Bank Regulation, Supervision and Performance around the World
-What has been the change since the Global Financial Crisis?

Abstract

In this study, using the World Bank's Bank Regulation and Supervision Survey (BRSS) data, we draw insights about the bank regulatory/supervisory styles, illustrate the differences in regulation/supervision among crisis, non-crisis, and BRICS countries, and highlight the ways in which bank regulation and supervision has changed during the crisis period. The study suggests that crisis-countries had weaker regulatory and supervisory frameworks compared to those in emerging countries during the crisis. BRICS countries as a distinct block has demonstrated uniqueness in the regulatory/supervisory styles which is neither similar to crisis-countries nor with the non-crisis countries.

Keywords: Central Banks, Banking Regulation, Capital adequacy, Regulation, Risk, Supervision, Financial markets and governance, Crisis

JEL Classification: E58, G18, G20, G21, G32, G38, L51, O16

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1. Introduction

Bank regulation and supervision has been the subject of much recent debate and attention due to the devastating effects of the global financial crisis. As the role of banking sector is undoubtedly indispensable in the process of financial intermediation and thereby achieving faster economic growth and sustainable development, a prudent regulatory environment can not only facilitate performance of the banking systems but also ensure financial stability. As is widely believed, at the heart of bank regulation is a deep-seated concern that social and economic costs of such systemic crises are enormous. Financial crises are of unique concern because they often have real effects on economic growth and employment. As such, the goal of prudential regulation should be to ensure the financial stability of the overall financial system as a whole. The recent global financial crisis has forced the regulators and researchers to re-examine our understanding of the characteristics of financial markets and financial institutions. The financial crisis has revealed the limitations in supervisory enforcement and market discipline underscoring the importance of combining strong, timely, and anticipatory supervisory enforcement with better use of market discipline. Some micro-prudential regulations were poorly designed, contributing to systemic risk. It also highlighted the importance of basics—solid, transparent, legal and institutional frameworks to promote financial stability as well as building supervisory capacity on priority. The crisis has triggered a healthy debate on approaches to regulation and supervision among regulators, policy makers, and academics, leading to multiple proposals for further reforms. Reforms are necessitated to aim at limiting regulatory arbitrage, more transparency, and simpler regulation to enhance accountability, more proactive efforts to identify and address incentive problems and make better use of regulatory resources. As financial regulators around the world endeavor to decide how best to reform bank regulation and supervision, an essential input ought to be a thorough understanding of what other countries do and eventually of the implications of these choices.

Though several studies have pointed to weaknesses in regulation and supervision as one of the factors leading to the crisis (Gonzalez, 2005; Dan, 2010; Lau, 2010; Levine, 2010; Merrouche and Neir, 2010; and Barth *et al.*, 2012), not only did the crisis raise important questions on the appropriateness of the regulatory and supervisory approaches pursued in the run-up to the crisis, but also it prompted regulators to consider important changes in regulation and supervision. It is widely believed that the epicenter of the crisis was in the developed countries but the contagion was seen even in the emerging and developing

economies. This underscores the need to examine the recent state of bank regulation and supervision in a wide range of countries and to compare it to the pre-crisis situation.

This paper builds on the kind of studies that have examined the Bank Regulation and Supervision Survey (BRSS). Barth *et al.,* (2004) assess the relationship between specific regulatory and supervisory practices and banking-sector development, efficiency, and fragility suggest that regulatory and supervisory practices that force accurate information disclosure to empower private sector monitoring of banks and create incentives for private agents to monitor banks work best to promote bank performance and stability. Barth *et al.,* (2006) reveal that restrictions on the entry of banks, government ownership of banks, and restrictions on bank activities hurt banking system performance. Further, on, Barth *et al.,* (2008) conclude that while many countries strengthened capital regulations and official supervisory agencies following Basel guidelines, the reforms are not likely to improve bank stability or efficiency.

The foregoing assay suggests the motivation to make a critical analysis of the regulatory environments in general and BRICS[1] countries in particular. Notwithstanding the high degree of interest in the topic and extensive work on the global regulatory framework, there is a need to examine the information on the regulatory and supervisory approaches pursued across the countries and the changes brought about by the crisis. This entails to find answers for three essential questions: First, what was the topography of the regulatory and supervisory frameworks of countries that were directly hit by the global financial crisis? Second, how did they differ from those of the BRICS countries? Third, what lessons can be drawn for strengthening the regulatory structures of these countries? Furthermore, it is also desirable to trace how the national regulatory and supervisory practices changed since the previous survey in response to the global financial crisis. In addition, an analysis of the relationship between bank performance and stability with differences in bank regulations and supervision in BRICS countries and that of the advanced countries merits an attention. The originality of this study lies in its unique approach in assessing the bank regulation and supervision styles around world and their impact on banking system profitability as its

[1]BRICS countries assume significance as these five (Brazil, Russia, India, China and South Africa) emerging economies host more than 2.8 billion people or 40 percent of the world's population, cover more than a quarter of the world's land area over three continents, and account for more than 25 percent of global GDP. The five BRICS countries are distinguished from a host of other promising emerging markets by their demographic and economic potential to rank among the world's largest and most influential economies in the 21st century.

employs a robust database. Further, this study provides the assessment not only in general but also for BRICS and emerging economies.

The remainder of the paper is organized as follows. Section 2 presents the review of the related literature on bank regulation, supervision and efficiency. Section 3describes the data employed for the analysis and the methodological design including the econometric approaches. Section 4presents the results and the related discussion. In section 5, we conclude.

2. Related Literature

Banks are considered fragile as they have high leverage ratios, fractional reserves and high potential for a run. This calls for a greater care in regulating the banks, as they are so sensitive and fragile (Freixas and Rochet, 1997). The twin goals of bank regulation and supervision are stability and efficiency of the financial system and often appear to pull in opposing directions. This has led to a raging debate on the nature and extent of the trade-off between the two. Demirguc-Kunt and Detragiache (2002) and Beck *et al*., (2006) studied the effect of regulations on banking crises, and Pasiouras *et al*., (2006) and Demirguc-Kunt *et al*., (2008) have examined the effect of banking regulation on banks' overall soundness. Further, while Barth *et al*., (2004) have studied the effect of a broad range of regulatory and supervisory measures on bank stability at the international level, Gonzalez (2005) and Laeven and Levine (2009) have examined the banks' risk-taking behaviour.

Available literature on bank governance and regulation can be broadly analyzed under two strands; first, exploring the unsystematic risk because of the internal variables as its potential determinants (Brewer *et al*., 1996; Gallo *et al*., 1996; Berger and DeYoung, 1997; Angbazo, 1997) and; the second, surveying the systematic risk due to the negative externalities in the financial markets, regulations and macro-economic conditions (Demirguc-Kunt, 1989; Hassan *et al*., 1994). Both streams offer evidence of substantial correlations among the internal determinants, externalities and the bank risk. However, reviewing the banking regulation in the microeconomics perspectives authors such as Rochet (2002), Freixas and Santomero (2002), and Santos (2000) observe that regulation is not at its optimal level.

Categorizing banking regulation as micro-prudential and macro-prudential, Hanson *et al*., (2011) observe that micro-prudential regulation is one in which regulation itself is a partial equilibrium in its conception and aimed at preventing the costly miscarriage of individual financial institutions and macro-prudential approach is one that recognizes the general equilibrium effects and strives to safeguard the financial system in entirety. Bank regulation is not only intended for fostering investor protection but also for enhancing efficiency of capital allocation for raising the efficacy of financial markets. Especially for emerging markets, the measurement used more often for regulating the banking industry include; reserve requirements, suspension of convertibility, deposits insurance and capital adequacy requirements (Eichberger and Harper, 1997). Emphasizing the need for regulation towards safeguarding banking stability, Swamy (2013) observes that ensuring overall macroeconomic balance, enhancement in the macro-prudential functioning of institutions and markets, and reinforcement of micro-prudential institutional soundness through regulation and supervision need to be regularly undertaken. A more detailed debate of the formative papers in banking regulation can be obtained in Dewatripont and Tirole (1993), and Freixas and Rochet (1997).

Conventional approaches to bank regulation underscore the positive features of capital adequacy requirements (Dewatripont and Tirole, 1994). Proclivity for banks to engage in risk-taking is curtailed with limited liability as against the higher levels of capital at risk. In this backdrop, capital adequacy obligations assume critical role in aligning the incentives for depositors, bondholders and other creditors (Berger *et al.*, 1995, and Keeley and Furlong, 1990). However, on the contrary, Koehn and Santomero (1980) and Besanko and Kanatas (1996) contend that increases in capital requirements could escalate the banks' risk-taking behavior and would have perverse effects on banking.

Quite a few notable theoretical considerations can be observed in understanding the risk-taking behaviour of the banks. Risk-taking is an effect of the cause such as the "*conflict of interest*" that may arise when banks diversify their activities (such as; insurance underwriting, real estate investment and securities underwriting, etc.) as they may dump such securities on ill-informed investors in order to help firms with outstanding loans (John *et al.*, 1994, and Saunders, 1985). It is the factor of moral hazard that induces the risk-taking behaviour of the banks (Demirguc-Kunt and Detragiache, 2002), as this would lead the banks to have more opportunities to engage itself in wide range of activities (Boyd *et al.*, 2005).

