0.020418 (0.722)
<b>SPP2</b>	-.0000328(0.334)	.0000281(0.119)	0.0004208 (0.218)	-0.0024656 (0.434)
<b>SPP3</b>	.7208857 (0.000)***	.543659(0.000)***	12.60624 (0.000)***	14.89032 (0.327)
<b>SPP4</b>	-.0040323(0.048)**	-.0033859(0.000)***	-0.0599 (0.000)***	0.0084002 (0.928)
<b>SPP5</b>	.0516283(0.126)	.0303132(0.006)***	1.432491 (0.000)***	2.161901 (0.365)

\*, \*\* And \*\*\* stand for significance at the 10%, 5% and 1% respectively. Note: the results are derived from specifications identical to those in Table 2, but with only the supervision variable quoted.

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## APPENDIX

**Table A1: Country Coverage**

Continent	Advanced	Developing or transition
Europe	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom	Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Slovakia, Turkey, Ukraine
N America	Canada, United States of America	Dominican Republic, El Salvador, Jamaica, Mexico, Trinidad and Tobago
S America		Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Venezuela
Africa		Cameroon, Central African Republic, Chad, Congo, Gabon, Kenya, Nigeria, Tanzania, Uganda
Asia	Japan, Korea, Taiwan	Bangladesh, India, Philippines, Sri Lanka
Middle East	Bahrain, Oman	Lebanon

**Table A2: IMF Financial Soundness Indicators: The Core and Encouraged Sets**

<b>Core Set</b>	
Deposit-takers	
<i>Capital adequacy</i>	Regulatory capital to risk-weighted assets Regulatory Tier 1 capital to risk-weighted assets Nonperforming loans net of provisions to capital
<i>Asset quality</i>	Nonperforming loans to total gross loans Sectoral distribution of loans to total loans
<i>Earnings and profitability</i>	Return on assets Return on equity Interest margin to gross income Noninterest expenses to gross income
<i>Liquidity</i>	Liquid assets to total assets (liquid asset ratio) Liquid assets to short-term liabilities
<i>Sensitivity to market risk</i>	Net open position in foreign exchange to capital
<b>Encouraged Set</b>	
Deposit-takers	Capital to assets Large exposures to capital Geographical distribution of loans to total loans Gross asset position in financial derivatives to capital Gross liability position in financial derivatives to capital Trading income to total income Personnel expenses to noninterest expenses Spread between reference lending and deposit rates Spread between highest and lowest interbank rate Customer deposits to total (noninterbank) loans Foreign-currency-denominated loans to total loans Foreign-currency-denominated liabilities to total liabilities Net open position in equities to capital
Other financial corporations	Assets to total financial system assets Assets to GDP
Nonfinancial corporations sector	Total debt to equity Return on equity Earnings to interest and principal expenses Net foreign exchange exposure to equity Number of applications for protection from creditors
Households	Household debt to GDP Household debt service and principal payments to income
Market liquidity	Average bid-ask spread in the securities market <sup>1</sup> Average daily turnover ratio in the securities market <sup>1</sup>
Real estate markets	Residential real estate prices Commercial real estate prices Residential real estate loans to total loans Commercial real estate loans to total loans

Source: IMF (2003)