



# IMF Working Paper

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## Bank Ownership and the Effects of Financial Liberalization: Evidence from India

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**IMF Working Paper**

Asia and Pacific Department

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**Abstract**

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Do financial sector reforms necessarily result in expansion of credit to the private sector? How does bank ownership affect the availability of credit to the private sector? Empirical evidence is somewhat mixed on these issues. We use the Indian experience with liberalization of the financial sector to inform this debate. Using bank-level data from 1991-2007, we ask whether public and private banks deployed resources freed up by reduced state preemption to increase credit to the private sector. We find that even after liberalization, public banks allocated a larger share of their assets to government securities than did private banks. Crucially, we also find that public banks were more responsive in allocating relatively more resources to finance the fiscal deficit even during periods when state pre-emption (measured in terms of the requirement to hold government securities as a share of assets) formally declined. These findings suggest that in developing countries, where alternative channels of financing may be limited, government ownership of banks, combined with high fiscal deficits, may limit the gains from financial liberalization.

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## I. INTRODUCTION

Do financial sector reforms necessarily result in expansion of credit to the private sector, and how does bank ownership affect this relationship? Empirical evidence is somewhat mixed on these issues. This paper uses the Indian experience with liberalization of the financial sector to inform this debate. As a part of its overall program of economic liberalization, India initiated significant financial sector reforms in the mid-1990s. These included easing the entry of new private and foreign banks, liberalizing interest rate controls, enhancing the role of market forces, and reducing state pre-emption of bank credit through reductions in reserve and statutory liquidity requirements, which together stood at over 50 percent of assets in 1992. However, despite these measures, the basic ownership structure of the existing banks remained broadly similar even many years after liberalization had first started. Although there has been a significant increase in the share of private and foreign banks in total assets, the Indian banking system has remained predominantly state-owned. Meanwhile, the fiscal deficit and the level of government debt have remained high, with the combined fiscal deficit of the federal and state governments averaging nearly 7.8 percent of GDP between 1992 and 2007, and public debt totaling about 80 percent of GDP in 2007.<sup>2</sup>

As documented in other studies, there have been some remarkable benefits of financial liberalization in India, most noticeably manifested in increased competition and improved efficiency.<sup>3</sup> Starting from a lower base, public banks have significantly improved their operational efficiency and profitability, as a result of which, the performance of public and private banks has converged for many indicators of efficiency and profitability. However, the impact of liberalization on increasing the availability of credit to the private sector has been less impressive. Using bank-level data from 1991-2007, we ask in this paper whether banks deployed resources freed up by reduced state-preemption to increase credit to the private sector. We find that banks did not increase credit to the private sector commensurate with the decline in the statutory requirements to hold government securities that accompanied liberalization. We also find that the public banks behaved in a markedly different fashion than their private counterparts in redeploying resources that became available as a result of reduced state preemption. Specifically, public banks appear to voluntarily allocate relatively more resources to finance the fiscal deficit.<sup>4</sup> Thus, ownership in itself appears to be a determinant of the effective crowding out of private sector credit at the bank level.

This willingness of the public sector banks to hold public debt over and above the private banks does not appear to be due to the objective to maximize profits or to lower the risk

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<sup>2</sup> The gross combined fiscal deficit of federal and state governments declined steadily between 2002 and 2007, from nearly 10 percent in 2002 to about 5 ½ percent in 2007.

<sup>3</sup> See e.g. Koeva (2003).

<sup>4</sup> Unless otherwise indicated, a bank is considered public if it is majority public owned.

profile of their assets, or indeed due to the lower demand for credit by the private sector. The explanations for this behavior that are consistent with the evidence include: (i) the incentive structure that the public banks face, in which greater credit expansion or higher profit making is not rewarded but a loan decision that turns bad can be punished, or (ii) moral suasion through which the public banks are perhaps coaxed to hold government securities when the deficit is high.

This paper is related to three strands of literature. The first strand is the literature on the effects of financial liberalization on financial deepening, e.g. a recent paper by Tressel and Detragiache (2008). It uses data for 90 some countries over the period 1973-2005 to see if financial reforms resulted in financial deepening, defined as an increase in bank credit to the private sector as percent of bank assets. They find that the evidence is very context-dependent, differing over the long run and shorter horizons, for developing and developed countries, and across countries with different political institutions. Overall, they find that the effect is positive for developing countries in the short run, and is stronger for countries that have political institutions that offer stronger protection of property rights. Our results suggest that the effect of financial liberalization on the availability of credit to the private sector may also depend on the state ownership of banks and the size of the fiscal deficit.

Several paper, including Galindo et al (2007) and Chari and Henry (2008), analyze the allocation of credit across firms using country case studies and find that financial liberalization improves the allocation of investment across firms. However, as these papers are not concerned with the issue of the allocation of bank credit between the private and government sectors, their focus is rather different from ours.

The second strand is the literature on the role of government-owned banks in the financial sector. Influential papers from this strand of literature include La Porta, Lopez-de-Silanes and Shleifer (2002) and the papers by Hauner (2008, 2009). La Porta et al (2002) discusses the two broad views about government participation in financial markets. One view, called the “development” view, holds that in economies with underdeveloped institutions, private entities could not be relied on to raise adequate amounts of capital or to allocate it efficiently for industrialization and growth. Under such circumstances, it is imperative for the government to set up and control banks to achieve these objectives in a direct manner. The alternate view, called the “political” view, considers that the state ownership of banks politicizes resource allocation and because of agency problems and soft budget constraints, lowers economic efficiency. Using cross-country data, La Porta et al find higher government ownership of banks to be associated with slower subsequent development of the financial system, lower economic growth, and in particular lower growth of productivity, and conclude that the political view is closer to the mark.

Hauner (2008, 2009) examines the effects of public debt on financial development and contrasts between a safe asset view and a lazy bank view. By providing relatively safe assets to the banks, public debt lends safety to their portfolios. But at the same time, they may

impart laziness by making the banks in developing countries unwilling to lend to the other sectors which operate in a relatively more difficult environment.

