Macroprudential regulation and bank performance:Does ownership matter?

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Abstract: Employing data on Indian banks for 1992-2012, the article examines the impact of macroprudential measures on bank performance. It finds that state-owned banks tend to have lower profitability and soundness than their private counterparts. Next, it tests whether such differentials between state-owned and private banks are driven by macroprudential measures; it finds strong support for this hypothesis.

1.   Introduction

In recent years, countries have put a lot on emphasis on financial sector reforms as a means to improve the overall functioning of the sector. Such reforms have encompassed a significant gamut of measures, including lowering of statutory reserve requirements, deregulation of interest rates, introduction of measures relating to income recognition, loan classification and provisioning, allowing more liberal entry of foreign banks and diversifying the ownership base of state-owned banks. The evidence emanating from empirical research is admittedly mixed. One set of studies find that financial deregulation leads to an increase in the resilience and performance of the banking sector (Boyd and De Nicolo, 2005; Das and Ghosh, 2006; Yeyati and Micco, 2007), while others find that the net effect of financial deregulation on the banking sector to be negative (Keeley, 1990; Grifell-Tatje and Lovell, 1996; Wheelock and Wilson, 1999).

The existing literature tends to look at each measure of prudential regulation measure in isolation, thereby ignoring the effect of these measures on bank performance. None of the studies take a holistic view on the joint effect of different policy dimensions of prudential regulation on bank performance. As Allen and Gale (2004) observe, since the aspects of performance, stability, efficiency and soundness of banks are inter-related, careful consideration of all important prudential measures is important for sound empirical analysis.

In this context, the paper investigates how various measures of macroprudential regulation affect the performance of the banking sector. More specifically, we consider the impact of three major policy dimensions of macroprudential regulation – capital adequacy ratio, provisioning norms and loan classification requirements - on the performance of the Indian banking system. We employ four indicators on which to assess the impact: return on asset (RoA) as the profitability measure, net interest margin (NIM) as the measure of economic efficiency, Z-score as the measure of bank stability and finally, advances growth (Gr_Adv) as a measure of bank business.

The paper combines several strands of literature. The first strand is the effect of macroprudential measures on bank performance. Second, the paper is related to the literature on the evolution of the Indian banking sector in the post-deregulation era and on the characterization of the state-owned banks in India (Banerjee *et al.,* 2004; Berger *et al*., 2008; Gormley, 2010; Cole, 2011). Finally, this study

belongs to the literature which investigates the within-country effects of changes in regulation (Shrieves and Dahl, 1992; Ediz *et al.*, 1998; Stolz, 2007) and to a wider literature which identifies the effects of regulations based on cross-country analysis (Murinde and Yaseen, 2006; Van Roy, 2008; Cosimano and Hakura, 2011).

The remainder of the paper continues as follows. We follow up with the literature, the data and methods, and thereafter, a discussion of the results. The final section concludes.

2.   Literature Review

A significant body of literature has examined the impact of deregulation on bank behavior. It is possible to broadly distinguish two strands of literature. The first is primarily theoretical in nature, while the second is more empirical in its scope.

The theoretical literature has focused on the interrelationship among financial deregulation, market power and risk-taking by banks. Hellmann *et al.* (2001) contend that capital requirements alone may not be enough to curtail bank risk and additional requirements could be useful to reduce risk in a competitive environment. Diamond and Rajan (2000, 2001) suggest that the optimal bank capital structure trades off liquidity creation and bank distress.

Empirical research into the above models report mixed findings. According to the first strand, the impact of financial deregulation is typically assessed either through a dummy variable (Salas and Saurina, 2003) or simply examining the behavior of banks during periods of financial deregulation (Das and Ghosh, 2006). The findings indicate that the impact of deregulation on bank behavior depends, among others, on the state of the banking system and differs significantly across bank ownership.