Merton (1977) was the first to quantify "*moral hazard*" issue by relating the value of deposit insurance with that of a put option on the FDIC. In this regard, Pennacchi (2005) has evoked significant concerns of moral hazard as that induces the banks to invest in off-balance sheet portfolios with high systematic risk. Likewise, Bhattacharya *et al.*, (1998) too have held the view that government deposit insurance affects the behaviors of banks, which was further acknowledged by Bühler and Koziol (2004).

The belief that banks such as "*too big to fail*" and "*too big to discipline*" often give rise to reasoning that they wield considerable economic power and consequently political clout thereby leading to aggressive risk-taking behaviour. It is observed that on evolution over a period of years, banks have grown horizontally as well as vertically to such a complex extent that they are posing difficulties in monitoring too. "*Originate to distribute*" (OTD) strategy quite obviously allows the global systemically important financial institutions (G-SIFIs) to originate risky loans and package them into asset backed securities (ABS) with structured tranches and subsequent repackaging them further as collateralized debt obligations (CDOs) in upper level securitizations. Though, in the short run OTD strategy is quite attractive and convincing, in practical effect, in the long run, credit default swaps (CDS) and the synthetic CDOs engineered by G-SIFIs have resulted in multiple bets on the high-risk loans (Wilmarth, 2010). Given the theoretical setting there is a need to study the regulatory impact on the top five banks in the banking systems during the crisis period.

The ownership structure and the management behaviour influence the risk-taking behaviour of the banks. It is widely held that bank risk[2] is dependent on each bank's ownership structure as standard agency theories advocate that bank risk-taking is influenced by ownership structure (Jensen and Meckling, 1976; John *et al.*, 2008). Further, Galai and Masulis (1976) and Esty (1998) have found that diversified owners in the case of limited liability firms have incentives to increase bank risk taking tendency as they collect funds from depositors and bondholders. Correspondingly, Jensen and Meckling (1976), Kane (1985) and Demsetz and Lehn (1985) have observed that managers with '*private benefits of control*' over banks tend to resort for less risk-taking. In the light of these theoretical underpinnings, one testable prediction that can be supposed is that banks with an ownership structure that empowers diversified owners tend towards more risk-taking than those banks

[2]Walid and Eric (2010) have established a causal relationship between degree of internationalization and performance, but find that the nature of this relationship varies by bank, and also depends upon the riskiness associated with each bank's foreign asset exposures.

whose owners assume a more low-key governance role holding the other factors constant. Analyzing the role of global financial crisis, Hale (2012) observes that it played an important role by shifting the center of network from developing to developed countries and by affecting the formation of new relationships by large banks, banks that are normally immune to the effects of local recessions and banking crises. Focusing on the role of corporate governance, Laeven and Levine (2009) state that banks' risk-taking is dependent on the corporate governance structure of the banks. In a detailed study of banking firms, providing evidence that stockholder-controlled banks embrace more risks than managerially controlled banks, Saunders, *et al.,* (1990) have observed that management stock ownership induces their risk-taking behaviour. Further, John *et al.,* (2000) in their seminal study on the theory of bank regulation and management compensation argue for a towering role for managerial compensation structures in bank regulation. In this backdrop, it is essential to study the impact of regulatory environment on the ownership structures during the crisis period.

Banks experience risk due to macroeconomic outlook as slowdown in economic growth is tied with high inflation, soaring interest rates and depreciating currency (Demirguc-Kunt and Detragiache, 1998). On the other hand, Taylor (2009), Yellen (2009) and De Larosiere (2009) underscore the viewpoint that a free flow monetary policy leads to excess liquidity and consequent low interest rates leading to the burst of financial engineering and innovation which further amplify and accelerate the consequences of excess liquidity and rapid credit expansion ultimately resulting in asset bubbles. Suggesting how the relation between integration and synchronization depends on the type of shocks hitting the world economy, Kalemli-Ozcan *et al.,* (2013) show that shocks to global banks played an important role in triggering and spreading the global financial crisis. On the other hand, Maxwell and Gitman (1989) found the evidence to support the existence of multiple classes of central banks that may insulate the international banking system from externally generated shocks. Further, it is the profit seeking behaviour of banks that are at the core of the Minskyan model of financial instability. Banks' rational profit-seeking behaviour in an uncertain decision-making environment extends them to pursue risk-taking financial practices that give rise to a state of escalating financial fragility (Minsky, 1975, 1982 and 1986). According to Yellen (2009), asset price bubbles are at the heart of Minsky's viewpoint on how financial meltdowns occur. It is the consideration of the imperfectness of financial markets, and more particularly the "*information asymmetries*" is the source of financial instability or a crisis as is established in Mishkin's approach (Mishkin 1999a and 1999b) that an upsurge in

information asymmetry causes ex ante a compounding risk of adverse selection. As is observed in the recent past, perverse incentives to managers that exist in the banking industry persuade them to take on too much risk, which lead to crises (Davidson, 2010).

The foregoing theoretical framework entails us to have thorough examination of the bank regulation/supervisory environment during the crisis period and figure out what was the topography of the regulatory and supervisory frameworks of countries that were directly hit by the global financial crisis vis-a-vis that of those countries that were not directly affected? In addition, it would be desirable to examine the regulatory environment in the case of the BRICS countries and find out whether they were quite different. In addition, an analysis of the relationship between bank performance and stability with differences in bank regulations and supervision in BRICS[3] countries and that of the advanced countries merits an attention. What lessons can be drawn for strengthening the regulatory structures of these countries? Furthermore, there exists a scope to trace how the national regulatory and supervisory practices changed and kind of inferences could be drawn to build the regulatory literature in this domain.

3. Data and Methodology

We source the data from World Bank's Bank Regulation and Supervision Survey (BRSS) data collected under their research program on Financial Institutions and Regulation. The BRSS, carried out by the World Bank, is a unique source of comparable worldwide data on how banks are regulated and supervised around the world. Including the current version of the survey database updated in 2012, and the earlier surveys, released in 2001, 2003, and 2007, in all, four databases are explored for the analysis of this study. The 2012 survey[4]database provides information on bank regulation and supervision for 143 jurisdictions. It covers data since 2008, and is therefore quite useful in scrutinizing the state of bank regulation and supervision in the focus countries of this study and comparing it to the

[3] BRICS countries assume significance as these five (Brazil, Russia, India, China and South Africa) emerging economies host more than 2.8 billion people or 40 percent of the world's population, cover more than a quarter of the world's land area over three continents, and account for more than 25 percent of global GDP. BRICS possess just 11% of the votes in IMF, despite accounting for more than 20% of global economic activity. Further, it is largely believed that bank governance and regulation styles in BRICS countries were not akin to that in the advanced countries.

[4] The World Bank's BRSS survey of 2011-12 provides data for the years 2008, 2009 and 2010 for 143 countries of which 37 are advanced and 106 are emerging and developing economies and provides a balanced representation of countries in terms of level of income and population size. In terms of topical coverage, the survey is quite comprehensive, providing a unique and valuable set of information on a wide range of issues related to bank regulation and supervision. It contains over 270 questions, some with sub-questions covering about 630 features of bank regulation and supervision.

pre-crisis situation. For the analysis, we consider 30 countries that are significant in terms of their geo-economic significance, exposure to crisis and the nature of their banking & financial systems. These include fifteen countries directly affected by crisis (systemic and borderline cases) and fifteen of those indirectly affected by contagion. Amongst them are included the BRICS countries for a differentiated focus of the study. In all, these thirty countries considered under this study cover more than 75 percent of global banking. We have classified the crisis-countries using the database developed by Laeven and Valencia (2010)[5]. We furnish in Table 1, the list of the countries included in this study.

Table 1: List of countries covered in the study

Sl. No.	Crisis-countries		Countries indirectly affected by crisis	
	Advanced	Emerging	Advanced	Emerging
1	Cyprus			Argentina
2	**Denmark**		Australia	
3	France			*Brazil*
4	**Germany**		Canada	
5	Greece			*China*
6	**Ireland**			Egypt
7	Italy			*India*
8	**Netherlands**			Indonesia
9		Poland		Kuwait
10	Portugal			Malaysia
11		*Russia*		Mexico
12	Spain		New Zealand	
13	Switzerland			Philippines
14	**United Kingdom**			*South Africa*
15	**United States**			Thailand

Notes: Countries of *systemic cases* with systemic banking crises are in bold font and the remaining with *borderline cases* are in regular font. Laeven and Valencia (2010) define systemic banking crises as cases where at least three of the listed interventions took place, and borderline cases are those that almost met their definition of a systemic crisis. Our classification of countries into advanced and emerging economies is influenced by the World Economic Outlook April 2011 of IMF (Table 4.1: Economy groupings). BRICS Countries (as per World Economic Outlook Database, April 2013, IMF) are in italic.