Our results support the main findings of La Porta et. al. and Hauner by suggesting that government ownership and the size of the fiscal deficit may, together, also limit the impact of financial liberalization on financial development.

Our paper also relates to the literature on the evolution of the Indian banking sector post liberalization and on the characterization of the public sector banks in India, e.g. Banerjee, Cole and Duflo (2004) and Cole (2004). Banerjee et al (2004) shows that Indian firms are credit constrained, and characterize the Indian public banks as “lazy”, in the sense that they do not lend adequately to the private sector and the lending decisions of their managers are based primarily on past turnovers and outlays of the borrowers rather than their current or expected profitability. This “lazy” behavior on the part of the bankers is also reflected in their preference to overinvest in government securities, especially in the states where, for various institutional reasons, it might be particularly difficult and costly to scrutinize the private sector applications for credit.<sup>5</sup> Our paper adds to these findings by focusing on changes in the specific regulations pertaining to asset allocation, and comparing the response of public and private banks to these changes.

The rest of the paper is organized as follows. Section II discusses the evolution of the banking sector and specific changes to the policy framework governing the Indian banking sector after reforms were initiated in 1991. Section III discusses the effects of liberalization on the efficiency and profitability of banks. Section IV presents the econometric analysis, Section V explains the findings, and the last section concludes.

## **II. FINANCIAL SECTOR LIBERALIZATION AND BANK OWNERSHIP IN INDIA**

At the time of independence in 1947, the Indian banking sector consisted of domestic private and foreign banks. The public ownership of banks was introduced and increased in three major initiatives after independence. The first major step in the move toward greater public ownership of banks occurred in 1955, when the Imperial Bank of India was taken over by the government and renamed the State Bank of India. In 1959 the State Bank of India took over seven banks as its subsidiaries. At this point, the banking landscape was characterized by 8 public sector banks (the State Bank of India and its 7 subsidiaries), 53 private sector banks and 15 foreign banks. The second phase of nationalization occurred in 1969 when fourteen of the largest private banks in India, each with deposits greater than Rs. 50 crores (or Rs. 500 million) were nationalized. The stated reasons for this action were to ensure that financial resources were not controlled by a few people; to achieve regional balance in financial

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<sup>5</sup> They proxy the lending environment in the state by the economic growth and consider the lending environment to be tough when growth is slow.

development; and to provide adequate credit allocation to agriculture and other priority sectors such as small scale industries and exports. A third wave of nationalization occurred in 1980 when 6 more banks, with deposits above Rs. 2 billion, were nationalized. As a result, by 1982, the private and foreign banks accounted for less than 10 percent of the assets of the banking sector.

An important rationale for the Indian bank nationalization was to direct credit towards the sectors the government thought were underserved, including small scale industry, agriculture and the backward areas. Keeping with this broad objective, the Reserve Bank of India issued guidelines in 1974 indicating that both public and private sector banks must provide at least one-third of their aggregate advances to the priority sector. In 1980 this quota was increased to 40 percent and sub-targets were specified for lending to agriculture and weaker sectors within the priority sector.

On the whole, the Indian banking sector was heavily regulated until the early 1990s. The regulations pertained to asset allocation, interest rate ceilings, entry barriers etc. Two main regulations governing the allocation of assets of Indian banks have been the Cash Reserve Requirements (CRR) requiring the banks to hold cash and other liquid assets, and the Statutory Liquidity requirements (SLR), which requires them to hold safe, liquid assets, mostly government securities. The CRR is prescribed as a percentage of a bank's net demand and time liabilities and has varied between 5 and 15 percent since 1990. Under the SLR, the scheduled commercial banks are required to maintain an amount between 25 to 40 percent of their demand and time liabilities in cash, gold, or in unencumbered approved government securities. The ratio has varied between 25 percent and 38.5 percent since 1990.

Overall these restrictions on the use of banking assets, along with restrictions on interest rates, resulted in severe financial repression of the economy, and set the stage for the financial reforms that were initiated starting in 1991. While discussing these reforms in detail is beyond the scope of this paper, we discuss a few key changes which relate to the exercise in this paper.<sup>6</sup>

### **A. Financial Liberalization in India**

The liberalization effort that began in the early 1990s was sweeping in scope and touched most financial markets (see Mohan (2004)). Banking reforms included the removal of controls on interest rates, reductions in reserve and liquidity ratios, entry deregulation,

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<sup>6</sup> For an excellent discussion and details on these regulations and reforms see Panagariya (2008), Chapter 11.

relaxation of credit controls, and the introduction of an inter-bank money market as well as auction-based repos and reverse repos (see Appendix A for details).<sup>7</sup>

Using the data on financial reforms put together by Abiad, Detragiache and Tressel (2010) one can track the pace of financial liberalization in India and compare it with the average for emerging Asia and the World. Abiad et al, using the data for 91 economies in 1973–2005, record financial policy changes along the following seven dimensions: credit controls and reserve requirements, interest rate controls, entry barriers and state ownership, policies on securities markets, banking regulations, and restrictions on capital account, and aggregate these in a composite index of financial liberalization for each country, which is normalized between zero and one.<sup>8</sup>

