

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

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Vighneshwara Swamy is Professor, IBS, Hyderabad.

email: vighneswar@ibsindia.org

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ABSTRACT

The global financial crisis has revealed several inadequacies in the financial regulation and supervisory topography around the world. Using the World Bank's Bank Regulation and Supervision Survey (BRSS) data, we draw insights about 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 have demonstrated uniqueness in the regulatory/supervisory styles, which is similar neither to crisis countries nor 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

1 INTRODUCTION

The role of the banking sector is paramount in the process of financial intermediation and, thereby, the achievement of faster economic growth and sustainable development. A prudent regulatory environment can not only facilitate the performance of banking systems but also ensure financial stability. Due to the devastating effects of the global financial crisis, bank regulation and supervision has been the subject of much recent debate and attention. At the heart of bank regulation is the deep-seated concern that the 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. The goal of prudential regulation should be to ensure the stability of the overall financial system. The recent global financial crisis has revealed inadequacies in supervisory enforcement and market discipline, and underlined the importance of combining strong, timely, and anticipatory supervisory enforcement with better market discipline. The crisis has triggered a healthy debate on approaches to regulation and supervision among regulators, policy makers, and academics, and led to multiple proposals for further reforms. As financial regulators around the world endeavour 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.

Barth et al. (2004) study the effect of a wide, worldwide range of regulatory and supervisory measures on banking stability and performance. Demirguc-Kunt et al. (2008) and Pasiouras et al. (2006) examine the effect of financial regulation and supervision on banks' overall soundness as measured by credit ratings. Other studies too have pointed to weaknesses in regulatory/supervisory systems as one of the factors of the crisis (Demirguc-Kunt and Detragiache 2002; Gonzalez 2005; Beck et al. 2006; Laeven and Levine 2010; Levine 2010; Barth et al. 2012). It is widely believed that the crisis was epicentred in developed countries and affected emerging and developing economies. This underlines 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. Against this backdrop, research has neglected to examine the

1. regulation, governance, and supervisory styles of banking systems worldwide;
2. topography of regulatory and supervisory frameworks;
3. bank regulation/supervisory environment before, during, and after the crisis;
4. difference in supervisory styles during these periods in advanced, emerging, and BRICS economies; or
5. factors of banking system performance in these economies during these periods.

That is the motivation to critically analyse regulatory environments in general, and BRICS¹ and emerging economies 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 regulatory and supervisory approaches pursued across countries and the changes brought about by the crisis. This entails finding out

1. the topography of the regulatory and supervisory frameworks of countries hit directly by the global financial crisis;
2. how these differed from those of BRICS countries; and
3. what lessons can be drawn for strengthening the regulatory structures of these countries.

It is desirable also to trace how national regulatory and supervisory practices changed in response to the crisis since the previous BRSS, and analyse the relationship between bank performance and stability in the context of differences in bank regulations and supervision in BRICS countries and that of advanced countries. This study, which employs a robust database, takes the original approach of assessing bank regulation and supervision styles worldwide and specifically in BRICS and emerging economies, and the impact of such styles on banking system profitability. Regulatory agencies worldwide would greatly benefit from systematic evidence of the relationship between bank performance and regulatory/supervisory systems. The remainder of the paper is organised as follows. Section 2 reviews the related literature on bank regulation, supervision, and efficiency. Section 3 describes the data employed for the analysis and the methodological design, including econometric approaches. Section 4 presents the results and the related discussion. In Section 5, we conclude.

2 RELATED LITERATURE

Banks are considered sensitive and fragile as they have high leverage ratios, fractional reserves, and high potential for a run. This calls for great care in regulating banks (Freixas and Rochet 1997). The twin goals of bank regulation and supervision—stability and efficiency of the financial system—often pull in opposing directions. This has led to a raging debate on the nature and extent of the trade-off between the two. Demircuc-Kunt and Detragiache (2002) and Beck et al. (2006) study the effect of regulations on banking crises, and Pasiouras et al. (2006) and Demircuc-Kunt et al. (2008) examine the effect of banking regulation on banks' overall soundness. Further, while Barth et al. (2004) have studied the effect of a broad range of

¹The five emerging economies of Brazil, Russia, India, China, and South Africa (BRICS) 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 over 25 percent of global GDP and 20 per cent of global economic activity, but possess just 11 per cent of the votes in the International Monetary Fund (IMF). Further, it is largely believed that bank governance and regulation styles in BRICS countries were not akin to that in advanced countries.

regulatory and supervisory measures on bank stability at the international level, Gonzalez (2005) and Laeven and Levine (2009) have examined banks' risk-taking behaviour.

The available literature on bank governance and regulation can be analysed broadly under two strands:

1. exploring unsystematic risk because of internal variables as its potential determinants (Brewer et al. 1996; Berger and DeYoung 1997); and
2. surveying systematic risk due to negative externalities in financial markets, regulations, and macro-economic conditions (Demirguc-Kunt 1989; Hassan et al. 1994).

Both streams offer evidence of substantial correlations among internal determinants, externalities, and bank risk. However, authors such as Santos (2000) and Freixas and Santomero (2002), who review banking regulation from the perspective of microeconomics, observe that regulation is not optimal.

Hanson et al. (2011) categorise banking regulation as micro-prudential and macro-prudential. They observe that in micro-prudential regulation, regulation itself is partial equilibrium in conception, and is aimed at preventing the costly miscarriage of individual financial institutions; and that the macro-prudential approach recognises general equilibrium effects and strives to safeguard the financial system in its entirety. Bank regulation is intended not only to foster investor protection but also to enhance the efficiency of capital allocation, in turn to improve the efficacy of financial markets. The measurements used most often for regulating the banking industry, especially in emerging markets are reserve requirements, suspension of convertibility, deposits insurance, and capital adequacy requirements (Eichberger and Harper 1997). Swamy (2013) emphasises the need for regulation to safeguard banking stability, and observes that regulation and supervision is necessary to ensure overall macroeconomic balance, enhance the macro-prudential functioning of institutions and markets, and reinforce micro-prudential institutional soundness².