Not all the responses in the BRSS questionnaire are considered for analysis due to issues of comparability. We have considered only those significant responses on questions cover topics on which consistent cross-country data are already available, easily comparable and widely acceptable. On a detailed study of the four versions of World Bank's BRSS (i.e. released in 2000, 2003, 2007 and 2012), we have grouped the select 51 responses to the questions in the survey into 10 variables *viz.*(i) entry, structure and competition; (ii) capital

[5]Laeven and Valencia (2010) provide a new database of systemic banking crises for the period 1970-2009 building on earlier work by Caprio *et al.*, (2005), Laeven and Valencia (2008), and Reinhart and Rogoff (2009). The update makes several improvements to the earlier database, including an improved definition of systemic banking crisis, the inclusion of crisis ending dates, and a broader coverage of crisis management policies. The database is the most up-to-date banking crisis database available. Table 1 in the paper provides the classification of countries for systemic banking crises, 2007-2009.

regime; (iii) asset classification norms; (iv) provisioning; (v) activities; (vi) protection to depositors; (vii) regulation of exposures; (viii) taxation; (ix) performance; and (x) supervision. We provide the description of the variables in Table 2.

Table 2: Description of variables

No.	Variable	Description of the Variables and Survey details about the variable
1.	Entry, structure and competition	Considers the responses of national supervisors for the select 10 questions of the survey related to: entry norms for new banks; number of existing banks; asset concentration; government ownership and control; percent of the total foreign-owned bank assets in your domestic banking system; and applications for commercial banking licenses from domestic entities: received, denied, withdrawn and accepted.
2.	Capital Regime	Includes the responses related to: minimum required risk-based regulatory capital ratio; actual risk based capital ratios; actual Tier 1 capital ratio; actual leverage ratio; variants of calculation of capital requirements; coverage of off-balance sheet items in estimation of leverage ratio; and variants of calculating capital requirements for credit risk.
3.	Asset classification norms	Considers the responses related to: prevalence of asset classification system; period of arrears stipulated for classification of a loan as non-performing; whether unrealized interest enters the income statement; upgradation of the loan classification; and minimum provisioning norms.
4.	Provisioning	Includes responses related to: ratio of non-performing loans; ratio of specific provisions to gross non-performing loans, and ratio of general provisions to total gross loans.
5.	Activities	Considers responses related to: can banks own voting shares in nonfinancial firms; single financial supervisory agency for all of the activities; and conditions for engaging in activities such as securities activities, insurance activities, real estate activities, and non-financial firms.
6.	Protection to depositors	Includes responses related to: percentage of the total deposits, the value of large denominated debt liabilities as a share of total assets.
7.	Regulation of banking exposures	Includes responses related to: percent of the commercial banking system's assets in foreign-currency denomination; percent of the commercial banking system's liabilities in foreign-currency denomination; percent of the commercial banking system's assets in public sector claims; assets funded with deposits; exposure to real estate loans; exposure to commercial real estate loans; and percent of residential real estate loans that were securitized.
8.	Bank taxation	Includes responses related to: statutory corporate tax rate; and effective tax rate.
9.	Bank performance	Considers responses related to after-tax return on equity; percent of non-interest income in total gross income; aggregate operating costs to assets ratio; and ratio of non-performing loans.
10.	Bank supervision	Includes responses related to: power of the supervisory agency to suspend the directors' decision to distribute bonuses, management fees; power of the national supervisor to supervise insurance, securities and pension funds; single financial supervisory agency; and onsite examinations.

Note: Responses to the survey questions are obtained from the World Bank's Bank Regulation and Supervision Survey (BRSS) database released in 2001, 2003, 2007 and 2012.

Comparing responses between the aforesaid BRSS surveys and attributing the changes observed to the crisis can be debatable as we cannot be sure that the changes observed were indeed caused because of the crisis. However to probe the changes that were

directly related to the crisis, the BRSS 2012 survey includes questions that explicitly request regulators to identify reforms introduced in response to the crisis. To determine whether there are significant differences in banking regulation and supervision in crisis versus non-crisis countries and during the crisis period, we conduct a series of *mean t-tests* on responses to distinct survey questions in BRSS. We perform *multivariate regression analyses* to understand the banking sector outcomes and regulation/supervision employing a wide range of bank regulation/supervision indicators. First, we use *ordinary least squares regressions* to observe the relationships between bank outcomes and bank regulation and supervision. In these regressions, we regress each of the two outcome variables (after-tax return on equity for the commercial banking system, and percent of the commercial banking system's total gross income that was in the form of non-interest income) on various supervisory and regulatory indicators. As La Porta *et al*., (1998) observe that legal origin helps account for cross-country differences in financial development; we include emerging markets origin dummy and BRICS dummy variables as exogenous control variables. The results of the detailed econometric analysis are presented in the ensuing section.

4. Results and Discussion

4.1 *Entry, structure and competition*

Economic literature offers differing views on the need for and the effect of regulations on entry into banking. While some argue that effective screening of bank entry can promote stability, others emphasize that banks with monopolistic power possess greater franchise value, which enhances prudent risk-taking behavior (Keeley, 1990). Others like, Shleifer and Vishny (1998) disagree, emphasizing the beneficial effects of competition and the harmful effects of entry regulation. Foreign banks[6] are believed to make bank-firm relationships more stable and by indirectly enhancing access to the financial system, foreign banks may benefit all firms (Giannetti and Ongena, 2012). Our approach enables us to explore whether there were significant restrictions on the entry of foreign and domestic banks that could explain the difference during the pre-crisis period and the crisis period.

Table3 presents the subset of questions for which we observe statistical significant changes between the 2007 and 2011-12 BRSS surveys. We observe from the paired samples *mean 't–test'* that there is no significant change in the number of commercial banks across

[6]Khoury (1979) provide the empirical explanation for the multinationalization of the banking firm using the profit maximization hypothesis.

the groups of countries under study. Similarly, we observe that there is no significant change in the percent of assets held by commercial banks, percent of total assets held by the five largest banks, and percent of total deposits held by the five largest banks. However, we notice significant change in the government ownership in the case of crisis-countries and BRICS countries. We observe significant change in assets of foreign banks in crisis-countries, non-crisis countries and BRICS countries. Foreign-owned bank assets were found to have experienced significant change in the case of crisis (advanced) and crisis-countries.

Table 3: Change in the banking structure during the crisis period

Year	Crisis – advanced countries average	Crisis - emerging countries average	Crisis-countries average	Non-crisis advanced countries average	Non-crisis emerging countries average	Non-crisis countries average	BRICS countries average
1. Number of commercial banks							
2007	931	580	884	58	77	72	313
2010	872	531	826	59	83	77	310
	(0.18)	(0.48)	(0.132)	(0.456)	(0.405)	(0.374)	(0.926)
2. Percent of assets held by commercial banks							
2007	97%	94%	97%	96%	90%	92%	95%
2010	97%	94%	97%	97%	90%	91%	96%
	(0.588)	(0.500)	(0.643)	(0.578)	(0.467)	(0.533)	(0.391)
3. Percent of total assets held by the five largest banks							
2007	68%	48%	65%	83%	61%	67%	62%
2010	68%	48%	65%	82%	62%	68%	62%
	(0.927)	(0.778)	(0.969)	(0.748)	(0.799)	(0.911)	(0.846)
4. Percent of total deposits held by the five largest banks							
2007	64%	57%	63%	85%	62%	68%	63%
2010	65%	56%	64%	85%	64%	67%	63%
	(0.510)	(0.686)	(0.564)	(0.845)	(0.318)	(0.334)	(0.940)
5. Percent of the banking system's assets that were government-controlled (e.g., where government owned 50% or more equity)							
2007	7%	28%	10%	1%	28%	21%	37%
2010	11%	31%	14%	1%	27%	19%	40%
	(0.118)	(0.175)	**(0.07)**	(0.423)	(0.440)	(0.372)	**(0.06)**
6. Percent of the banking system's assets that were foreign-controlled (e.g., where foreigners owned 50% or more equity)							
2007	23%	43%	26%	56%	28%	34%	19%
2010	22%	40%	25%	54%	26%	33%	18%
	(0.116)	(0.411)	**(0.05)**	(0.201)	(0.221)	**(0.076)**	**(0.046)**
7. Percent of the total foreign-owned bank assets in domestic banking system held in branches as opposed to other juridical forms (e.g. subsidiaries)							
2007	28%	4%	22%	44%	16%	2008	23%
2010	30%	4%	24%	40%	16%	2010	22%
	(0.05)	(0.50)	**(0.04)**	(0.296)	(0.505)	(0.272)	(0.391)

Note: We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance.

We examine the changes in the applications accepted for commercial banking licenses from domestic entities. From the results reported in Table 4, we observe that there is no significant change either within the group of countries or between the pre-crisis period and the crisis period.