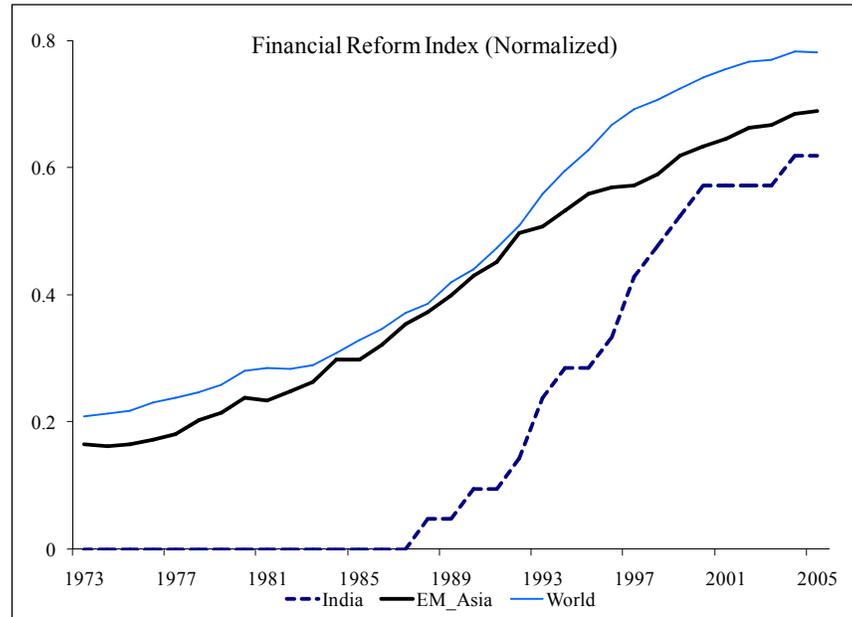
Using this index in Chart 1 we see that, as compared with emerging Asian economies or other countries in the Abiad et al sample, the Indian financial sector was quite repressed until the late 1980s. Liberalization in India gathered pace in the early to mid 1990s and the catch up has been very fast since then, to the extent that by the late 1990s the gap between India and the average of all countries, and in particular emerging Asia, had narrowed substantially.<sup>9</sup>

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<sup>7</sup> Significant reforms were also enacted in the government securities market (introduction of primary dealers, delivery versus payment settlement, floating rate bonds, interest rate derivatives etc); and the foreign exchange market (convertibility for current account transactions, gradual opening up of capital account, currency swap market, foreign currency accounts). Other reforms tackled important aspects of the stock market, insurance sector, and non-bank financial entities.

<sup>8</sup> It provides a raw score for each of the seven components of the liberalization index and their sub components, and then normalizes the score for each component--a score of 3 is assigned if the sector is considered to be fully liberalized, 2 if it is considered to be largely liberalized, 1 if it is partially repressed, and 0 if it is considered to be fully repressed. Finally, the liberalization scores for each category are combined in a graded index that is normalized between zero and one for each country.

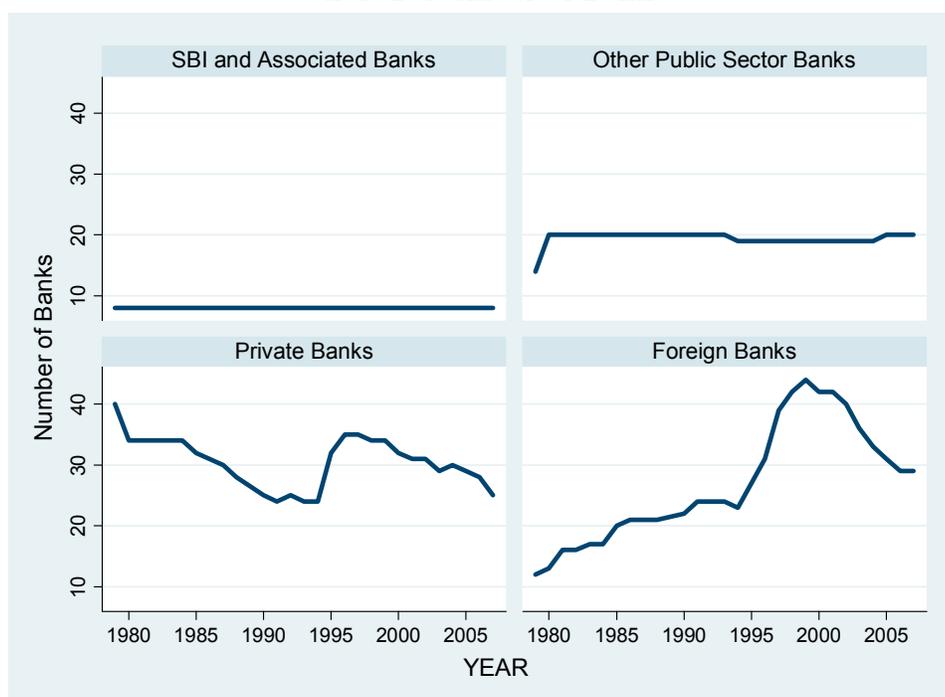
<sup>9</sup> We extend the index for India through 2007 by assuming that the values of the index in 2006 and 2007 are at the same level as in 2005.

**Chart 1: Financial Liberalization in India**

Source: Constructed using the data from Abiad, Detragiache, and Tressel (2008)

### **B. Ownership Structure in the Indian Banking Sector**

During the liberalization period a more liberal entry of private and foreign banks was allowed, as a result of which the total number of banks in the industry increased and the ownership structure of the Indian banking sector changed somewhat in the first few years post liberalization. As shown in Chart 2, due to the entry of new banks, the number of private sector banks first increased in the mid-1990s, but since then the number has declined due to mergers or closures. The number of foreign banks increased steadily through the 1980s, and mid 1990s, and then declined. The total number of banks peaked at 105 in the mid-1990s but by 2007 the number had declined to 82, which was only marginally higher than their number in the early 1990s when liberalization had started.

**Chart 2: Number of Banks**

Source: The data used is from the RBI's database "*Statistical Tables Relating to Banks in India*" and "*Basic Statistical Returns*".