The second strand of the literature focuses on the impact of financial deregulation on bank performance. Cross-country studies (Maudos and Pastor, 2001) report improvements in performance, post-financial deregulation. However, given the inherent difficulties inherent in cross-country comparisons, studies have also been conducted at the country-level. At the country level, studies have examined, among others, the performance of banks in the US (Elyasiani and Mehdian, 1995; Wheelock and Wilson, 1999), Norway (Berg *et al*., 1992), Thailand (Leightner, 1997), Korea (Gilbert and Wilson, 1998) and Taiwan (Shyu, 1998).

These studies suffer from two major limitations. First, they focus on a catch-all measure, thereby ignoring the impact of specific policy dimensions of deregulation. Second, most studies examine the impact of financial deregulation on efficiency and productivity, neglecting other measures of bank performance, such as profitability and soundness. Partly as a response to these concerns, two sets of studies have emerged. The first examines the impact of specific regulatory reforms on various facets of bank performance. The second set examines the impact of financial deregulation on alternate measures of bank performance.

As regards the former, Kwan (2002) focused on the impact of interest rate financial deregulation in bank performance in Hong Kong. The study observed that interest rate deregulation led to significant decline in bank market values. Others have examined the impact of possible changes in prudential norms for loan classification on banks' credit portfolio (Das and Ghosh, 2007).

A second set of studies explore the impact of financial deregulation on alternate measures of bank performance. For instance, several studies investigate the determinants of bank profitability or net interest margins (Demirguc Kunt and Huizinga, 2000; Demirguc Kunt *et al.*, 2003; Maudos and Solis, 2009), bank stability indicators (Ianotta *et al.*, 2007; Beck *et al.*, 2009), These studies veer around the view that financial deregulation generally has a positive effect on performance.

The study which comes closest to the spirit of the present analysis is IMF (2012). Employing cross-national data on 36 countries for the period 2000-11, the analysis examined the impact of several macroprudential instruments on both financial and real variables.[1] The results appear to suggest statistically significant effects for both capital requirements and reserve requirements on credit growth. In terms of real variables, the results point to the fact that limits on LTV ratio exerts a non-negligible impact on output growth.

Although there are certain similarities between that study and the present one, there are also important differences. First, unlike the IMF (2013) study, the present article focuses on a single country. This enables us to bypass issues of data comparability that often plagues cross-country studies (Honohan, 2008). Second, the comparison of institutional and political characteristics across countries can be rendered difficult due to the diversity in their historical experiences, cultural norms and institutional contexts. Focusing on a single country enables to bypass the limitations of cross-country studies (Rodrik, 2005). Third, the set of macroprudential instruments considered across the two sets of studies is significantly different. And finally, we explore the differential impact of macroprudential variables across bank ownership, an aspect not addressed by IMF (2013). This paper seeks to fill the gap in the literature and to shed further light on the evidence in the context of various measures of macroprudential regulation and banking in India during 1992–2012.

3.   The database and sample

Bank-wise data on commercial banks spanning the period 1992 through 2012 are culled out from the various issues of *Statistical Tables Relating to Banks in India*. This publication by the Indian central bank provides the annual audited data on the balance sheet and profit and loss accounts of individual banks. The financial year for banks runs from the first day of April of a particular year to the last day of March of the subsequent year. Accordingly, the year 1992 corresponds to the period 1991–92 (April–March) and so on, for the other years. The data has the advantage of being perfectly comparable across banks,

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1 The macroprudential instruments considered were capital requirements, limits on LTV, cap on debt-to-income and reserve requirements.

with the central bank acting as the regulator of the financial system requires the financial entities to present their balance sheets in the same format and criteria.