Table 4: Regulatory impact on banking licenses

Applications for commercial banking licenses from domestic entities: Accepted		
Year	2010	2007
Crisis	20.6	54.8
Non-Crisis	2.2	1.73
	(0.256)	(0.17)
Crisis	20.6	54.8
BRICS	39.6	111.4
	(0.38)	(0.54)
Non-Crisis	2.2	1.73
BRICS	39.6	111.4
	(0.383)	(0.381)

Applications for commercial banking licenses from domestic entities: Accepted – period comparison			
Year	Crisis-countries	Non-crisis countries	BRICS countries
2007	54.8	1.73	111.4
2010	20.6	2.2	39.6
	(0.19)	(0.73)	(0.37)

Note: We report the p-values of the paired samples t-test in the parenthesis.

We examine the issue of entry of foreign banks by considering the response to the question – are foreign entities prohibited from entering through and present the results in Table 5. There is a significant change in the case of joint venture foreign entities among crisis and non-crisis countries.

Table 5: Regulatory impact on entry of foreign banks

Are foreign entities prohibited from entering through:				
Year	Acquisition	Subsidiary	Branch	Joint Venture
Crisis	0	0	0.667	0
Non-Crisis	0	0.13	0.433	0.266
	(0)	(0.164)	(0.582)	**(0.041)**
Crisis	0	0	0.667	0
BRICS	0	0	0.2	0
	(0)	(0)	(0.374)	(0)
Non-Crisis	0	0	0.433	0.266
BRICS	0	0	0.2	0
	(0)	(0)	(0.374)	(0.374)

We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance.

4.2 Capital regime

Literature provides conflicting predictions as to whether the imposition of capital requirements will have positive effects (Santos, 2001; Gorton and Winton, 2003). Studies like Kim and Santomero (1988), Besanko and Kanatas (1996), and Blum (1999) claim that capital requirements might increase risk-taking behavior. In this study, we examine the regulatory impact on capital regime in the case of sample countries. We do not consider the relationships

between capital regulations and banking performance in isolation. The results of the analysis presented in Table 6 explain that there was no significant change among the groups of countries during the periods of study in the case of minimum required risk-based regulatory capital ratio. However, there was a significant change in the case of actual risk based capital ratio of the banking system among crisis-countries, crisis (advanced) countries, and BRICS countries. We also observe a significant change in the case of actual tier-1 capital ratio of the banking system among crisis-countries, crisis (advanced) countries and non-crisis (advanced) countries. The results indicate that there was substantial capitalization of banks particularly in the crisis affected advanced countries and non-crisis advanced countries. In the case of BRICS countries actual risk based capital ratio experienced a substantial increase. These observations entail to believe that there was indeed a spillover effect of the crisis on the BRICS countries. In addition, there exists a scope to reason that BRICS countries took lessons from the crisis and geared up to strengthen their banking systems.

Table 6: Regulatory impact on capital regime

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis-countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
1. Minimum required risk-based regulatory capital ratio							
2007	0.081	0.09	0.077	0.08	0.092	0.089	0.096
2010	0.08	0.04	0.074	0.05	0.083	0.077	0.075
	(0.131)	(0.5)	(0.769)	(0.423)	(0.315)	(0.155)	(0.348)
2. Actual risk based capital ratio of the banking system							
2007	0.08	0.152	0.09	0.11	0.12	0.12	0.11
2010	0.13	0.159	0.14	0.13	0.14	0.14	0.15
	(0.01)	(0.69)	**(0.01)**	(0.14)	(0.32)	(0.23)	**(0.06)**
3. Actual Tier 1 capital ratio of the banking system							
2007	0.08	0.123	0.08	0.08	0.08	0.08	0.07
2010	0.11	0.126	0.11	0.1	0.11	0.11	0.09
	(0.001)	(0.84)	**(0.001)**	**(0.06)**	(0.18)	(0.117)	(0.4)

Note: We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance.

4.3 Asset classification norms

In this section, with a subset of responses to five questions of BRSS survey, we examine the impact of regulation of asset classification norms among the group of countries during the pre-crisis and crisis periods. The provisioning stringency measures the degree to which a bank must make provision against a loan that is classified first as “sub-standard”, then as “doubtful”, and lastly as “loss”.

Table 7: Regulatory impact on asset classification norms

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis- countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
1. Existence of an asset classification system under which banks have to report the quality of their loans and advances using a common regulatory scale							
2007	0.61	0.5	0.6	0.66	0.91	0.86	0.8
2010	0.53	0.5	0.53	0	1	0.8	1.0
	(0.72)	(1.0)	(0.75)	(0.18)	(0.33)	(0.58)	(0.37)
2. After how many days is a loan in arrears classified as non-performing as sub-standard asset?							
2007	90	30	70		83	83	70
2010	60	90	70	--	29	71	65
	(0.5)	--	(0.99)		(0.134)	(0.134)	(0.423)
3. Minimum provisioning required as loans become sub-standard assets							
2007	0.23	0.15	0.15		0.2	0.2	0.16
2010	0.24	0.2	0.16	--	0.26	0.22	0.15
	(0.72)	(0.5)	(0.87)		(0.44)	(0.79)	(0.91)
4. Minimum provisioning required as loans become doubtful assets							
2007	0.65	0.35	0.53		0.44	0.44	0.36
2010	0.61	0.5	0.57	--	0.45	0.45	0.35
	(0.74)	(0.5)	(0.63)		(0.82)	(0.82)	(0.94)
5. Minimum provisioning required as loans become loss assets							
2007	0.9		1.0		0.95	0.93	1.0
2010	1.0	--	1.0	--	0.95	0.93	1.0
	(0.39)		--		--	--	--

Note: We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance. (--) indicates data not available or econometric result could not be obtained due to data inadequacy.

The results presented in Table 7 suggest that there is no significant change in the case of all the considered parameters related to asset classification in banks. These findings imply that though these norms were already in place before the crisis either their implementation was flawed or the supervisory agencies were not passionately enforcing them.

4.4 Provisioning for bad and doubtful assets

In this section, we assess the regulatory impact on the provisioning norms. The results presented in Table 8 that there was no significant change in the case of ratio of specific provisions to gross non-performing loans. However, significant change was observed in the case of ratio of general provisions among the non-crisis emerging countries. This leads to the inference that the non-crisis emerging countries took cue from the crisis and initiated required changes in the general provisioning for loans.

Table 8: Regulatory impact on provisioning for non-performing loans

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis-countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
1. Ratio of non-performing loans (gross of provisions) to total gross loans							
2007	0.033	0.04	0.03	0.008	0.034	0.028	0.031
2010	0.05	0.08	0.06	0.015	0.029	0.026	0.041
	(0.009)	**(0.09)**	**(0.00)**	**(0.09)**	(0.14)	(0.42)	(0.35)
2. Ratio of specific provisions to gross non-performing loans							
2007	0.395	0.98	0.49	0.28	0.78	0.66	0.9
2010	0.393	0.85	0.47	0.28	0.87	0.58	0.96
	(0.95)	(0.29)	(0.49)	(0.99)	(0.16)	(0.16)	(0.66)
3. Ratio of general provisions to total gross loans							
2007	0.012		0.011	0.13	0.009	0.04	0.007
2010	0.013	--	0.012	0.17	0.01	0.05	0.008
	(0.64)		(0.63)	(0.41)	**(0.06)**	(0.26)	(0.33)

Note: We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance. (--) indicates data not available or econometric result could not be obtained due to data inadequacy.

4.5 Regulations on bank activities and banking-commerce

In the richly available economic literature, Boyd *et al.*, (1998) examine whether restricting bank activities and the mixing of banking and commerce is associated with positive outcomes under specific conditions, and predict that restricting bank activities may reduce financial fragility in the presence of generous deposit insurance. We assess the extent of changes to measure the degree to which national regulatory authorities allow banks to engage in the following three fee-based rather than more traditional interest-spread-based activities: (i) *Securities activities*: the ability of banks to engage in the business of securities underwriting, brokering, dealing, and all aspects of the mutual fund industry. (i) *Insurance activities*: the ability of banks to engage in insurance underwriting and selling. (iii) *Real estate activities*: the ability of banks to engage in real estate investment, development, and management. The results presented in Table 9 suggest a significant change in the regulatory environment towards banks wholly owning nonfinancial firms during the crisis period in crisis and non-crisis countries as well except BRICS countries. While in the case of banks' foray into securities activities; we notice a significant change among non-crises (emerging) and BRICS countries, in the case of banks' foray into insurance activities; significant change is noticed only in non-crises (emerging) countries suggesting that there was a swift regulatory action in curbing/ceasing the banks from wholly owning nonfinancial firms particularly in advanced and emerging countries. Likewise, emerging and BRICS countries too have taken measures in curbing/ceasing the banks from actively involving in securities activities. On the other hand, insurance activities by the banks in the emerging countries found a substantial increase.