The belief that banks are 'too big to fail' and 'too big to discipline' often lead to the reasoning that they wield considerable economic power and, consequently, political influence; this, in turn, leads to aggressive risk-taking. Over time, banks have grown horizontally and vertically to the extent that they are posing difficulties in monitoring too. The 'originate to distribute' (OTD) strategy quite obviously allows global systemically important financial institutions (G-SIFIs) to originate risky loans and package them into asset-backed securities (ABS) with structured tranches and, subsequently, repackage them as collateralised

²A more detailed debate of the formative papers in banking regulation can be obtained in Dewatripont and Tirole (1993) and Freixas and Rochet (1997).

debt obligations (CDOs) in upper-level securitisations. Although the OTD strategy is attractive in the short run, credit default swaps (CDS) and synthetic CDOs engineered by G-SIFIs have in effect resulted in multiple bets on high-risk loans in the long run (Wilmarth 2010). Given the theoretical setting, there is a need to study the regulatory impact on the top five banks in banking systems during the crisis.

Conventional approaches to bank regulation underline the positive features of capital adequacy requirements (Dewatripont and Tirole 1994). Quite a few notable theoretical considerations can be observed in understanding banks' risk-taking behaviour. Risk-taking is an effect of causes 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 to help firms with outstanding loans (John et al. 1994). It is the factor of moral hazard³ that induces banks' risk-taking behaviour (Demirguc-Kunt and Detragiache 2002).

Ownership structure and management behaviour influence banks' risk-taking behaviour. It is widely held that bank risk⁴ is dependent on each bank's ownership structure, as standard agency theories hold advocate that bank risk-taking is influenced by ownership structure (Jensen and Meckling 1976; John et al. 2008). Further, Galai and Masulis (1976) find that, in limited liability firms, diversified owners have incentives to increase banks' risk-taking tendency, as they collect funds from depositors and bondholders. Correspondingly, Jensen and Meckling (1976) and Demsetz and Lehn (1985) observe that managers with *private benefits of control* over banks tend to take fewer and smaller risks. In a detailed study of banking firms, providing evidence that stockholder-controlled banks embrace more risks than managerially controlled banks, Saunders et al. (1990) observe that management stock ownership induces risk-taking behaviour. Further, in their seminal study on the theory of bank regulation and management compensation, John et al. (2000) argue for a towering role for managerial compensation structures in bank regulation. Against this backdrop, it is essential to study the impact of regulatory environment on ownership structure during the crisis.

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) and Yellen (2009) underline the viewpoint that a free flow monetary policy leads to excess liquidity and, consequently, low interest rates. This leads to a burst of financial engineering and innovation,

³Merton (1977) was the first to quantify 'moral hazard' by relating the value of deposit insurance with that of a put option on the FDIC. Pennacchi (2005) evokes significant concerns of moral hazard as it induces banks to invest in off-balance sheet portfolios with high systematic risk. Bhattacharya et al. (1998) too hold that government deposit insurance affects bank behaviour.

⁴Walid and Eric (2010) establish a causal relationship between the degree of internationalisation and performance, but find that the nature of this relationship varies by bank, and by the risk of its foreign asset exposure.

which amplifies and accelerates the consequences of excess liquidity and rapid credit expansion, which ultimately results in asset bubbles. Suggesting how the relation between integration and synchronisation 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. Banks' profit-seeking behaviour is at the core of the Minskyan model of financial instability. Rational profit-seeking behaviour in an uncertain decision-making environment leads banks to pursue risk-taking financial practices that give rise to a state of escalating financial fragility. 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 that information asymmetries are the source of financial instability or a crisis. Mishkin's approach establishes that an upsurge in information asymmetry causes ex ante a compounding risk of adverse selection (Mishkin 1999a and 1999b). As has been observed in the recent past, perverse incentives to banking industry managers persuade them to take on too much risk, which lead to crises (Davidson 2010).

The foregoing theoretical framework lets us examine the bank regulation/supervisory environment during the crisis and compare the topography of the regulatory and supervisory frameworks of countries affected directly by the crisis with that of countries not directly affected. It is desirable also to examine the regulatory environment of BRICS countries and find out whether they were quite different, and analyse the relationship between bank performance and stability with differences in bank regulations and supervision in BRICS countries and that of advanced countries. What lessons can be drawn for strengthening the regulatory structures of these countries? There is scope to trace how national regulatory and supervisory practices changed, and the kind of inferences that can be drawn to build the regulatory literature in this domain.

3 DATA AND METHODOLOGY

We source the data from the World Bank's Bank Regulation and Supervision Survey (BRSS) data collected under their research programme on financial institutions and regulation. The BRSS is a unique source of comparable data on how banks are regulated and supervised worldwide. Including the current version of the survey database updated in 2012, and the earlier surveys, released in 2001, 2003, and 2007, this study analyses four databases. The 2012 survey⁵ database provides information on bank regulation and supervision for 143

⁵The World Bank's BRSS survey of 2011-12 provides data for 143 countries for the years 2008, 2009, and 2010. These 143 countries, of which 37 are advanced economies and 106 are emerging and developing economies, provide a balanced representation of countries in terms of income level and population size. In terms of topical coverage, the survey is comprehensive, and provides 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.

jurisdictions. It covers data since 2008, and is therefore quite useful in scrutinising the state of bank regulation and supervision in the focus countries of this study and comparing it to the 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 and financial systems. These include 15 countries directly affected by crisis (systemic and borderline cases) and 15 of those indirectly affected by contagion. BRICS countries are included for a differentiated focus. These 30 countries cover more than 75 percent of global banking (Table 1). We have classified the crisis countries using the database developed by Laeven and Valencia (2010).⁶

Table 1 Countries studied

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

⁶Laeven 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.

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 that 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 selected 51 responses to the questions in BRSS into 10 variables: (1) entry, structure and competition; (2) capital regime; (3) asset classification norms; (4) provisioning; (5) activities; (6) protection to depositors; (7) regulation of exposures; (8) taxation; (9) performance; and (10) supervision. We provide the description of the variables in Table 2.