The sample comprises of all state-owned banks (SOBs), which account for around 75% of total banking assets, 20 domestic private banks (DPBs), including 5 *de novo* private banks (which became operational after the initiation of reforms), which account for around 15% of banking assets and 16 foreign banks (FBs), accounting for roughly 7% of total banking assets. The excluded private and foreign banks are those which have become operational only recently and therefore lack a consistent time series of relevant variables. The *de novo* private banks became operational only since 1996. As a result, the number of reporting banks witnessed a sharp increase thereafter. Subsequently, the banking industry also witnessed some consolidation, both domestic and internationally. We also include a dummy variable for take this aspect on board. As a result, we have an unbalanced panel, with a minimum of 58 banks at the beginning of the sample to a maximum of 64 banks. Finally, the macroeconomic variables are obtained from the *Handbook of Statistics on Indian Economy*.

4.   Results and Discussion

4.1   Univariate tests

Table 1 reports comparisons of various measures of performance, as indicated earlier. The results indicate a clear divergence across ownership. These differences in most cases appear to be economically important, as well. For example, the average NIM for FBs is 3.4%, which is significantly higher as compared to SOBs and DPBs. Return on asset displays the greatest variation, especially for SOBs. Their average RoA is 0.6%, which is around 50% lower than that obtaining for DPBs and roughly half as compared to FBs. All these differences are statistically significant at the 0.01 level.

The results on Z-score and credit growth[2] are no less striking.[3] FBs have statistically significant lower Z-score as well as credit growth as compared to other bank groups. To illustrate, credit growth for FBs is roughly 9%, which is significantly lower as compared to 14.3% growth obtaining for DPBs. Overall, the results in table 3 appear to suggest that FBs have the highest margins and profitability, although their stability and credit growth are the lowest across ownership.

Table 1: Univariate tests: Differences in performance across bank ownership

Variable	RoA	NIM	ln (1+Z)	Gr_Adv	Banks
SOB	0.006 (0.017)	0.031 (0.036)	1.462 (0.511)	0.105 (0.199)	28
DPB	0.009 (0.007)	0.027 (0.008)	1.529 (0.453)	0.143 (0.178)	19
FB	0.012 (0.028)	0.034 (0.017)	1.259 (0.451)	0.084 (0.203)	17
t-test of difference					
SOB vs. DPB	-3.634***	3.157***	-2.092**	-2.991***	
SOB vs. FB	3.637***	-2.190**	6.345***	2.532***	
DPB vs. FB	-2.057**	-7.384***	-8.004***	4.076***	

Standard deviation within brackets
***, ** and * denote statistical significance at the 1,5 and 10% level, respectively

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[2] To moderate the influence of outliers, the credit growth variable is calculated as in Dinc (2005).
[3] Consistent with the literature, risk taking is measured by the Z-score, which is a proxy for insolvency risk (Boyd and Runkle, 1993; Laeven and Levine, 2009). A higher Z-score indicates that the bank is more stable. Because the Z-score is highly skewed, we employ the natural logarithm of the Z-score, which is normally distributed (Laeven and Levine, 2009).

4.2 Multivariate regression

We control for unaccounted factors in a multivariate regression framework. Akin to Demirguc Kunt and Huizinga (2000) and Martinez Peria and Mody (2004) and Micco *et al.* (2007), measures of performance are regressed on a set of controls (**X**) included with a lag to account for endogeneity. The regression specification for bank *s* at time *t* is specified according as:

$$Perf_{s,t} = \eta_t + X_{s,t-1}\gamma' + \alpha_2\, OD_{s,t} + \alpha_3[dy\_merger]_{s,t} + \upsilon_{s,t} \tag{1}$$

In (1), *Perf* is the performance measure, which is regressed on a set of lagged bank-level controls (X) and η_t are year fixed effects. All expressions control for the impact of mergers (dy_merger). We run the regressions with and without the ownership dummy (OD) to ascertain its impact on bank performance. Finally, *v* is the error term.

We estimate the impact of explanatory variables on performance by fixed effects panel regressions. Throughout, inference is based on standard errors that are clustered at the bank level.