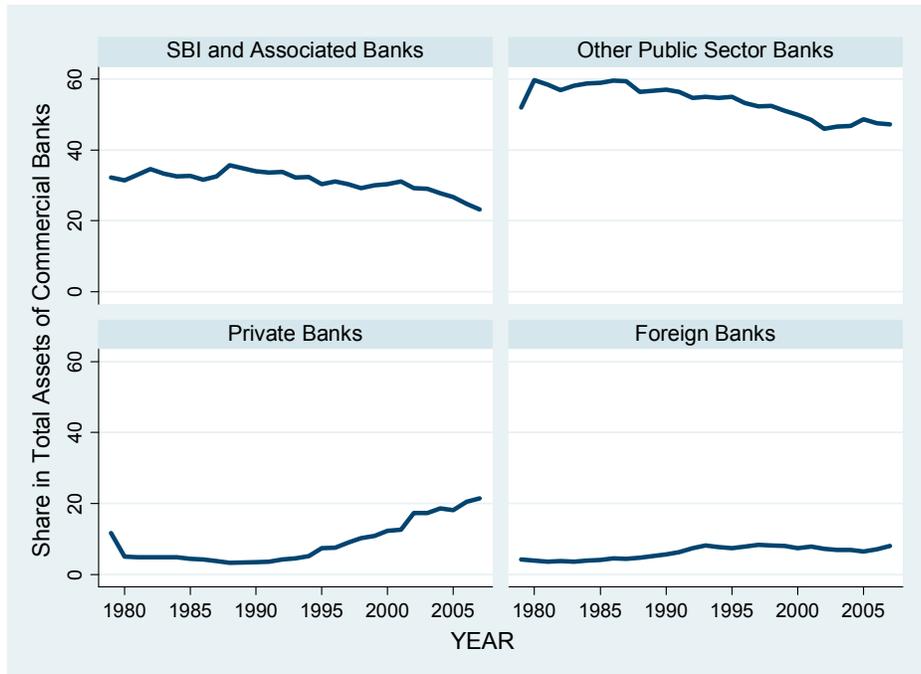
**Table 1: Number of Banks and the Share of Banks in Total Assets in 2007, by Ownership Groups**

Bank Type	No of Banks	Share in Assets (%)
State Bank of India and its 7 associates banks <sup>10</sup>	8	23.3
Other Public Sector Banks	20	47.2
Private Banks	25	21.5
Foreign Banks	29	8.0

<sup>10</sup> The State Bank of India (SBI) is the largest and oldest Indian bank which was nationalized in 1955. Seven other banks with similar names and logo, constituted the SBI group until 2007. Since then in 2008, Bank of Saurashtra was merged with the SBI and in 2010 the State Banks of Indore was merged with the SBI. There are now five associated banks besides the SBI in the groups.

Despite the fact that their number did not increase much over this period, private banks' share of total banking sector assets increased steadily from 3.5 percent in 1991 to about 21 percent in 2007, as documented in Chart 3 and Table 1. This increase in market share was gained at the expense of both the SBI and its associated banks and other public banks. Nevertheless, in comparison to many other countries, the Indian banking sector remains predominantly under government ownership to this day, with nearly 70 percent of assets of the banking sector belonging to state owned banks.<sup>11</sup>

**Chart 3: Share of Banks Under Different Ownership Groups in Banking Assets**



Source: Data used is from the RBI's database "*Statistical Tables Relating to Banks in India*" and "*Basic Statistical Returns*".

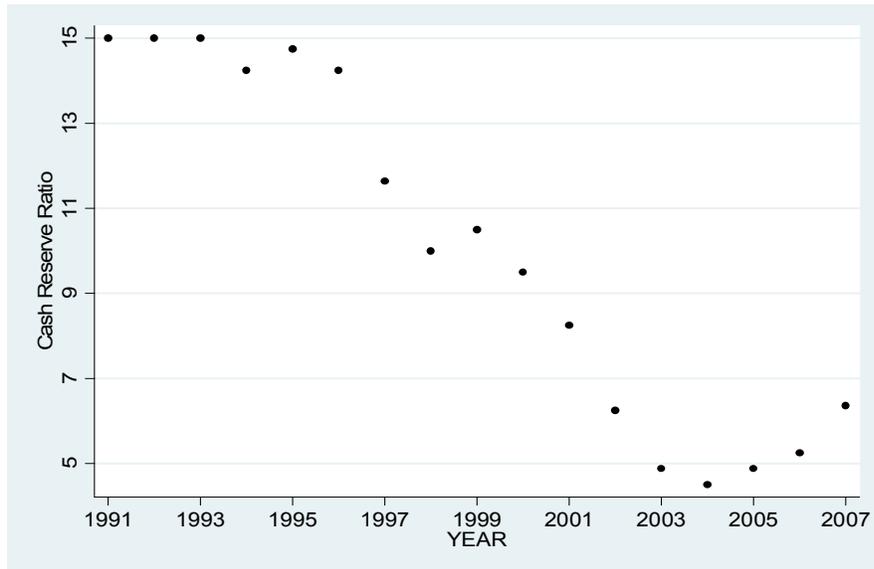
### C. Statutory Requirements on Cash and Liquidity and Allocation of Credit

A main component of the financial liberalization program in India has been a reduction in the statutory limits on the share of banks' assets that they are required to hold in cash and liquid instruments and in government securities through the CRR and SLR regulations. As documented in Appendix A, and shown in Charts 4 and 5 below, the CRR was brought down from its peak of 15 percent in the early 1990s to about 5 percent as liberalization progressed. Commensurate with this decline, public and private banks reduced their actual cash holdings as a percent of assets. The SLR was reduced as well, with the main reductions coming

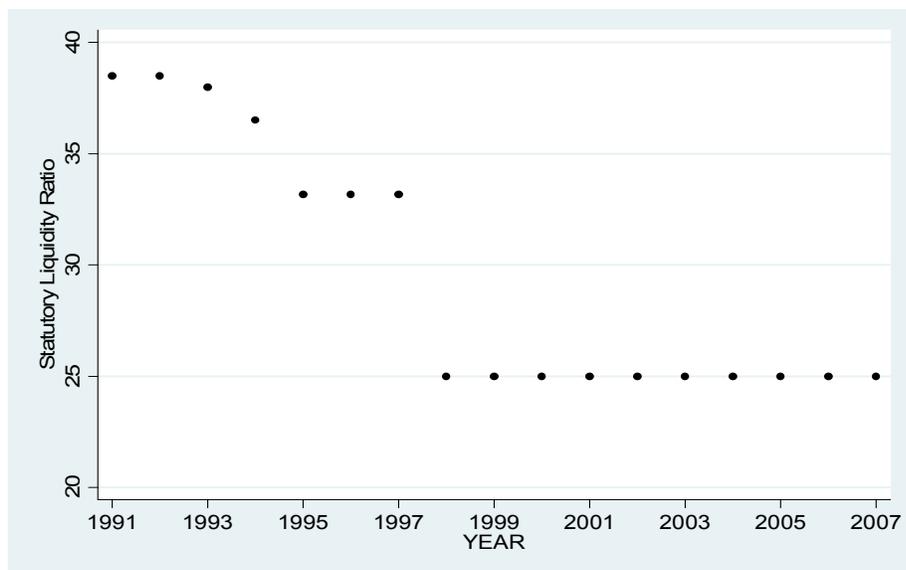
<sup>11</sup> Foreign banks are, unsurprisingly, much smaller than the domestic banks since they face strict restrictions on branch expansion.