Table 2 Description of variables

No.	Variable	Description and survey details
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 unrealised 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.

Table 2 Description of variables (contd.)

No.	Variable	Description and survey details
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 securitised.
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 BRSSs 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 includes questions that explicitly request regulators to identify reforms introduced in response to the crisis. We perform our study in two phases.

Phase 1

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 questions in BRSS.

Phase 2

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 three outcome variables (after tax return on equity for the commercial banking system, percentage of the commercial banking system's total gross income that was in the form of non-interest income, and domestic credit provided by the financial sector as percent of GDP) on various supervisory and regulatory indicators. To estimate the relationship between performance and regulatory/supervisory practices, we need to control for (1) exogenous determinants of bank performance and (2) potential endogeneity of bank regulations and supervisory practices. We do this in two steps. First, we use existing theory and evidence to identify exogenous determinants of banking sector development and include these determinants as control variables in the bank performance regulation/supervision regressions. Second, we choose exogenous determinants of bank regulation and supervision and use them as instrumental variables. By doing this, we provide an empirical assessment of whether simultaneity bias is driving the results. As La Porta et al. (1998) observe, 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.

4 RESULTS AND DISCUSSION

In this Phase 1 of the analysis, we estimate the econometric significance of the changes or transformations in the financial/banking regulation and supervision in crisis versus non-crisis countries and during the pre and post crisis periods. We conduct a series of mean t-tests on responses to distinct questions in BRSS.

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 emphasise that banks with monopolistic power possess greater franchise value, which enhances prudent risk-taking behaviour (Keeley 1990). Others, like Shleifer and Vishny (1998), disagree, emphasising the beneficial effects of competition and the harmful effects of entry regulation. Foreign banks are believed to make bank–firm relationships more stable and, by indirectly enhancing access to the financial system, 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. Table 3 presents the subset of questions for

which we observe statistical significant changes between the 2007 and 2011–12 BRSSs. We observe from the paired samples mean't-test' that there is no significant change in the assets held by the five largest banks across the groups of countries. However, we notice significant change in the government ownership in the case of crisis-countries and BRICS countries. There is 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. Percentage of total assets held by the five largest banks							
Pre-crisis	68%	48%	65%	83%	61%	67%	62%
Post-crisis	68% (0.927)	48% (0.778)	65% (0.969)	82% (0.748)	62% (0.799)	68% (0.911)	62% (0.846)
2. Percentage of the banking system's assets that were government-controlled (e.g., where government owned 50% or more equity)							
Pre-crisis	7%	28%	10%	1%	28%	21%	37%
Post-crisis	11% (0.118)	31% (0.175)	14% (0.07)	1% (0.423)	27% (0.440)	19% (0.372)	40% (0.06)
3. Percentage of the banking system's assets that were foreign-controlled (e.g., where foreigners owned 50% or more equity)							
Pre-crisis	23%	43%	26%	56%	28%	34%	19%
Post-crisis	22% (0.116)	40% (0.411)	25% (0.05)	54% (0.201)	26% (0.221)	33% (0.076)	18% (0.046)
4. Percentage of the total foreign-owned bank assets in domestic banking system held in branches as opposed to other juridical forms (e.g. subsidiaries)							
Pre-crisis	28%	4%	22%	44%	16%	2008	23%
Post-crisis	30% (0.05)	4% (0.50)	24% (0.04)	40% (0.296)	16% (0.505)	2010 (0.272)	22% (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.

Examining the changes in the applications accepted for commercial banking licenses from domestic entities, the results reported in Table 4, suggest 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			
	2010	2007	
Crisis	20.6	54.8	
Non-Crisis	2.2 (0.256)	1.73 (0.17)	
Crisis	20.6	54.8	
BRICS	39.6 (0.38)	111.4 (0.54)	
Non-Crisis	2.2	1.73	
BRICS	39.6 (0.383)	111.4 (0.381)	
Applications for commercial banking licenses from domestic entities: Accepted – period comparison			
Year	Crisis-countries	Non-crisis countries	BRICS countries
Pre-crisis	54.8	1.73	111.4
Post-crisis	20.6 (0.19)	2.2 (0.73)	39.6 (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 acquisitions, subsidiaries, branches, and joint ventures? The results (in Table 5) indicate 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:				
	Acquisition	Subsidiary	Branch	Joint Venture
Crisis	0	0	0.667	0
Non-Crisis	0 (0)	0.13 (0.164)	0.433 (0.582)	0.266 (0.041)
Crisis	0	0	0.667	0
BRICS	0 (0)	0 (0)	0.2 (0.374)	0 (0)
Non-Crisis	0	0	0.433	0.266
BRICS	0 (0)	0 (0)	0.2 (0.374)	0 (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

The literature provides conflicting predictions as to whether the imposition of capital requirements will have positive effects (Santos 2000). Studies like Besanko and Kanatas (1996) claim that capital requirements might increase risk-taking behaviour. Per se, we assess the regulatory impact on capital regime in the case of sample countries and do not consider the relationships between capital regulations and banking performance in isolation.

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							
Pre-crisis	0.081	0.09	0.077	0.08	0.092	0.089	0.096
Post-crisis	0.08 (0.131)	0.04 (0.5)	0.074 (0.769)	0.05 (0.423)	0.083 (0.315)	0.077 (0.155)	0.075 (0.348)
2. Actual risk based capital ratio of the banking system							
Pre-crisis	0.08	0.152	0.09	0.11	0.12	0.12	0.11
Post-crisis	0.13 (0.01)	0.159 (0.69)	0.14 (0.01)	0.13 (0.14)	0.14 (0.32)	0.14 (0.23)	0.15 (0.06)
3. Actual Tier 1 capital ratio of the banking system							
Pre-crisis	0.08	0.123	0.08	0.08	0.08	0.08	0.07
Post-crisis	0.11 (0.001)	0.126 (0.84)	0.11 (0.001)	0.1 (0.06)	0.11 (0.18)	0.11 (0.117)	0.09 (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.