Table 9: Regulatory impact on activities by banking companies

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis-countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
1. A bank may own 100% of the equity in any nonfinancial firm							
2007	0.3		0.33	0	0.166	0.133	0.2
2010	0	--	0	0.33	0.416	0.4	0.2
	(0.04)		**(0.019)**	(0.423)	**(0.082)**	**(0.041)**	(--)
2. A bank may own 100% of the equity in a nonfinancial firm but ownership is limited based upon a bank's equity capital							
2007	0.23	0	0.2	0.33	0.41	0.166	0.6
2010	0.38	0.5	0.4	0.33	0.5	0.25	0.4
	(0.337)	(0.5)	(0.189)	(1.0)	(0.674)	(0.586)	(0.621)
3. A bank can only acquire less than 100% of the equity in any nonfinancial firm							
2007	0.15	0.1	0.146	0.433	0.308	0.198	0.2
2010	0.07	0.07	0.078	0.1	0.139	0.266	0.49
	(0.409)	(0.5)	(0.382)	(0.423)	(0.129)	(0.554)	(0.191)
4. When a bank can only acquire less than 100% of the equity in any nonfinancial firm, what can be the maximum percent which can be owned							
2007	0.153	0.1	0.146	0.433	0.308	0.198	0.2
2010	0.079	0.07	0.078	0.1	0.139	0.266	0.49
	(0.409)	(0.5)	(0.381)	(0.423)	(0.129)	(0.554)	(0.191)
5. A bank can engage in securities activities							
2007	0.615	1	0.533	1	0.75	0.533	0.8
2010	0.3	0	0.266	0.667	0.25	0.266	0.2
	(0.165)	(--)	(0.164)	(0.423)	**(0.007)**	(0.164)	**(0.07)**
6. A bank can engage in insurance activities							
2007	0.307	0.5	0.266	0.666	0.416	0.466	0.6
2010	0.539	0	0.466	0.666	0.833	0.8	0.4
	(0.337)	(0.5)	(0.384)	(--)	**(0.096)**	(0.136)	(0.704)
7. A bank can engage in real estate activities							
2007	0.307	0.5	0.133	0.666	0.166	0.133	0.2
2010	0.154	0.5	0.2	0	0.5	0.4	0.4
	(0.436)	(--)	(0.582)	(0.184)	(0.104)	(0.164)	(0.374)

Note: We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance. (--) indicates data not available or econometric result could not be obtained due to data inadequacy.

4.6 Protection to depositors

Deposit insurance/guarantee schemes politically are meant to prevent widespread bank runs. To protect payment and credit systems from contagious bank runs, many governments favor deposit insurance *plus* effective official oversight of banks to augment private sector monitoring of banks. Though they may encourage excessive risk-taking behavior, which some believe offsets any stabilization benefits. Demirguc-Kunt and Detragiache (2002) provide a detailed study on measuring the effects of the design of deposit insurance on bank fragility. Yet, many contend that regulation and supervision can control the moral-hazard problem by designing an insurance scheme that encompasses appropriate coverage limits, scope of coverage, coinsurance, funding, premia structure, management and membership requirements. We present here the results of our assessment of the impact of regulatory environment on the depositor protection mechanisms during the pre-crisis and

crisis period employing the response of the sample countries to the survey question – what percentage of the total deposits of participating commercial banks was actually covered by the scheme (Table 10). We observe no significant change in the depositor protection/guarantee measures suggesting that crisis did not instigate substantial changes.

Table 10: Regulatory impact on depositor protection schemes

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis-countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
Coverage of total deposits of participating commercial banks under protection schemes							
2007	0.494		0.51		0.457	0.441	0.516
2010	0.559	--	0.56	--	0.43	0.423	0.44
	(0.112)		(0.164)		(0.451)	(0.553)	(0.404)

Note: We report the p-values of the paired samples t-test in the parenthesis. (--) indicates data not available or econometric result could not be obtained due to data inadequacy.

4.7 Regulation of banking exposures

In this section, we consider a subset of responses to select seven questions in the BRSS survey related to regulatory rules or supervisory guidelines regarding requirements for the management of foreign currencies, exposures of banking assets and liabilities in foreign-currency denomination, exposure of banking assets in commercial and residential real estate and their securitization for liquidity requirements. The results of the analysis are furnished in Table 11. We notice that foreign-currency denominated assets drastically reduced during the crisis period among the crisis, non-crisis, and non-crisis (emerging) countries. The foreign-currency liabilities shrunk drastically among the crisis (advanced) and non-crisis countries. Public sector claims sharply swelled only among the crisis (advanced) and crisis-countries suggesting that governments lent substantially to bail out these banks. Though the bank assets in residential real estate loans swelled in the crisis-countries, there was no significant change in commercial real estate loans. We do not find any significant change in the securitization of residential real estate loans among all the groups of study sample. One interesting observation in this section of the analysis is that BRICS countries did not experience any substantial change suggesting that there were no significant regulatory/supervisory measures initiated by these countries during the crisis period. These results suggest that these severe imbalances were caused necessarily due to the severe liquidity and credit crunch, seemed to be confined more or less to financial markets and institutions in the United States and Western Europe and also due to the absence of proper mechanisms to address such situations or failure of regulatory apparatus.

Table 11: Regulatory impact on banking exposures

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis-countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
1. Percent of the commercial banking system's assets that was foreign-currency denominated							
2007	0.183	0.306	0.205	0.031	0.156	0.136	0.132
2010	0.166	0.252	0.182	0.049	0.133	0.115	0.099
	(0.13)	(0.31)	**(0.041)**	(0.262)	**(0.02)**	**(0.007)**	(0.187)
2. Percent of the commercial banking system's liabilities that was foreign-currency denominated							
2007	0.210	0.241	0.216	0.235	0.147	0.163	0.121
2010	0.185	0.213	0.190	0.226	0.124	0.142	0.089
	(0.006)	(0.476)	(0.476)	(0.76)	(0.101)	**(0.083)**	(0.137)
3. Percent of the commercial banking system's assets that was in public sector claims							
2007	0.058	0.016	0.050	0.006	0.165	0.129	0.246
2010	0.086	0.034	0.076	0.018	0.202	0.159	0.239
	(0.003)	(0.419)	**(0.001)**	(0.376)	(0.284)	(0.236)	(0.792)
4. Percent of the commercial banking system's assets that was funded with deposits							
2007	0.508	0.430	0.498	0.493	0.671	0.627	0.589
2010	0.521	0.500	0.518	0.535	0.674	0.639	0.608
	(0.323)	(0.115)	(0.108)	(0.106)	(0.67)	(0.353)	(0.611)
5. Percent of total bank assets that were residential real estate loans							
2007	0.159	0.116	0.151	0.294	0.074	0.119	0.069
2010	0.174	0.135	0.166	0.344	0.075	0.132	0.077
	(0.109)	(0.587)	**(0.058)**	(0.148)	(0.752)	(0.141)	(0.126)
6. Percentage of total bank assets that were commercial real estate loans							
2007	0.054		0.048	0.050	0.026	0.032	0.034
2010	0.05	--	0.044	0.049	0.026	0.032	0.039
	(0.216)		(0.205)	(0.749)	(0.993)	(0.823)	(0.249)
7. Percentage of residential real estate loans that were securitized							
2007	0.236		0.236	0.125	0.027	0.060	0.008
2010	0.243	--	0.243	0.113	0.023	0.053	0.009
	(0.851)		(0.851)	(0.644)	(0.418)	(0.368)	(0.717)

Note: We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance. (--) indicates data not available or econometric result could not be obtained due to data inadequacy.

4.8 Bank taxation

The regulatory literature 'taxation', except in the shape of deposit insurance, justified primarily as a defense against bank runs—has played no significant role. Some of the literature refers to capital regulation as a price-based instrument, since it effectively raises the shadow value of capital. While IMF (2010) offers an extensive review of the comparison between taxation and regulation in the financial sector, Shackelford *et al*., (2010) discuss aspects of financial sector taxation in light of the crisis. In the backdrop of trying to understand whether there is a merit in the dominance of the regulatory approach to dealing with financial sector externalities warranted, or is there a more purposive role in this area for corrective taxation, the purpose of this section is to know whether there existed a significant change during the crisis period. In this section, we present the results of our assessment of a subset of responses to two specific questions related to statutory corporate tax and effective

tax rate on the banking system (Table 12). We notice no significant change in either the statutory corporate tax rate or effective tax rate on the bank income.

Table 12: Regulatory impact on taxing the banking corporations

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis-countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
1. Statutory corporate tax rate on domestic bank income							
2007	0.266	0.215	0.258	0.315	0.258	0.285	0.242
2010	0.251	0.195	0.242	0.3	0.296	0.296	0.3
	(0.183)	(0.5)	(0.111)	(0.5)	(0.579)	(0.654)	(0.609)
2. Effective tax rate on the aggregate commercial banking system's pre-tax income							
2007	0.263		0.263	0.275	0.279	0.278	0.243
2010	0.173	--	0.173	0.285	0.243	0.254	0.293
	(0.140)		(0.14)	(0.793)	(0.352)	(0.402)	(0.520)

Note: We report the p-values of the paired samples t-test in the parenthesis. (--) indicates data not available or econometric result could not be obtained due to data inadequacy.