between 1992 and 1998 when it was progressively reduced from 38.5 percent to 25 percent, at which level it remained until November 2008, when it was lowered to 24 percent in the wake of the recent global financial crisis, and increased back to 25 percent in November 2009.

**Chart 4: Cash Reserve Requirement**



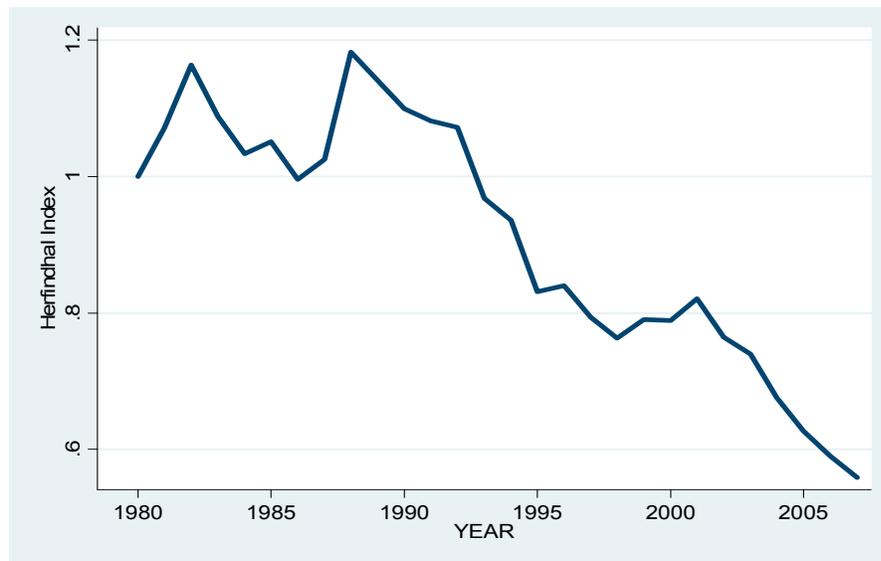
**Chart 5: Statutory Liquidity Requirement**



### III. COMPETITION AND EFFICIENCY INDICATORS POST LIBERALIZATION

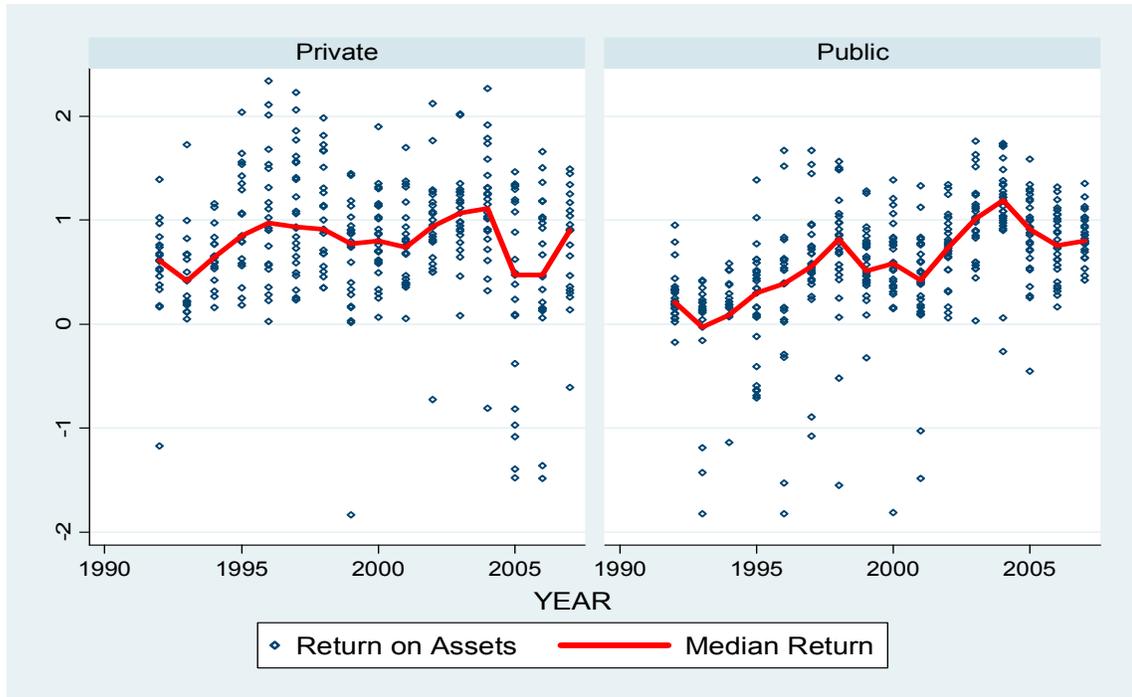
There have been far reaching impacts of these liberalization measures, especially on competition, and on the profitability and efficiency of banks, some of which we discuss briefly here. Due to the entry of new banks, and an increase in the share of private banks, the degree of concentration has declined in the banking sector. In Chart 6 below, we present the Herfindhal Index based on the shares in assets for all banks including foreign banks, which shows that there has been a sharp decline in concentration since the early 1990s, with another decline occurring from the early 2000s.

**Chart 6: Herfindahl Index for the Banking Sector**



The increased competition has improved banks' efficiency as well. As has been carefully documented elsewhere, we see that Indian banks, especially the public sector banks, have made remarkable progress in improving profitability. Starting from significantly lower operating profits and returns on assets in the early 1990s, public sector banks were broadly at par with private banks by 2007, Chart 7.