The results of the analysis presented in Table 6 explain that there was no significant change in the case of minimum required risk-based regulatory capital ratio. However, there was a significant change in actual risk-based capital ratio of the banking systems. We also observe a significant change in actual tier-1 capital ratio of the banking systems. The results indicate that there was substantial capitalisation of banks, particularly in 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 lead us to believe that there was indeed a spillover effect of the crisis on the BRICS countries.

4.3 Asset classification norms

With a subset of responses to four questions of BRSS, we examine the impact of regulation of asset classification norms. 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'. The results presented in Table 7 suggest that there is no significant change in all the considered parameters, implying 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.

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							
Pre-crisis	0.61	0.5	0.6	0.66	0.91	0.86	0.8
Post-crisis	0.53 (0.72)	0.5 (1.0)	0.53 (0.75)	0 (0.18)	1 (0.33)	0.8 (0.58)	1.0 (0.37)
2. Minimum provisioning required as loans become sub-standard assets							
Pre-crisis	0.23	0.15	0.15	--	0.2	0.2	0.16
Post-crisis	0.24 (0.72)	0.2 (0.5)	0.16 (0.87)		0.26 (0.44)	0.22 (0.79)	0.15 (0.91)
3. Minimum provisioning required as loans become doubtful assets							
Pre-crisis	0.65	0.35	0.53	--	0.44	0.44	0.36
Post-crisis	0.61 (0.74)	0.5 (0.5)	0.57 (0.63)		0.45 (0.82)	0.45 (0.82)	0.35 (0.94)
4. Minimum provisioning required as loans become loss assets							
Pre-crisis	0.9	--	1.0	--	0.95	0.93	1.0
Post-crisis	1.0 (0.39)		1.0 --		0.95 --	0.93 --	1.0 --

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.

4.4 Provisioning for bad and doubtful assets

We assess the regulatory impact on the provisioning norms. The results presented in Table 8 suggest that there was no significant change in the ratio of specific provisions to gross non-performing loans. However, significant change was observed in the ratio of general provisions among the non-crisis emerging countries, which 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.

4.5 Regulations on bank activities and banking-commerce

In the rich, available economic literature, Boyd et al. (1998) examine whether restricting bank activities 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 activities—rather than more traditional activities—based on interest spread: (1) securities, (2) insurance, and (3) real estate.

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

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							
Pre-crisis	0.3	--	0.33	0	0.166	0.133	0.2
Post-crisis	0 (0.04)		0 (0.019)	0.33 (0.423)	0.416 (0.082)	0.4 (0.041)	0.2 (--)
2. A bank can engage in securities activities							
Pre-crisis	0.615	1	0.533	1	0.75	0.533	0.8
Post-crisis	0.3 (0.165)	0 (--)	0.266 (0.164)	0.667 (0.423)	0.25 (0.007)	0.266 (0.164)	0.2 (0.07)
3. A bank can engage in insurance activities							
Pre-crisis	0.307	0.5	0.266	0.666	0.416	0.466	0.6
Post-crisis	0.539 (0.337)	0 (0.5)	0.466 (0.384)	0.666 (--)	0.833 (0.096)	0.8 (0.136)	0.4 (0.704)
4. A bank can engage in real estate activities							
Pre-crisis	0.307	0.5	0.133	0.666	0.166	0.133	0.2
Post-crisis	0.154 (0.436)	0.5 (--)	0.2 (0.582)	0 (0.184)	0.5 (0.104)	0.4 (0.164)	0.4 (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.

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 except BRICS countries. In the case of banks' foray into securities activities, we notice a significant change among non-crisis (emerging) and BRICS countries, suggesting that there was swift regulatory action, particularly in advanced and emerging countries, in curbing/ceasing banks from wholly owning nonfinancial firms. 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 banks in emerging countries registered a substantial increase.

4.6 Protection to depositors

Politically, deposit insurance/guarantee schemes are meant to prevent widespread bank runs. To protect payment and credit systems from contagious bank runs, many governments favour deposit insurance and effective official oversight of banks to augment private sector monitoring of banks. Though they may encourage excessive risk-taking behaviour (Demirguc-Kunt and Detragiache 2002), which some believe offsets any stabilisation benefits, 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. The results of our assessment of the impact of regulatory environment on the depositor protection mechanisms (Table 10) indicate no significant change in the depositor protection/guarantee measures; this suggests that the crisis did not initiate 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							
Pre-crisis	0.494	--	0.51	--	0.457	0.441	0.516
Post-crisis	0.559 (0.112)		0.56 (0.164)		0.43 (0.451)	0.423 (0.553)	0.44 (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 assess the regulations considering a subset of responses to select seven questions in the BRSS related to regulatory rules or supervisory guidelines detailed in Table 11. The results suggest a drastic reduction in foreign currency-denominated assets during the crisis period among the crisis, non-crisis, and non-crisis (emerging) countries. Foreign currency liabilities shrunk drastically among 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 securitisation of residential real estate loans among all the groups of the study sample. Interestingly, 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 were 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							
Pre-crisis	0.183	0.306	0.205	0.031	0.156	0.136	0.132
Post-crisis	0.166 (0.13)	0.252 (0.31)	0.182 (0.041)	0.049 (0.262)	0.133 (0.02)	0.115 (0.007)	0.099 (0.187)
2. Percent of the commercial banking system's liabilities that was foreign-currency denominated							
Pre-crisis	0.210	0.241	0.216	0.235	0.147	0.163	0.121
Post-crisis	0.185 (0.006)	0.213 (0.476)	0.190 (0.476)	0.226 (0.76)	0.124 (0.101)	0.142 (0.083)	0.089 (0.137)
3. Percent of the commercial banking system's assets that was in public sector claims							
Pre-crisis	0.058	0.016	0.050	0.006	0.165	0.129	0.246
Post-crisis	0.086 (0.003)	0.034 (0.419)	0.076 (0.001)	0.018 (0.376)	0.202 (0.284)	0.159 (0.236)	0.239 (0.792)
4. Percent of the commercial banking system's assets that was funded with deposits							
Pre-crisis	0.508	0.430	0.498	0.493	0.671	0.627	0.589
Post-crisis	0.521 (0.323)	0.500 (0.115)	0.518 (0.108)	0.535 (0.106)	0.674 (0.67)	0.639 (0.353)	0.608 (0.611)
5. Percent of total bank assets that were residential real estate loans							
Pre-crisis	0.159	0.116	0.151	0.294	0.074	0.119	0.069
Post-crisis	0.174 (0.109)	0.135 (0.587)	0.166 (0.058)	0.344 (0.148)	0.075 (0.752)	0.132 (0.141)	0.077 (0.126)
6. Percentage of total bank assets that were commercial real estate loans							
Pre-crisis	0.054	--	0.048	0.050	0.026	0.032	0.034
Post-crisis	0.05 (0.216)		0.044 (0.205)	0.049 (0.749)	0.026 (0.993)	0.032 (0.823)	0.039 (0.249)
7. Percentage of residential real estate loans that were securitized							
Pre-crisis	0.236	--	0.236	0.125	0.027	0.060	0.008
Post-crisis	0.243 (0.851)		0.243 (0.851)	0.113 (0.644)	0.023 (0.418)	0.053 (0.368)	0.009 (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