4.9 Banking performance

Banks are costly and difficult to monitor. Some theoretical model suggest that strong, official supervision under such circumstances can help prevent banks from engaging in excessive risk-taking behavior and thus improve bank development, performance and stability. Contrary view is that powerful supervisors may exert a negative influence on bank performance as they may use their powers to benefit favored constituents, attract campaign donations, and extract bribes (Shleifer and Vishny, 1998; Djankov *et al.*, 2002). Another strand of literature views that countries with more open, private-sector-oriented approaches to regulation and supervision tend to have greater bank development, better performance and more stable banks. The aim of this section is to assess the impact of regulatory environment on the performance of banking systems. The regulatory literature is not rich on the rigorous assessment of which specific regulatory and supervisory standards actually matter for bank performance and stability. Regulatory agencies around the world would greatly benefit from systematic evidence on the relationship between bank performance and regulatory and supervisory systems. The results of our assessment presented in Table 13suggest that aggregate operating costs experienced significant change only in the non-crisis emerging countries. Obviously, as is widely known, the ratio of non-performing loans to total gross loans experienced a significant change among the crisis, advanced as well as emerging among the crisis-countries, and the non-crisis (advanced) countries.

Table 13: Regulatory impact on banking performance

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis-countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
1. After-tax return on equity for the commercial banking system							
2007	-0.083	0.103	-0.058	0.131	0.134	0.133	0.175
2010	0.031	0.107	0.041	0.122	0.131	0.13	0.153
	(0.413)	(0.795)	(0.408)	(0.691)	(0.90)	(0.806)	(0.117)
2. Percent of the commercial banking system's total gross income that was in the form of non-interest income							
2007	0.254	0.479	0.256	0.285	0.315	0.308	0.399
2010	0.326	0.480	0.347	0.292	0.322	0.314	0.376
	(0.338)	(0.99)	(0.336)	(0.874)	(0.691)	(0.698)	(0.382)
3. Aggregate operating costs to assets ratio for the commercial banking system							
2007	0.016		0.017	0.015	0.036	0.031	0.0273
2010	0.015	--	0.016	0.0156	0.038	0.032	0.0271
	(0.454)		(0.389)	(0.456)	**(0.079)**	(0.623)	(0.93)
4. Ratio of non-performing loans (gross of provisions) to total gross loans							
2007	0.033	0.043	0.034	0.008	0.034	0.028	0.031
2010	0.064	0.081	0.066	0.015	0.03	0.026	0.041
	(0.001)	**(0.099**)	**(0.000)**	**(0.096)**	(0.201)	(0.423)	(0.351)

Note: We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance. (--) indicates data not available or econometric result could not be obtained due to data inadequacy.

4.10 Banking supervision

Literature on the overall role of the government in regulating economic activity dates back to Pigouvian period (Pigou, 1938). Arguments in favor of government intervention such as: the existence of monopoly power, externalities, and informational asymmetries that are Pigouvian create a potentially constructive role for government interventions to offset these market failures and enhance social welfare. However, others such as Shleifer and Vishny (1998) dispute that governments act in their own interests and frequently do not ameliorate market failures. Irrespective of the theoretical debates, countries in practice assign very different priorities to bank supervision. In this backdrop, the aim of this section is to know was there a significant change during the crisis period in the supervisory environment of the groups of countries in the study sample. Considering a subset of responses for two important questions of the survey, we assess the impact of the change. The results presented in Table 14 suggest that the power of supervisory agencies to control dividend distribution strengthened substantially in the crisis-countries only. However, onsite examinations drastically increased in the non-crisis countries more vigorously than in the crisis-countries. Interestingly the results suggest that BRICS countries did not undergo any substantial supervisory transformation in this regard.

Table 14: Changes in banking supervision

Year	Crisis – advanced countries	Crisis - emerging countries	Crisis-countries	Non-crisis advanced countries	Non-crisis emerging countries	Non-crisis countries	BRICS countries
1. Power of supervisory agencies to suspend the directors' decision to distribute dividends							
2007	0.416		0.357		0.75	0.733	0.6
2010	0.750	--	0.787	--	0.833	0.800	0.8
	(0.039)		**(0.008)**		(0.339)	(0.334)	(0.374)
2. Onsite examinations per bank that were performed in the last 5 years							
2007	2.667		0.237	0.475	0.265	3.05	2.667
2010	2.945	--	0.266	0.8	5.687	6.15	9.333
	(0.840)		(0.798)	(0.314)	(0.156)	**(0.076)**	(2.92)

Note: We report the p-values of the paired samples t-test in the parenthesis and the bold figures indicate the levels of significance. (--) indicates data not available or econometric result could not be obtained due to data inadequacy.

4. 11 Regression results

Banking regulation/supervision and their impact on banking sector outcomes: multivariate analyses

The purpose of this section is to examine the relationship between the bank regulation and supervision variables and the bank performance outcomes. Not much of recent studies focus on the relationship between regulation on bank efficiency except the studies by Fries and Taci, 2005;Fernandez and Gonzalez, 2005; Pasiouras *et al.*,2006; 2009. This analysis contributes uniquely to the bank regulation, supervision, and performance literature by first investigating the impact of bank regulatory and supervisory approaches on bank performance during the pri-crisis, post-crisis, and crisis periods. We estimate the regulatory impact on banking performance during the pre-crisis, post-crisis and crisis period by regressing each of the two important outcome variables (viz. after tax return and non-interest income) on various supervisory and regulatory indicators. We use ordinary least squares regressions to examine the relationships between bank performance outcomes (viz. after-tax return and non-interest income) and bank regulation and supervision variables detailed in Table 15. Our first dependent variable - *After-tax return on equ*ity for the commercial banking system is largely related to the fund based activities of the banks (*atr*) and the second dependent variable - Percent of the commercial banking system's total gross income that was in the form of *non-interest income* (*nii*) is related to the non-fund based activities of the banks. Our intent here is to examine the aforesaid relationship during the pre-crisis period, post-crisis period, and the crisis period. In order to elicit the relationship in the case of BRICS countries and emerging countries we introduce dummies *d1* and *d2* respectively. Though La Porta *et al.*, (1998) observe that legal origin helps account for cross-country differences in financial

development, Barth *et al*., (2004) find that results do not depend on including these controls. Accordingly, we do not bring in the legal origin controls into our model.

Table 15: Bank regulation/supervision variables

	Variables	Symbol
1	Existence of an asset classification system under which banks have to report the quality of their loans and advances using a common regulatory scale	*acs*
2	Actual risk based capital ratio of the banking system	*arbcar*
3	Percent of total assets held by the five largest banks	*atfb*
4	Applications for commercial banking licenses from domestic entities: Accepted	*bl*
5	Coverage of total deposits of participating commercial banks under protection/guarantee schemes	*dg*
6	Power of supervisory agencies to suspend the directors' decision to distribute dividends	*div*
7	Effective tax rate on the aggregate commercial banking system's pre-tax income	*etr*
8	Percent of the total foreign-owned bank assets in domestic banking system held in branches as opposed to other juridical forms (e.g. subsidiaries)	*fba*
9	Percent of the commercial banking system's liabilities that was foreign-currency denominated	*fcl*
10	Ratio of general provisions to total gross loans	*gpr*
11	A bank may own 100% of the equity in any nonfinancial firm	*nff*
12	Ratio of non-performing loans (gross of provisions) to total gross loans	*npl*
13	Aggregate operating costs to assets ratio for the commercial banking system	*oc*
14	Onsite examinations per bank that were performed in the last 5 years	*os*
15	Minimum provisioning required as loans become Sub Standard Assets	*pssa*
16	A bank can engage in real estate activities	*reest*
17	Percent of total bank assets that were residential real estate loans	*rer*
18	Percentage of residential real estate loans that were securitized	*rers*
19	Statutory corporate tax rate on domestic bank income	*sct*
20	A bank can engage in securities activities	*sec*
21	Ratio of specific provisions to gross non-performing loans	*spr*

We believe there are two methodological limitations to this analysis. One is that we conduct pure cross-country regressions because information on regulations and supervisory practices is available at particular points of time. The problem with this approach is that it is challenging to control fully for potential simultaneity bias as banking-sector outcomes may influence regulations and supervisory practices. The other limitation is that only aggregate measures of bank performance as available in the BRSS are used. However, our cross-country study provides a unique assessment of the relationships between banking systems' performance and the regulation/supervision of banks of select geo-financially important 30 countries (including advanced and emerging) around the world.

The results of the multivariate regression analysis for the pre-crisis period are presented in Table 16. We observe that actual risk based capital ratio is significant at 0.01 percent level of confidence in all the three models in the case of dependent variable – *non-*

interest income and at all levels of confidence in the case of dependent variable – *after-tax return*, which indicates that actual risk based capital ratio with an average of 12.91 percent had a considerable impact on profitability by compelling the banks to push up their non-interest income. This finding contributes to the theory that increasing capital adequacy ratio has an adverse impact on the profitability of the banks (Das *et al.*, 2004). The significant positive relationship of assets held by the top five largest banks with the non-interest income establishes that top five banks in the banking systems were actively engaged in increasing their fee-based services in order to boost their profitability.