The bank-specific variables include (log of) total assets (LTA), bank-wise asset share (SHTA) in a given year, demand deposits (DDEP) and fee income (NINT). Following Berger *et al.* (2005), we include both LTA and SHTA. Among the other variables, DDEP takes into account for banks' funding structure (SOBs tend to rely more on retail deposits as compared to other bank groups) whereas NINT accounts for banks' income diversification (foreign banks tend to rely more on non-interest income).

4.3 Results and Discussion

In Table 2, across the first two sets of specifications, the coefficient on demand deposits is significant and positive, suggesting that banks with greater retail dependence have higher profitability and margins. In the baseline specification, it is observed that a 10% increase in retail dependence improves RoA by nearly 0.3 percentage points. One reason for this could be the low (or, negligible) cost of such deposits, which enables banks to earn higher margins and profitability on such funds. Banks with higher fee incomes are able to generate higher profitability, as expected.

Bigger banks appear to exhibit greater stability. These findings are consistent with Beck *et al.* (2009) who find that bank size exerts a positive impact on stability. Credit growth is slower for big banks, suggestive of the fact that smaller banks increase credit at a faster pace to gain market share.

When we include bank ownership, it is observed that as compared to DPBs, FBs have lower credit growth and stability. The effect is quantitatively important, indicating that the average foreign bank has a credit growth that is 0.08% points lower as compared to an average domestic private bank. Considering that the average credit growth in the sample is 11%, this is a sizeable difference.

Table 2. Relative performance of banks

Variables	RoA		NIM		Ln (1+Z)		Gr_Adv	
Intercept	0.014	0.009	0.007	0.014	1.029	1.240	0.191	0.245
	(0.010)	(0.011)	(0.015)	(0.013)	(0.269)***	(0.258)***	(0.110)*	(0.176)
LTA	-0.002	-0.001	0.003	0.001	0.059	0.056	-0.014	-0.038
	(0.001)*	(0.001)	(0.002)	(0.001)	(0.035)*	(0.034)*	(0.008)*	(0.018)**
SHTA	0.019	0.019	-0.005	-0.006	0.557	0.799	-0.136	-0.025
	(0.018)	(0.018)	(0.043)	(0.044)	(0.368)	(0.327)***	(0.183)	(0.195)
DDEP	0.033	0.031	0.021	0.025	0.740	0.774	0.074	0.120
	(0.010)***	(0.009)***	(0.022)	(0.020)	(0.467)	(0.461)*	(0.171)	(0.197)
NINT	0.241	0.239	0.452	0.442	-0.344	-0.201	-0.125	-0.405
	(0.113)**	(0.118)**	(0.180)***	(0.190)**	(0.268)	(0.154)	(0.445)	(0.303)
d_merger	0.003	0.003	0.006	0.006	0.011	0.020	0.034	0.028
	(0.001)**	(0.001)**	(0.008)	(0.008)	(0.096)	(0.095)	(0.047)	(0.044)
SOB		-0.002		0.001		-0.103		0.070
		(0.001)*		(0.004)		(0.060)*		(0.052)
FB		-0.0007		-0.007		-0.220		-0.078
		(0.002)		(0.002)		(0.061)***		(0.023)***
Time fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Period	1992-2012	1992-2012	1992-2012	1992-2012	1992-2012	1992-2012	1992-2012	1992-2012
N.Obs; Banks	1291; 64	1291; 64	1291; 64	1291; 64	1291; 64	1280; 64	1243; 64	1243; 64
R-squared	0.1527	0.1539	0.1736	0.1765	0.2283	0.2532	0.0364	0.0559