In the regulatory literature, 'taxation', except in the shape of deposit insurance, justified primarily as a defence against bank runs, has played no significant role. The IMF (2010) offers an extensive review of the comparison between taxation and regulation in the financial sector. In the backdrop of trying to understand whether there is merit in the dominance of the regulatory approach to dealing with financial sector externalities or if there is 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. 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 (in Table 12) find 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							
Pre-crisis	0.266	0.215	0.258	0.315	0.258	0.285	0.242
Post-crisis	0.251 (0.183)	0.195 (0.5)	0.242 (0.111)	0.3 (0.5)	0.296 (0.579)	0.296 (0.654)	0.3 (0.609)
2. Effective tax rate on the aggregate commercial banking system's pre-tax income							
Pre-crisis	0.263	--	0.263	0.275	0.279	0.278	0.243
Post-crisis	0.173 (0.140)		0.173 (0.14)	0.285 (0.793)	0.243 (0.352)	0.254 (0.402)	0.293 (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 difficult and costly to monitor. Some theoretical models suggest that strong, official supervision can help prevent banks from engaging in excessive risk-taking behaviour and thus improve bank development, performance, and stability. The contrary view is that powerful supervisors may exert a negative influence on bank performance as they may use their powers to benefit favoured 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 regulatory literature is not rich on the rigorous assessment of which specific regulatory and supervisory standards actually matter for bank performance and stability. The results of our assessment, presented in Table 13, suggest that aggregate operating costs experienced significant change only in the non-crisis emerging countries. Obviously, the ratio of non-

performing loans to total gross loans experienced a significant change among the crisis, advanced as well as emerging between the crisis and 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							
Pre-crisis	-0.083	0.103	-0.058	0.131	0.134	0.133	0.175
Post-crisis	0.031 (0.413)	0.107 (0.795)	0.041 (0.408)	0.122 (0.691)	0.131 (0.90)	0.13 (0.806)	0.153 (0.117)
2. Percent of the commercial banking system's total gross income that was in the form of non-interest income							
Pre-crisis	0.254	0.479	0.256	0.285	0.315	0.308	0.399
Post-crisis	0.326 (0.338)	0.480 (0.99)	0.347 (0.336)	0.292 (0.874)	0.322 (0.691)	0.314 (0.698)	0.376 (0.382)
3. Aggregate operating costs to assets ratio for the commercial banking system							
Pre-crisis	0.016	--	0.017	0.015	0.036	0.031	0.0273
Post-crisis	0.015 (0.454)		0.016 (0.389)	0.0156 (0.456)	0.038 (0.079)	0.032 (0.623)	0.0271 (0.93)
4. Ratio of non-performing loans (gross of provisions) to total gross loans							
Pre-crisis	0.033	0.043	0.034	0.008	0.034	0.028	0.031
Post-crisis	0.064 (0.001)	0.081 (0.099)	0.066 (0.000)	0.015 (0.096)	0.03 (0.201)	0.026 (0.423)	0.041 (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

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 market failures and enhance social welfare.

Table 14 Changes in banking supervision

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

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. Against this backdrop, we attempt in this section to know if there was a significant change during the crisis period in the supervisory environment. Considering a subset of responses for two important questions of the BRSS, 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. Onsite examinations drastically increased in the non-crisis countries than in crisis countries. Interestingly the results suggest that BRICS countries did not undergo any substantial supervisory transformation in this regard.

4.11 Regression results

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

The purpose of Phase 2 of this study is to examine the relationship between the bank regulation and supervision variables and the bank performance outcomes. We estimate the regulatory impact on banking performance during the pre-crisis, crisis, and post-crisis periods by regressing each of the three important outcome variables (viz. after-tax return, non-interest income, and domestic credit provided by the financial sector) on various supervisory and regulatory indicators. We use ordinary least squares regressions to examine the relationships between bank performance outcomes and bank regulation and supervision variables. To estimate the impact of the regulatory variables on performance / (in) efficiency while controlling for other country-specific characteristics, we provide the specification of the model as below:

$$P = f(\text{regulatory variables}) + (\text{economic variables}) \text{-----} \text{ (Eqn 1)}$$

$$P = f(\text{capital regime, structure, assets classification, provisioning, activities, protection to depositors, banking exposures, para banking activities, taxation, bank supervision}) + (\text{macroeconomic variables})$$

We write the Eqn1 as

$$P_i = \alpha + \beta (X_i + Y_i) + \varepsilon \text{-----} \text{ (Eqn 2)}$$

Where, P_i is the banking system performance variable (such as after-tax return – *atr*, non-interest income – *nii*, domestic credit provided by financial sector as percent of GDP – *dcfs*). 'X' is the bank regulation/supervisory variable, 'Y' is the macroeconomic variable to control for the macroeconomic environment and 'ε' is the error term. We follow White heteroscedasticity-consistent procedures, estimating with the standard deviation weights.