**Chart 7: Profitability of Public and Private Banks**  
**(Return on Assets in percent)**



Similar trends are seen in Table 2, in which the average profitability of public banks was much lower than that of a private bank in the early 1990s. The profitability increased for both public and private banks in subsequent years but the increase was sharper for public banks. The improvement seems to have been achieved due to a decline in wage costs and a decline in interest paid. Commensurate with the freeing up of interest rates, effective interest rates declined for both types of banks. Finally, loan loss provisions declined dramatically for public banks. Interestingly, we also see that the convergence between public and private banks is mostly a story of improvements in the costs—operating expenses, interest payments, and loan loss provisions. Components of income that were higher for public sector banks in the mid-to early 1990s remained high at the end of the sample period and those that were lower remained so.

**Table 2: Trends in the Profitability and Efficiency Indicators for Public and Private Banks**

(all variables are calculated as percent of assets)

	1993		1995		2000		2007	
	Public	Private	Public	Private	Public	Private	Public	Private
Profitability (% of assets)								
Operating Profits	.44***	1.32	1.18***	2.13	1.51*	1.88	1.78	1.72
Return on Assets	-1.48***	0.49	0.11***	1.04	0.54**	0.88	0.84	0.75
Expenses (% of assets)								
Wages	2.02	2.08	1.95	1.78	1.90***	1.28	1.13	1.08
Non Wage Operating Expenses	0.87	0.92	0.91	0.82	0.70***	0.89	0.65***	1.08
Interest Paid	7.3***	6.53	5.79	6.08	6.08*	7	4.24	4.49
Provisions	2.01***	0.83	1.1	1.1	0.97	1	0.94	0.98

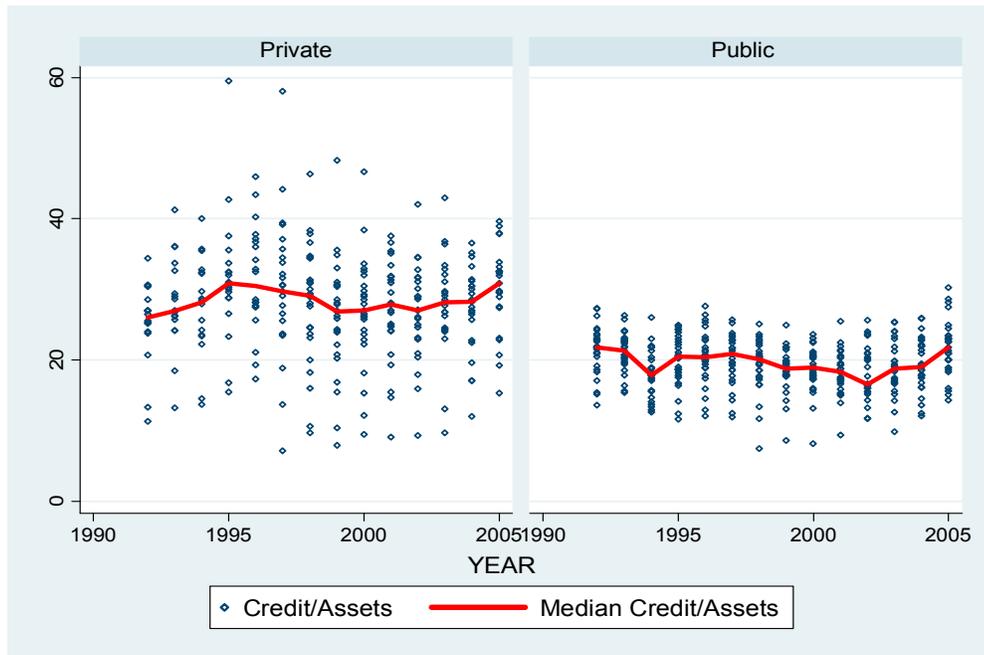
Note: The numbers represent simple means of variables for bank groups. \*, \*\*, \*\*\* denote if the average of the public banks is significantly different from the average of the private banks at 10, 5, and 1 percent levels respectively.

Despite this convergence in efficiency indicators, public and private banks remained different in the allocation of credit to the private sector and investment in government securities. The allocation of credit to the private sector remained much lower for the public banks, and this share did not increase despite the resources freed up by the formal reductions in the CRR and the SLR post liberalization, as shown in Chart 8.

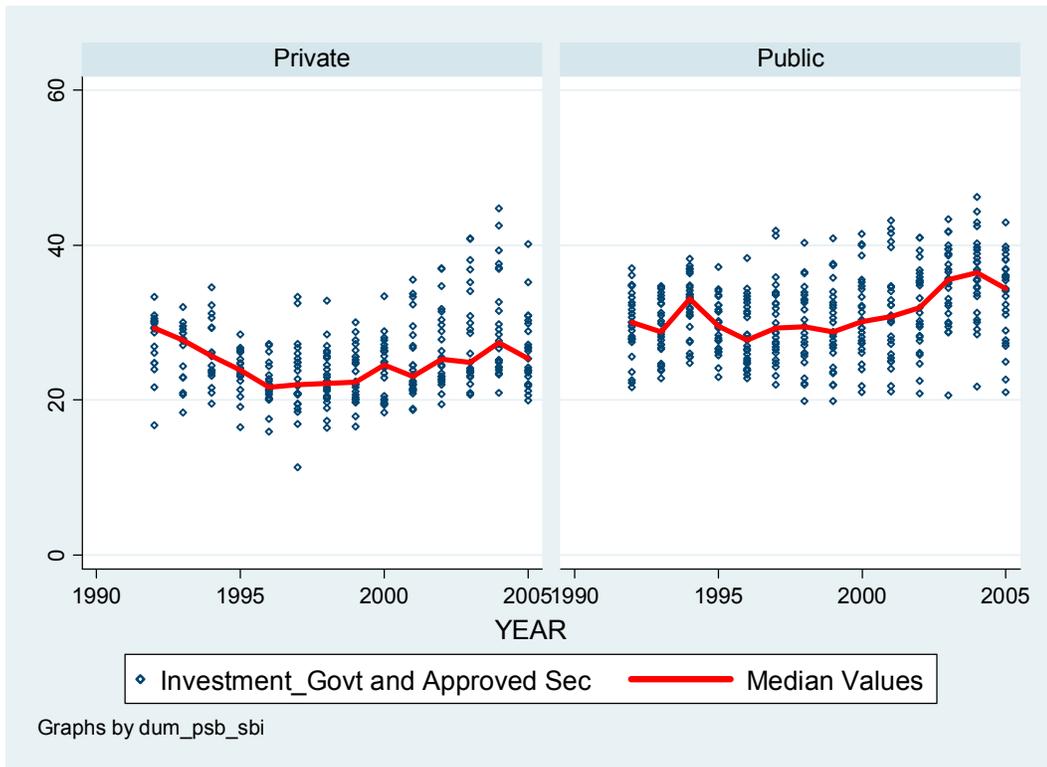
Similarly, Chart 9 shows that public sector banks invested a larger share of their assets in government securities, and the share of government securities in bank assets increased for the public banks post liberalization.<sup>12</sup> We analyze these patterns more systematically in the next section.