Note: Standard errors (clustered by bank) are within brackets

***, ** and * denote statistical significance at the 1,5 and 10% level, respectively

4.4 The role of macroprudential regulation

The previous discussion indicates that FBs display lower stability and exhibit lower credit growth as compared to DPBs. The analysis does not highlight how specific macroprudential measures impact bank performance. To investigate this further, we check whether macroprudential regulation affects the relationship between ownership and performance by estimating equations of the following form:

$$Perf_{s,t} = \eta_t + SOB_{s,t}\,(\alpha_1 + \alpha_2\,GDPGR_t + \alpha_3\,PRU_t) +$$
$$FB_{s,t}\,(\beta_1 + \beta_2\,GDPGR_t) + X_{s,t-1}\gamma' + \upsilon_{s,t}$$

(2)

In (2), GDPGR measures the real GDP growth in year t, and PRU (PRU=CRAR, LOAN, PROV) is the particular macroprudential measure; the remaining variables are as defined in Eq. (1).

Our main coefficient of interest is α_3. The coefficient measures the impact of implementation of a given macroprudential measure on state-owned banks (the main effect of macroprudential norms is controlled through year effects). We control for the interaction between ownership and GDP growth, because state-owned and foreign banks might respond differently to the business cycle as compared to domestic private banks. This would not be a problem if the business cycles were uncorrelated with the prudential measures, although such a correlation cannot be ruled out (Micco *et al.*, 2007).

Table 3 reports the results for return on asset, interest margins, soundness and credit growth. Take for instance, Column 1. The results suggest that, as compared with DPBs, SOBs have higher profitability during periods of economic expansion although their profitability is reduced after imposition of capital adequacy norms. The impact of the macroprudential measure is economically meaningful, as well. To see this, consider the differential in profitability of the average SOB and the average DPB in a year in which real GDP grew by 6.7%, the average growth rate in the sample. Ignoring the impact of the

tightening of capital standards, the differential is equals to 0.011% points [=-0.019+0.067*(0.125)]. Taking on board the impact of capital adequacy norms, the point estimates of Col. 1 yield a difference of 0.023% points [=-0.019+0.067*(0.125)-0.012], an increase of over 100% with respect to the no-capital imposition benchmark. In a similar fashion, in case of both loan classification and provisioning practices (Cols. 2 and 3), the difference in profitability works out to be 85% and 62%, respectively.

Table 3. Regression result: Analysis of bank performance

	Dep variable = RoA			Dep variable = NIM		
	(1)	(2)	(3)	(4)	(5)	(6)
SOB	-0.019	-0.011	-0.017	-0.010	-0.011	-0.009
	(0.004)***	(0.001)***	(0.003)***	(0.002)***	(0.003)***	(0.001)***
FB	-0.005	-0.004	-0.004	0.013	0.014	0.014
	(0.007)	(0.007)	(0.007)	(0.005)***	(0.005)***	(0.005)***
SOB* GDPGR	0.125	0.129	0.134	0.110	0.136	0.117
	(0.024)***	(0.031)***	(0.023)***	(0.053)**	(0.072)*	(0.052)**
FB*GDPGR	0.064	0.063	0.063	-0.179	-0.181	-0.180
	(0.089)	(0.089)	(0.090)	(0.074)***	(0.074)***	(0.074)***
SOB*CRAR	-0.012			-0.012		
	(0.002)***			(0.002)***		
SOB*PROV		-0.002			-0.005	
		(0.001)**			(0.002)**	
SOB*LOAN			-0.005			-0.006
			(0.001)***			(0.002)***
Period	1992-2012	1992-2012	1992-2012	1992-2012	1992-2012	1992-2012
N.Obs; Banks	1291; 64	1291; 64	1291; 64	1291; 64	1291; 64	1291; 64
R^2	0.1662	0.1585	0.1614	0.1899	0.1854	0.1876
	Dep variable = Ln (1+Z)			Dep variable = Gr_Advances		
	(7)	(8)	(9)	(10)	(11)	(12)
SOB	-0.141	-0.117	-0.124	-0.059	-0.061	-0.057
	(0.055)***	(0.059)*	(0.056)**	(0.025)**	(0.026)**	(0.029)*
FB	-0.401	-0.403	-0.407	-0.077	-0.076	-0.076
	(0.129)***	(0.129)***	(0.129)***	(0.058)	(0.059)	(0.059)
SOB* GDPGR	-2.226	-3.911	-2.639	0.841	0.856	1.072
	(1.109)**	(1.524)***	(1.537)*	(0.453)*	(0.659)	(0.683)
FB* GDPGR	2.797	2.827	2.868	-0.032	-0.035	-0.039
	(1.802)	(1.803)	(1.805)	(0.889)	(0.892)	(0.891)
SOB*CRAR	0.216			-0.004		
	(0.048)***			(0.002)**		
SOB*PROV		0.212			0.016	
		(0.045)***			(0.018)	
SOB*LOAN			-0.236			0.011
			(0.059)***			(0.022)
Period	1992-2012	1992-2012	1992-2012	1992-2012	1992-2012	1992-2012
N.Obs; Banks	1280; 64	1280; 64	1280; 64	1243; 64	1243; 64	1243; 64
R^2	0.2597	0.2687	0.2701	0.0604	0.0582	0.0580