Further, substituting the Eqn 2 with the bank regulation/supervisory variables:

$$atr_i = \alpha + \beta_1 arbcarr_i + \beta_2 atfb_i + \beta_3 npl_i + \beta_4 rer_i + \beta_5 ose_i + \beta_6 gdpgr_i + \beta_7 infl_i + \varepsilon \quad \text{----- (Eqn 3)}$$

$$nii_i = \alpha + \beta_1 arbcarr_i + \beta_2 npl_i + \beta_3 rer_i + \beta_4 rers_i + \beta_5 fba_i + \beta_6 fcl_i + \beta_7 nff_i + \beta_8 gdpgr_i + \beta_9 infl_i + \varepsilon \quad \text{----- (Eqn 4)}$$

$$dcfs_i = \alpha + \beta_1 arbcarr_i + \beta_2 atfb_i + \beta_3 npl_i + \beta_4 rer_i + \beta_5 fba_i + \beta_6 fcl_i + \beta_7 nff_i + \beta_8 gdpgr_i + \beta_9 infl_i + \varepsilon \quad \text{----- (Eqn 5)}$$

The bank regulation and supervision variables are detailed in Table 15. We present the results of the detailed econometric analysis in the ensuing section. Our first dependent variable, *After tax return on equity*, for the commercial banking system is largely related to the overall (fund based as well as non-fund based) activities of the banks (*atr*) and acts as a general indicator of a financial institution's performance. The second dependent variable—percentage of the commercial banking system's total gross income that was in the form of *non-interest income (ni)*—is related to the non-fund based activities of the banks, and generally indicates the efficiency of the financial institution's ability to generate revenue without using costly funds. The third dependent variable, *domestic credit by financial sector*, as percent of GDP (*dcfs*) indicates the loan output of the financial institutions. Our intent here is to examine the relationships between bank performance outcomes as described above and bank regulation and supervision variables 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. 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 limitation 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.

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

The multivariate regression models employed in the analysis are:

$$atr = \alpha + \beta_1 arbcarr + \beta_2 atfb + \beta_3 npl + \beta_4 ins + \beta_5 reest + \beta_6 spr + \beta_7 gdpgr + \beta_8 infl + \varepsilon \text{--- (Eqn 3.1)}$$

$$nii = \alpha + \beta_1 arbcarr + \beta_2 atfb + \beta_3 npl + \beta_4 spr + \beta_5 div + \beta_6 nff + \beta_7 sec + \beta_8 gdpgr + \beta_9 infl + \varepsilon \text{--- (Eqn 4.1)}$$

$$dc = \alpha + \beta_1 arbcarr + \beta_2 atfb + \beta_3 npl + \beta_4 ins + \beta_5 reest + \beta_6 nff + \beta_7 ose + \beta_8 gdpgr + \beta_9 infl + \varepsilon \text{--- (Eqn 5.1)}$$

We run three regressions for each dependent variable (after-tax return – *atr*, non-interest income – *nii*, and domestic credit by financial sector - *dcfs*) using White heteroscedasticity-consistent standard errors and covariance. The first is the basic model without introducing any dummy. In the second, we introduce the dummy d_1 for BRICS, and in the third; we introduce the dummy d_2 for emerging economies.

	Dependent variable: <i>atr</i>			Dependent variable: <i>nii</i>			Dependent variable: <i>dcfs</i>		
	1	2	3	1	2	3	1	2	3
Regulatory/Supervisory variables									
<i>arbcarr</i>	0.67 (0.45)	0.77 (0.45)	0.48 (0.6)	0.71 (0.93)	0.86 (1.07)	0.82 (1.37)	-2.79 (1.8)	-2.71 (1.7)	-1.79 (2.4)
<i>atfb</i>	0.2*** (0.05)	0.2*** (0.05)	0.2*** (0.05)	0.14 (1.10)	0.14 (0.10)	0.15 (0.12)	0.53 (0.47)	0.51 (0.50)	0.61 (0.50)
<i>npl</i>	-0.21 (0.25)	-0.11 (0.25)	-0.27 (0.24)	-0.56 (0.50)	-0.38 (0.62)	-0.52 (0.64)	1.70 (1.88)	1.80 (1.96)	2.30 (1.87)
<i>ins</i>	0.05*** (0.01)	0.05*** (0.01)	0.05***			(0.13)	0.28* (0.13)	0.28* (0.13)	0.24
<i>reest</i>	-0.05*** (0.01)	-0.05*** (0.02)	-0.05**			(0.17)	-0.5*** (0.2)	-0.6*** (0.18)	-0.5***
<i>spr</i>	-0.02 (0.02)	-0.03 (0.02)	-0.02 (0.07)	0.1** (0.09)	0.15 (0.07)	0.17**			
<i>div</i>			(0.04)	-0.1*** (0.04)	-0.1*** (0.04)	-0.1***			
<i>nff</i>			(0.03)	0.1*** (0.04)	0.09* (0.03)	0.1*** (0.15)	0.38** (0.15)	0.38** (0.14)	0.41***
<i>sec</i>			(0.04)	0.07 (0.04)	0.06 (0.04)	0.07			
<i>ose</i>							0.09* (0.04)	0.09 (0.04)	0.08
Control Variables									
<i>gdpgr</i>	0.02*** (0.004)	0.01*** (0.01)	0.01 (0.01)	0.001 (0.02)	0.003 (0.02)	0.003 (0.04)	0.10** (0.06)	0.11 (0.050)	0.07
<i>infl</i>	0.004 (0.0020)	0.004 (0.003)	0.004 (0.005)	-0.001 (0.006)	-0.001 (0.006)	-0.001 (0.02)	-0.05** (0.02)	-0.05** (0.02)	-0.06**
Dummy Variables									
<i>d1</i>		0.03 (0.02)			0.05 (0.06)			0.04 (0.21)	
<i>d2</i>			0.03 (0.04)			-0.02 (0.09)			-0.18 (0.26)
<i>Intercept</i>	-0.2*** (0.07)	-0.2*** (0.08)	-0.19* (0.10)	0.08 (0.12)	0.09 (0.12)	0.06 (0.21)	5.09*** (0.48)	5.1*** (0.54)	4.85*** (0.5)
<i>R-squared</i>	0.73	0.75	0.74	0.62	0.62	0.62	0.89	0.89	0.90

Note: We report the coefficients of regression and standard errors in parenthesis (.). The levels of significance are indicated as * for 0.10 level, ** for 0.05 level and *** for 0.01 level.