<sup>12</sup> We do not show the data for 2006 and 2007 in the charts when fiscal deficit declined substantially in these years and credit to private sector by public banks increased.

**Chart 8: Credit to the Private Sector (percent of assets) by Private and Public Banks**



**Chart 9: Investment in Government and Other Approved Securities (percent of assets) by Private and Public Banks**



Graphs by dum\_psb\_sbi

#### IV. STATUTORY REQUIREMENTS AND ALLOCATION OF ASSETS POST LIBERALIZATION

In this section we first ask to what extent public and private banks change their cash holdings in practice when the CRR is reduced, and then we ask to what extent banks reallocate their assets between government securities and credit to the private sector when the SLR is reduced.

##### A. Data Sources

We use the data for scheduled commercial banks from the RBI's database on banking statistics for 1991-2007 in our analysis. Details on the definitions of the variables and data sources are provided in Appendix B and the summary statistics of the key variables are provided in Appendix C. The data are available at the bank level for all ownership groups, i.e. the State Bank of India and the banks associated with it, other public sector banks, domestic private banks and foreign banks. Foreign banks' entry and branch expansion is tightly controlled in India, and most of the branches of the foreign banks are in big cities. Given their small size, limited branch network, and urban concentration, the business model of the foreign banks, and consequently their lending practices and asset allocation decisions are likely to be different from those of the domestic banks. Thus, we limit our analysis to only public banks and domestic private banks. There were several cases of mergers among banks and instances when banks changed their names in our sample period. We meticulously record these changes in our data, as described in Appendix D, to build a panel data set.

##### B. Cash Holdings and the Cash Reserve Requirements

To analyze the effect of a decline in the CRR on cash holdings of banks we estimate the specification given in Equation 1 below, in which the dependent variable,  $Cash/Assets_{it}$ , is the cash holdings of bank  $i$  in year  $t$  as a percentage of its assets. The right hand side variables include bank fixed effects, GDP growth rate to proxy the demand for bank credit and the overall macroeconomic environment, and bank characteristics such as bank size (measured as the share of bank's assets in the total assets of the banking sector), or the health of the bank (measured as the return on assets). The final set of variables includes CRR and the interaction of CRR with the dummy for public sector banks. In Equation 1, The coefficient of CRR,  $\alpha$ , estimates the effect of a change in CRR on the cash holdings of the private banks; and the sum of the coefficients of CRR and the interaction variable, i.e.  $\alpha+\beta$ , estimates the effect of a change in the CRR on the cash holdings of the public sector banks. A negative and significant  $\beta$  implies that the public banks change their cash ratio by a smaller amount in response to a change in the CRR than the private banks.

$$(Cash/Assets)_{it} = \gamma_i \text{ Bank Dummies}_i + \alpha \text{ CRR}_t + \beta \text{ CRR}_t * \text{Dummy for Public banks}_i + \delta \text{ GDP Growth}_t + \lambda (\text{Bank Characteristics: Size}_{it}, \text{Return on Assets}_{it}) + \varepsilon_{it} \quad (1)$$

Results are presented in Table 3 below, in which Column I shows that the cash ratio of the public as well as private banks responds to the official CRR, but the response of the public sector banks to a reduction in the CRR is significantly smaller than the response of the private banks. The coefficient ranges between 0.90-0.95 for private banks (which is statistically close to 1) but is only about 0.70 (which is statistically less than 1) for public sector banks.

In Columns II-V we estimate several different specifications by way of robustness tests. In Column II we include year fixed effects (and thus do not include GDP growth and CRR) to control for changes which are the same across banks (such as regulatory changes or changes in the macroeconomic environment) but are not captured fully by CRR and GDP growth variables. In Column III we proxy the demand conditions by GDP growth as before, but now also interact GDP growth with the dummy for public banks to see whether the private and public banks adjust their cash holdings differently to changes in GDP growth controlling for change in CRR. Here we find an interesting difference between the way public banks and private banks respond to a change in GDP growth. While private banks reduce their cash holdings by 0.21 percent for every one percentage point increase in GDP growth, public banks increase their cash holdings by 0.14 percent for an equivalent increase in GDP growth.