Table 16: Banking systems' performance and regulation/supervision – pre-crisis period

The multivariate regression models employed in the analysis are:
$atr = \alpha + \beta_1 arbcar + \beta_2 atfb + \beta_3 dg + \beta_4 etr + \beta_5 npl + \beta_6 reest + \beta_7 rer + \beta_8 spr + \varepsilon$ --- (Eqn 1)
$nii = \alpha + \beta_1 arbcar + \beta_2 atfb + \beta_3 npl + \beta_4 rer + \beta_5 bl + \beta_6 os + \varepsilon$ ----- (Eqn 2)
We run three regressions for each dependent variable. The first is the basic model without introducing any dummy. In the second, we introduce the dummy for BRICS and in the third; we introduce the dummy for emerging economies.

	Dependent Variable: *atr*			Dependent Variable: *nii*		
	1	2	3	1	2	3
arbcar	3.19***	3.25*	0.23**	3.23***	3.21***	2.56***
	(0.21)	(0.35)	(0.01)	(0.63)	(0.77)	(0.05)
atfb	-0.40***	-0.40	-0.47*	0.69***	0.71***	0.85***
	(0.01)	(0.10)	(0.05)	(0.17)	(0.18)	(0.19)
dg	0.015	0.015	0.015			
	(0.012)	(0.019)	(0.013)			
etr	-0.20***	-0.20	-0.13			
	(0.03)	(0.05)	(0.05)			
npl	-4.8***	-4.78	-5.15*	-0.8	-0.62	-0.99**
	(0.31)	(1.29)	(0.5)	(0.43)	(0.42)	(0.33)
reest	-0.09***	-0.09	-0.10*			
	(0.01)	(0.02)	(0.01)			
spr	-0.09***	-0.01	-0.10			
	(0.009)	(0.06)	(0.01)			
rer		0.01	0.04	-0.68***	-0.64**	-0.72**
		(0.06)	(0.06)	(0.21)	(0.24)	(0.22)
bl				0.0003***	0.0003***	0.0004***
				(0.00008)	(0.00009)	(0.00009)
os				-0.03*	-0.03	-0.03**
				(0.01)	(0.01)	(0.01)
d1		0.004			0.06	
		(0.05)			(0.03)	
d2						0.07
						(0.04)
Intercept	0.24***	0.23	0.23**	-0.32**	-0.35***	-0.36***
	(0.02)	(0.11)	(0.01)	(0.09)	(0.08)	(0.05)
Adj. R-squared	0.97	0.91	0.96	0.75	0.78	0.78

Note: We report the coefficients of regression and standard errors in parenthesis ( ) using heteroscedasticity-consistent standard errors from an OLS regression. The levels of significance are indicated as * for 0.10 level, ** for 0.05 level and *** for 0.01 level. Each column represents one regression and the 2nd and 3rd columns in both the dependent variables regressions include dummy variables viz. *d1* for BRICS countries and *d2* for emerging countries.

On the expected lines, residential real estate loans were found to be negatively affecting non-interest income expounding that increasing exposure to such loans was not contributing to the profitability of the banking systems (Jalilian *et al.*, 2007). Taxation was significant but

negatively impacting on after-tax return, which indicates that increasing taxation on the banks adversely affected bank profitability. Another intriguing observation is that onsite inspections by the supervisor/s were negatively affecting bank profitability, which reveals that banks were either not accurate or unfair in collecting their income. Further, the stipulation of ratio of specific provisions to gross non-performing loans had a negative impact on bank profitability. We also observe that during the pre-crisis period allowing the banks to engage in real estate activities was impeding on their profitability. In consonance with the theory, non-performing loans were of concern for bank profitability as is suggested by the level of significance and the negative sign.

Table 17: Banking systems' performance and regulation/supervision – post-crisis period

The multivariate regression models employed in the analysis are:
$atr = \alpha + \beta_1 arbcar + \beta_2 atfb + \beta_3 dg + \beta_4 fba + \beta_5 npl + + \beta_6 oc + \beta_7 os + \beta_8 reest + \varepsilon$ --- (Eqn 3)
$nii = \alpha + \beta_1 acs + \beta_2 arbcar + \beta_3 atfb + \beta_4 div + \beta_5 gpr + \beta_6 os + \beta_7 reest + \beta_8 sec + \beta_9 sct + \varepsilon$ ----- (Eqn 4)
We run three regressions for each dependent variable. The first is the basic model without introducing any dummy. In the second, we introduce the dummy for BRICS and in the third; we introduce the dummy for emerging economies.

	Dependent Variable: *atr*			Dependent Variable: *nii*		
	1	2	3	1	2	3
acs				-0.13**	-0.13**	-0.13**
				(0.05)	(0.05)	(0.05)
arbcar	0.21	0.20	0.16	0.35	0.34	0.21
	(0.20)	(0.19)	(0.18)	(0.22)	(0.27)	(0.20)
atfb	0.04	0.04	0.08	0.26***	0.26***	0.30***
	(0.03)	(0.03)	(0.05)	(0.07)	(0.07)	(0.06)
dg	-0.04*	-0.02	-0.03			
	(0.02)	(0.02)	(0.02)			
div				-0.13***	-0.12***	-0.13***
				(0.03)	(0.03)	(0.03)
fba	0.06*	0.07*	0.04			
	(0.03)	(0.03)	(0.04)			
gpr				-0.82***	-0.82***	-0.79***
				(0.11)	(0.11)	(0.10)
npl	-1.6***	-1.6***	-1.4***			
	(0.41)	(0.41)	(0.45)			
oc	2.03***	1.9***	1.82***			
	(0.37)	(0.39)	(0.40)			
os	-0.0006	-0.001	-0.001	-0.01	-0.01	-0.01
	(0.001)	(0.002)	(0.001)	(0.006)	(0.007)	(0.006)
reest	-0.08**	-0.07**	-0.07**	-0.03	-0.03	-0.05
	(0.03)	(0.03)	(0.02)	(0.04)	(0.04)	(0.04)
sec				0.15***	0.15***	0.14***
				(0.05)	(0.05)	(0.05)
sct				0.89***	0.87***	0.85***
				(0.23)	(0.21)	(0.21)
d1		0.03*			0.03	
		(0.01)			(0.06)	
d2			0.03			0.03
			(0.02)			(0.03)
Intercept	0.08***	0.07***	0.05	0.12**	0.13**	0.12**
	(0.02)	(0.02)	(0.04)	(0.05)	(0.05)	(0.05)
Adj. R-squared	0.73	0.73	0.74	0.81	0.80	0.81

Note: We report the coefficients of regression and standard errors in parenthesis ( ) using heteroscedasticity-consistent standard errors from an OLS regression. The levels of significance are indicated as * for 0.10 level, ** for 0.05 level and *** for 0.01 level. Each column represents one regression and the 2nd and 3rd columns in both the dependent variables regressions include dummy variables viz. *d1* for BRICS countries and *d2* for emerging countries.

We present the results of the multivariate regression analysis for the post-crisis period in Table 17. Interestingly, existence of an asset classification system was negatively affecting bank profits implying that banks were either inaccurate in implementing the income collection activities or asset classification norms were too taxing on their profitability (VanHoose, 2007). We need to note that during the post-crisis period too, the significant positive relationship of assets held by the top five largest banks with the non-interest income confirms that top five banks in the banking systems are vigorously engaged in expanding their fee-based services to boost their profitability. Actual risk based capital ratio being found positively significant only in BRICS countries confirms the hypothesis of positive link between capital requirements and bank profitability particularly during the post-crisis period[7]. Power of supervisors to control dividend distribution is found to have adverse impact on bank profitability suggesting that supervisory agencies have, obligated by the crisis period experience, vigorously exercised their powers in regulating the bank directors' powers to distribute dividends. Further, this analysis verifies that there was a substantial reduction in taxation on the commercial banking systems resulting in significant positive impact on their profitability (also see Table 12). General provisions to gross loans is found to have significant negative impact on the profitability implying that provisioning norms were strengthened and passionately implemented by the banks backed by the learning from the crisis experience. In line with the theoretical arguments (Boudriga *et al.*, 2009), non-performing loans continued to be of concern during the prost crisis period as well for bank profitability as is suggested by the level of significance and the negative sign. Residential real estate loans are negatively affecting the profitability explaining that increasing exposure to such loans was now not contributing to bank profitability. However, the securitization of these loans had a substantial positive effect on profitability. Engaging in securities activities for the banks is found to have positive effect on profitability implying that post crisis period banks have regained their hold on the securities business. The model is significant in the case of BRICS countries as well though found to be insignificant in the case of emerging economies.