Supporting the theory of bank regulation from macroeconomic perspectives (Rochet 2002), banks owning 100% of the equity in any nonfinancial firm was negatively associated with profitability. Further, the significance of the dummy variable for emerging economies suggests that the banking supervision was different and effective than the advanced economies.

Table 17 Banking systems' performance and regulation/supervision – crisis period The multivariate regression models employed in the analysis are:

$$atr = \alpha + \beta_1 arbcarr + \beta_2 atfb + \beta_3 npl + \beta_4 rer + \beta_5 ose + \beta_6 gdpgr + \beta_7 infl + \varepsilon \text{ --- (Eqn 3.2)}$$

$$nii = \alpha + \beta_1 arbcarr + \beta_2 npl + \beta_3 rer + \beta_4 rers + \beta_5 fba + \beta_6 fcl + \beta_7 nff + \beta_8 gdpgr + \beta_9 infl + \varepsilon \text{ --- (Eqn 4.2)}$$

$$dcfs = \alpha + \beta_1 arbcarr + \beta_2 atfb + \beta_3 npl + \beta_4 rer + \beta_5 fba + \beta_6 fcl + \beta_7 nff + \beta_8 gdpgr + \beta_9 infl + \varepsilon \text{ --- (Eqn 5.2)}$$

We run three regressions for each dependent variable (after-tax return – *atr*, non-interest income – *nii*, and domestic credit by financial sector - *dcfs*) using White heteroscedasticity-consistent standard errors and covariance. The first is the basic model without introducing any dummy. In the second, we introduce the dummy d_1 for BRICS, and in the third; we introduce the dummy d_2 for emerging economies.

	Dependent variable: <i>atr</i>			Dependent variable: <i>nii</i>			Dependent variable: <i>dcfs</i>		
	1	2	3	1	2	3	1	2	3
Regulatory/Supervisory variables									
<i>arbcarr</i>	1.89 (1.51)	2.45 (1.69)	1.71 (1.48)	0.44 (0.82)	0.46 (0.86)	0.56 (0.88)	-2.64 (4.00)	-4.48 (5.02)	-0.88 (3.26)
<i>atfb</i>	-2.49 (2.25)	-2.32 (2.27)	-2.52 (2.19)				1.96 (2.25)	1.61 (2.36)	1.40 (1.87)
<i>npl</i>	-6.8** (3.28)	-6.4* (3.33)	-7.9** (3.53)	-0.20 (0.76)	-0.14 (0.79)	0.32 (0.89)	5.10 (4.42)	4.35 (4.29)	1.03 (4.94)
<i>rer</i>	3.73 (3.17)	3.60 (3.21)	2.71 (2.81)	3.08 (2.12)	3.05 (2.18)	3.66 (2.37)	10.1*** (2.9)	10.4*** (3.08)	5.17 (4.45)
<i>ose</i>	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)						
<i>rers</i>				2.32 (1.65)	2.34 (1.70)	2.41 (1.67)			
<i>fba</i>				2.9* (1.65)	2.92 (1.70)	3.3* (1.85)	6.66 (4.74)	7.31 (5.11)	2.65 (4.47v)
<i>fcl</i>				1.52 (0.99)	1.45 (1.06)	1.86 (1.23)	11.3** (4.1)	12.6*** (3.3)	8.01** (3.3v)
<i>nff</i>				-0.07 (0.06)	-0.10 (0.06)	-0.10 (0.08)	-0.7*** (0.1)	-0.7*** (0.1)	-0.4*** (0.1)
Control Variables									
<i>gdpgr</i>	-0.03 (0.01)	-0.02 (0.01)	-0.02 (0.01)	-0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)	0.00 (0.02)	-0.01 (0.03)	0.01 (0.02)
<i>infl</i>	0.01 (0.01)	0.01* (0.007)	0.01* (0.006)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	-0.05** (0.02)	-0.05** (0.02)	-0.04** (0.02)
Dummy Variables									
<i>d1</i>		-0.07 (0.08)			-0.02 (0.04)			0.20 (0.45)	
<i>d2</i>			-0.14 (0.11)			0.07 (0.06)			-0.5* (0.3)
<i>Intercept</i>	0.02 (0.06)	0.02 (0.06)	0.12 (0.11)	0.05 (0.03)	0.06 (0.03)	0.02 (0.04)	4.9*** (0.17)	5.02*** (0.1)	5.2*** (0.2)
<i>R-squared</i>	0.35	0.35	0.38	0.48	0.48	0.50	0.64	0.65	0.73

Note: We report the coefficients of regression and standard errors in parentheses (.). The levels of significance are indicated as * for 0.10 level, ** for 0.05 level and *** for 0.01 level.

We now present the results of the multivariate regression analysis for the crisis period in Table 17. On expected lines, non-performing loans are found to have a substantial negative impact on the performance of financial institutions. 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 these banks deteriorated substantially causing negative returns to these banking systems and resulted in the increasing losses during the crisis period. Allowing banks to own 100 per cent of the equity in any nonfinancial firm had a significant negative impact on the banking systems during the crisis period. It is interesting to find the positive impact of a foreign currency-denominated banking system's liabilities during the crisis period, evidencing the fact that most advanced banking systems failed during the crisis period and could find some solace only in their foreign banking activities, mostly in developing and emerging economies. The significance of the dummy variable for emerging economies and BRICS economics suggests that the banking supervision was different and effective than the advanced economies during the crisis period.