Note: Standard errors (clustered by bank) are within brackets
***, ** and * denote statistical significance at the 1,5 and 10% level, respectively

Similar results are echoed when we focus on interest margins. More specifically, the evidence indicates that interest margins of SOBs tend to be higher during periods of economic expansion and lower after imposition of macroprudential norms. Again, the coefficient on the macroprudential dummy is quite large and indicates that the differential between the interest margin of state-owned and private banks more than quadruples after imposition of capital adequacy norms (assuming 6.7% GDP growth, the two values are -0.003 and -0.015). Similar, although of slightly lower order of magnitude, are in evidence

when the provisioning and loan classification norms are considered. This provides evidence that the macroprudential channel is at work: the decline in profitability is driven to an extent by the lower margins.

Cols.(7) to (9) focus on bank soundness. The evidence indicates that the soundness of SOBs declines during periods of economic growth, although macroprudential norms exert a salutary impact. More specifically, capital adequacy and provisioning norms improve soundness, whereas loan classification norms lower it. The magnitude of the macroprudential effect in all cases is extremely large. In case of provisioning norms for example, the point estimates indicate that the differential between the soundness of SOBs and DPBs halves after imposition of such norms (with 6.7% GDP growth, the two values are -0.38 and -0.17).

[Table 7 here]

The final three columns focus on credit growth. In particular, we find that SOBs increase their loan growth after imposition of capital norms. In Col.10 for example, the differential between credit growth of SOBs and DPBs works out to be over 100% (the two values are equal to -0.003 and -0.007 respectively, assuming 6.7% GDP growth).

In other words, the evidence indicates that the state-owned banks are less profitable than private banks and the difference in performance is accentuated after imposition of macroprudential norms.

5.   Summary and conclusions

Financial sector reforms in India, undertaken as part of the overall process of reforms since the early 1990s, were aimed at improving the efficiency and productivity of the financial sector. While there have been several studies on bank performance, these papers do not pay adequate attention to the important policy dimensions of prudential deregulation and their impact on bank performance.

In this context, the present study employs panel data techniques to examine the impact of three important macroprudential measures - capital adequacy norms, provisioning requirements and tightening of loan classification norms - on the performance of Indian banks since the 1990. We focus on four major firm characteristics: profitability, margins, soundness and credit growth. The analysis indicates that the state-owned banks are less profitable than private banks and the difference in performance is accentuated after imposition of macroprudential norms. These results are quite robust. It is apparent in simple univariate comparisons as well as in multivariate regressions that takes on board several control variables.

Summing up, the balance of evidence indicates that different measures of macroprudential regulation exert differential impact on banks across ownership. It, therefore, appears important for policymakers to take a holistic view of all prudential measures and their potential impact on the banking system in order to avoid possible pitfalls.

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