[7] Too little capital increases the danger of bank failure whilst excessive capital imposes unnecessary costs on banks and their customers and may reduce the efficiency of the banking system (Barth *et al.*, 2004; 2006)

Table 18: Banking systems' performance and regulation/supervision – crisis period

The multivariate regression models:

$atr = \alpha + \beta_1 arbcar + \beta_2 atfb + \beta_3 dg + \beta_4 gpr + \beta_5 nff + \beta_6 npl + \beta_7 os + \beta_8 pssa + \beta_9 sec + \beta_{10} spr + \varepsilon$ --- (Eqn 5)

$nii = \alpha + \beta_1 acs + \beta_2 arbcar + \beta_3 fba + \beta_4 fcl + \beta_5 nff + \beta_6 pssa + \beta_7 rer + \beta_8 rers + \beta_9 reest + \varepsilon$ --- (Eqn 6)

We run three regressions for each dependent variable. The first is the basic model without introducing any dummy. In the second, we introduce the dummy for BRICS economies and in the third; we introduce the dummy for emerging economies.

	Dependent Variable: *atr*			Dependent Variable: *nii*		
	1	2	3	1	2	3
acs				0.04	0.04	0.04
				(0.04)	(0.05)	(0.05)
arbcar	2.93*	3.03*	2.93	-1.17	-0.80	-1.25
	(1.68)	(1.68)	(1.76)	(1.18)	(1.29)	(1.24)
atfb	-5.41*	-5.40*	-5.41*			
	(2.78)	(2.86)	(2.88)			
fba				3.01*	2.80*	3.15*
				(1.38)	(1.40)	(1.54)
fcl				2.29*	2.10*	2.38*
				(1.28)	(1.31)	(1.37)
dg	0.37	0.36	0.37			
	(0.26)	(0.28)	(0.27)			
gpr	-3.27*	-3.22*	-3.27*			
	(1.67)	(1.77)	(1.69)			
nff	-0.26*	-0.26*	-0.26*	-0.11	-0.10	-0.12
	(0.13)	(0.14)	(0.14)	(0.07)	(0.07)	(0.08)
npl	-10.35***	-10.32***	-10.36***			
	(3.10)	(3.21)	(3.07)			
os	-0.02*	-0.01	-0.02			
	(0.01)	(0.01)	(0.01)	0.007	0.0087	0.0073
pssa	-0.52**	-0.52**	-0.52**	(0.008)	(0.008)	(0.007)
	(0.20)	(0.21)	(0.22)			
rer				3.49	3.39	3.69
				(2.17)	(2.22)	(2.28)
rers				2.38*	2.36	2.43
				(1.36)	(1.38)	(1.40)
reest				0.03	0.03	0.02
				(0.04)	(0.04)	(0.04)
sec	0.09	0.09	0.09			
	(0.06)	(0.07)	(0.06)			
spr	-1.51*	-1.51*	-1.51*			
	(0.74)	(0.76)	(0.77)			
d1		-0.01			-0.04	
		(0.09)			(0.048)	
d2			-0.0005			0.02
			(0.07)			(0.05)
Intercept	0.23**	0.23**	0.23**	0.07	0.06	0.06
	(0.10)	(0.10)	(0.10)	(0.05)	(0.05)	(0.05)
Adj. R-squared	0.56	0.53	0.53	0.33	0.31	0.30

Note: We report the coefficients of regression and standard errors in parenthesis ( ) using heteroscedasticity-consistent standard errors from an OLS regression. The levels of significance are indicated as * for 0.10 level, ** for 0.05 level and *** for 0.01 level. Each column represents one regression and the 2nd and 3rd columns in both the dependent variables regressions include dummy variables viz. *d1* for BRICS countries and *d2* for emerging countries.

We now present the results of the multivariate regression analysis for the crisis period in Table 18. On expected lines, non-performing loans are found to have a substantial negative impact on profitability. Ratio of general provisions to total gross loans was significant and

negatively impacting on profitability. Similar is the case with the stipulation of ratio of specific provisions to gross non-performing loans as it had a significant negative impact on bank profitability. The significant negative relationship of assets held by the top five largest banks with the after tax return on equity establishes that the assets of the top five banks in the banking systems were causing negative returns to these banking systems and resulted in the increasing losses. The stipulation of a bank may own 100% of the equity in any nonfinancial firm was negatively associated with profitability outcome as the banks were found to incur losses due to burst of property bubbles in advanced economies more particularly in U.S. Further, the stipulation of minimum provisioning required as loans become substandard assets was negatively impacting on profitability. However, securitization of residential real estate loans is found to have a significant positive impact, which implies that during the crisis period the banks managed their incomes by securitizing major chunks of their residential real estate loans. Interestingly, we notice that foreign bank assets have had a positive effect on bank profitability. It reveals that during the crisis period most of the banks gained their incomes from foreign banking activity as their domestic financial systems were crisis ridden. One important observation is that BRICS banking systems too experienced negative impact during the crisis period as we find the dummy variable negatively significant at 0.10 level. On the other hand, though emerging economy banking systems too had a negative impact during the crisis period, the impact was found to be insignificant.

To sum up, in terms of structure, while government ownership of banks has surged during the crisis period in the crisis and BRICS countries, there was substantial decrease in assets of foreign banks in the crisis, non-crisis, and BRICS countries. However, foreign-owned bank assets were found to have substantially increased in only in the crisis-countries. There was substantial capitalization of banks not only in the advanced countries of the crisis and non-crisis groups but also in BRICS countries which entails to believe that there was indeed a spillover effect of the crisis on the BRICS countries. Therefore, there exists a scope to reason that BRICS countries took lessons from the crisis and geared up to strengthen their banking systems. Though these asset classification norms were already in place before the crisis either their implementation was flawed or the supervisory agencies were not passionately enforcing them. General provisions against loans drastically went up in the non-crisis emerging countries leading us to conclude that these countries have taken cue from the crisis and initiated required changes to place necessary firewalls against bank failures.

During the crisis period, swift regulatory action is felt in curbing/ceasing the banks from wholly owning nonfinancial firms, particularly in advanced and emerging countries. Likewise, emerging and BRICS countries too have taken measures in curbing/ceasing the banks from actively involving in securities activities. On the other hand, insurance activities by the banks in the emerging countries found a substantial increase during the crisis period. We find no significant change in the depositor protection/guarantee measures suggesting that crisis did not instigate substantial changes in this direction. Public sector claims sharply swelled only among the crisis (advanced) and crisis-countries suggesting that governments lent substantially to bail out these banks. Further, the foreign-currency denominated assets drastically reduced and the foreign-currency liabilities shrunk considerably, suggesting that though these awful imbalances were caused necessarily due to the severe liquidity and credit crunch, seemed to be confined more or less to financial markets and institutions in the United States and Western Europe, but then were aggravated due to the absence of proper mechanisms to address such situations or failure of regulatory apparatus. While the supervisory powers to control dividend distribution strengthened substantially in the crisis-countries only, onsite examinations considerably bettered in the non-crisis countries more vigorously than in the crisis-countries. Interestingly the results suggest that BRICS countries did not undergo any substantial supervisory transformation in this regard. In terms of the stringency of capital adequacy norms, there exists a positive link between capital requirements and bank performance during the crisis period. Non-performing loans and banks' real estate activities have substantially cut down bank profitability. Securitization of residential real estate loans helped banks to manage awful liquidity needs. Interestingly, foreign bank assets have had a positive effect on bank profitability as most of these banks gained their incomes from foreign banking activity, as their domestic financial systems were crisis ridden.

5. Conclusion

Our results offer interesting insights about the bank regulatory/supervisory styles, illustrate the differences in regulation between crisis, non-crisis, and BRICS countries, and highlight the ways in which bank regulation and supervision has changed during the crisis period. Drawing on the analysis, we conclude that though the financial crisis was an outcome of mis-governance as well as market failure. The world experienced different styles of regulatory/supervisory styles in dealing with the crisis. Banks in crisis-countries faced fewer restrictions to engage in non-bank activities such as insurance, investment banking and real

estate activities compared to non-crisis countries. Crisis-countries were not only laidback in the treatment of bad loans and loan losses; they were deficient in regulating the capital requirements, constituting greater provisions or in suspending bonuses or withholding management fees. Even though crisis-countries had robust information disclosure requirements, the incentives for the private sector to monitor banks' risks were weaker and hence could aid in better risk management. On the contrary, emerging economies did fare better, partly because of structural reasons and partly because their policies worked in their favor. The soundness of domestic financial sectors also improved in emerging countries mostly due to better regulation and supervision, more prudent practices by financial intermediaries, and abundant local liquidity. Perhaps for the first time in recent decades, the domestic financial systems of many emerging countries did not amplify the shocks from the crisis. The analysis nevertheless suggests that crisis-countries had weaker regulatory and supervisory frameworks compared to those in emerging countries during the crisis. BRICS countries as a distinct block has demonstrated uniqueness in the regulatory/supervisory styles which is neither similar to crisis-countries nor with the non-crisis countries. Their regulatory practices have greatly evolved and hence could sustain the onslaught of the crisis remarkably with relatively lesser damage and faster recovery. Overall, the regulatory/supervisory styles are evolving and there have not been swift changes only due to the crisis except some noteworthy developments particularly in the area of capital adequacy, asset classification approaches, controlling the managements in dividend distribution and management fees, and allowing banks in taking up related activities like owning nonfinancial firms, dealing in securities and insurance businesses etc. Although these changes are encouraging, there still is the scope for further reforming the regulatory and supervisory structures as well as policies and practices.

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