We present the results of the multivariate regression analysis for the post-crisis period in Table 18. We find that the significance of actual risk based capital indicates that, with an average of 12.91 percent, it had a positive impact on 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.⁷The significant positive relationship of assets held by the top five largest banks with all the three performance variables during the post crisis period confirms that these are vigorously recovering from the their worst performance experienced during the crisis period. 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. 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. Further, the model is negatively significant in the case of emerging economies.

⁷Too little capital increases the danger of bank failure while 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–post crisis period

The multivariate regression models employed in the analysis are:

$$atr = \alpha + \beta_1 arbcarr + \beta_2 atfb + \beta_3 npl + \beta_4 reest + \beta_5 ose + \beta_6 gpr + \beta_7 gdpgr + \beta_8 infl + \varepsilon \text{ --- (Eqn 3.3)}$$

$$nii = \alpha + \beta_1 arbcarr + \beta_2 atfb + \beta_3 npl + \beta_4 reest + \beta_5 ose + \beta_6 div + \beta_7 gdpgr + \beta_8 infl + \varepsilon \text{ --- (Eqn 4.3)}$$

$$dcf = \alpha + \beta_1 atfb + \beta_2 npl + \beta_3 ose + \beta_4 gpr + \beta_5 nff + \beta_6 pssa + \beta_7 spr + \beta_8 car + \beta_9 gdpgr + \beta_{10} infl + \varepsilon \text{ --- (Eqn 5.3)}$$

We run three regressions for each dependent variable (after-tax return – *atr*, non-interest income – *nii*, and domestic credit by financial sector - *dcfs*) using White heteroscedasticity-consistent standard errors and covariance. The first is the basic model without introducing any dummy. In the second, we introduce the dummy d_1 for BRICS, and in the third; we introduce the dummy d_2 for emerging economies.

	Dependent variable: <i>atr</i>			Dependent variable: <i>nii</i>			Dependent variable: <i>dcfs</i>		
	1	2	3	1	2	3	1	2	3
Regulatory/Supervisory variables									
<i>arbcarr</i>	0.39** (0.16)	0.39** (0.17)	0.39** (0.17)	0.46 (0.31)	0.49 (0.39)	0.40 (0.33)			
<i>atfb</i>	0.12*** (0.03)	0.12*** (0.03)	0.13*** (0.02)	0.29*** (0.10)	0.28** (0.12)	0.31*** (0.1)	1.45** (0.6)	1.31* (0.6)	0.69 (0.79)
<i>npl</i>	-0.46 (0.34)	-0.46 (0.35)	-0.49 (0.41)	0.12 (1.14)	0.07 (1.19)	-0.10 (1.12)	-8.79 (5.80)	-8.37 (5.9)	-6.59 (5.37)
<i>reest</i>	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.03)	-0.09** (0.03)	-0.09*** (0.03)	-0.1*** (0.03)			
<i>ose</i>	0.001* (0.001)	0.00 (0.00)	0.00* (0.001)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.03 (0.02)	0.02 (0.02)	0.04* (0.01)
<i>gpr</i>	0.1** (0.03)	0.10** (0.04)	0.10** (0.04)				-27.05 (20.3)	-22.04 (23.1)	-28.07 (15.6)
<i>div</i>				-0.1*** (0.04)	-0.13*** (0.04)	-0.1*** (0.04)			
<i>nff</i>							-0.26 (0.23)	-0.22 (0.2)	0.19 (0.32)
<i>pssa</i>							0.12 (0.39)	0.20 (0.44)	0.26 (0.38)
<i>spr</i>							-1.0*** (0.2)	-0.92** (0.3)	-0.8*** (0.2)
<i>car</i>							7.21 (4.70)	5.25 (5.60)	7.80 (4.88)
Control Variables									
<i>gdpgr</i>	0.01*** (0.002)	0.01*** (0.002)	0.01*** (0.003)	0.02** (0.008)	0.02*** (0.006)	0.02 (0.01)	0.00 (0.04)	-0.02 (0.05)	0.04 (0.04)
<i>infl</i>	0.001** (0.001)	0.001** (0.001)	0.001 (0.002)	-0.01** (0.004)	-0.01 (0.01)	-0.01** (0.005)	-0.1*** (0.03)	-0.1*** (0.03)	-0.06 (0.03)
Dummy Variables									
<i>d1</i>		0.00 (0.02)			0.02 (0.11)			0.30 (0.32)	
<i>d2</i>			0.01 (0.03)			0.05 (0.05)			-0.92 0.3**
<i>Intercept</i>	-0.07 (0.04)	-0.07 (0.04)	-0.07 (0.04)	0.20 (0.11)	0.20 (0.12)	0.21* (0.11)	4.87*** (0.3)	5.04*** (0.3)	5.14*** (0.5)
<i>R-squared</i>	0.81	0.81	0.81	0.73	0.73	0.74	0.78	0.79	0.84

Note: We report the coefficients of regression and standard errors in parenthesis (.). The levels of significance are indicated as * for 0.10 level, ** for 0.05 level and *** for 0.01 level.

To sum up, in terms of structural topography, 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 capitalisation of banks not only in the advanced countries of the crisis and non-crisis groups, but also in BRICS countries, which leads us 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. 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. 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.

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 the world experienced different styles of regulatory/supervisory styles in dealing with the crisis. 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 incentive for the private sector to monitor bank risk was weaker and, hence, could be strengthened to improve risk management. On the contrary, emerging

economies did fare better, partly because of structural reasons and partly because their policies worked in their favour. 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 crisis countries had weaker regulatory and supervisory frameworks compared to those in emerging countries during the crisis. As a distinct bloc, BRICS countries demonstrated uniqueness in their regulatory/supervisory styles—similar neither to crisis countries nor non-crisis countries. Their regulatory practices have evolved greatly 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. There are 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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Institute of Economic Growth
University Enclave, University of Delhi
Delhi 110007, India
Tel: 27667101/288/424; Fax : 27667410
Website : www.iegindia.org