**Table 3: Cash Holdings of Banks and Cash Reserve Requirement: Private and Public Banks**

	<b>Dependent Variable: Cash/Assets (in percent)</b>				
	I	II	III	IV	V
Lagged, GDP Growth	-0.02 [0.38]		-0.21*** [2.83]	-0.02 [0.37]	-0.02 [0.37]
Size (share in assets)	-0.10 [1.15]	-0.14 [1.54]	-0.05 [0.49]	0.13 [1.22]	0.18* [1.69]
Return on Assets					-0.56* [1.81]
Cash Reserve Requirement (CRR)	.94*** [23.07]		.90*** [22.76]	.95*** [23.19]	.90*** [21.00]
CRR * Public Banks	-0.26*** [4.88]	-0.27*** [4.99]	-0.20*** [3.84]	-0.24*** [4.27]	-0.20*** [3.32]
CRR * Size				-0.01** [2.45]	-0.01*** [2.78]
CRR * Return on Assets					0.06** [2.43]
GDP Growth Lag*Public Banks			0.35*** [3.53]		
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No	No	No
Observations	787	787	787	787	787
R-squared	0.66	0.68	0.66	0.66	0.66
Number of Banks	52	52	52	52	52

Robust t statistics are in parentheses. \*, \*\*, \*\*\* indicate that the coefficients are significant at 10, 5 and 1 percent levels respectively.

In order to rule out the possibility that we are proxying the effect of some other bank characteristics through our ownership dummy, we include the interaction of size and returns of the banks with CRR in the last two columns. We find that the response of the larger banks' is somewhat sharper to a decline in CRR while the more profitable banks who hold a lower cash ratio to begin with, reduce it less sharply in response to a decline in CRR. Even in these additional specifications our central result that public banks reduce their cash ratio by less than the private banks does not change.

Even with these robustness tests, one could argue that we have not accounted for all the potential omitted variables. More specifically, one concern might be that there were many other changes in the regulatory environment as well as in the demand for bank credit during the period under consideration, and the decline in the cash ratio may be due to these factors rather than a decline in the CRR. Therefore, we use another approach to isolate the effect of a change in the CRR on cash holdings. In this approach, we compare the cash holdings of banks between the two nearest time periods when the CRR declined significantly. Specifically, we compare the cash ratios during the years 1994-1996 when the CRR ranged between 14  $\frac{1}{4}$  -14  $\frac{3}{4}$  percent with the years 1997-1999 when the CRR ranged between 10-11.64 percent. Since we now are looking at a shorter time period, when perhaps other variables did not change as sharply as the CRR, this approach is likely to be less affected by omitted variables.

In order to implement this approach, we use the data from 1994-1999, and define a dummy variable which takes a value 0 for the years 1994-1996 and 1 for the years 1997-1999; and as before, we interact it with the ownership dummy. The overall specification and other variables, remain as in Equation 1. The results (in Table 4 below) show that the average cash ratio declined by about 4 percentage points for private banks between 1994-1996 and 1997-1999; but only by about 2 percentage points for the public sector banks, and that this difference in their response is statistically significant.

The results using this approach hold across different specifications reported in various columns in Table 4. In Column II we include the interaction of CRR with size, to rule out the possibility that ownership is a proxy for size. In Column III we include the interaction of returns on assets with the CRR dummy, again to rule out the possibility that ownership is a proxy for the profitability of the banks. Finally, in Column IV we get to the issue of whether cash holdings are determined by demand conditions—i.e. if the demand for bank credit is low when the CRR is reduced then we might see banks responding less to the decline in the CRR requirements and hold more cash. We proxy the demand conditions by GDP growth as before, and also interact GDP growth with the dummy for public banks. As in Table 3, we confirm that there is a difference between the way public banks and private banks have adjusted their cash ratios in response to an increase in GDP growth: controlling for CRR, while private banks lower their cash holdings in the years of higher GDP growth, public banks do not. Finally, as before, we include year fixed effects in the regressions. Results, not shown here, confirm that the coefficient for public sector banks is positive and significant.

**Table 4: Cash Holdings of Banks and Cash Reserve Requirement with an Alternative Approach: Private and Public Banks**  
**Dependent Variable: Cash/Assets (in percent)**

	I	II	III	IV
Lagged, GDP Growth	-0.06 [0.56]	-0.06 [0.57]	-0.08 [0.77]	-0.33** [2.11]
Size (share in assets)	0.47 [0.85]	0.18 [0.25]	0.60 [0.83]	0.14 [0.19]
Return on Assets			0.32* [1.93]	
CRR dummy	-4.36*** [9.20]	-4.32*** [9.13]	-3.99*** [-.03]	-4.37*** [9.25]
CRR dummy*Public Banks	1.94*** [3.05]	2.06*** [3.01]	1.51* [1.93]	2.14*** [3.11]
CRR dummy* Size		-0.06 [1.06]	-0.02 [0.26]	-0.07 [-.09]
CRR dummy* Return on Assets			-0.42 [1.18]	
Lagged GDP Growth*Public Banks				0.50** [2.33]
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No
Observations	294	294	294	294
R-squared	0.54	0.54	0.55	0.55
Number of Banks	52	52	52	52

Robust t statistics are in parentheses. \*, \*\*, \*\*\* indicate that the coefficients are significant at 10, 5 and 1 percent levels respectively.

All in all, consistent with Banerjee et al (2004), the evidence presented here points to a passive behavior on the part of the public banks in reallocating their assets towards earning assets even when they are required to hold less cash.

### C. Investment in Government Securities and the Statutory Liquidity Requirement

Next, we look at the impact of a decline in the SLR on banks' holdings of central government and other approved securities (such as state development loans of the state governments) which they are required to hold to meet the SLR requirements. We use the regression framework given in Equation 2, which is similar to the one used earlier, but the dependent variable now is investment in government and other approved securities as percent of assets. The demand for private credit is proxied by GDP and the demand for funds by the government is proxied by the fiscal deficit (measured as the combined fiscal deficit of the

federal and state governments).<sup>13</sup> In Equation 2,  $\alpha$  estimates the effect of an increase in SLR on investment in government and other approved securities by private banks; and  $\alpha+\beta$  estimates the effect of an increase in SLR on investments in such securities by the public sector banks. Two other coefficients of interest are  $\theta$  and  $\eta$ , where  $\theta$  is the estimated effect of an increase in the fiscal deficit on the investment in government securities by private banks; and  $\theta+\eta$  estimates the effect of an increase in the fiscal deficit on investment in government securities by the public sector banks.

$$\begin{aligned} (\text{Investment in Govt Sec/Assets})_{it} = & \gamma_i \text{ Bank Dummies}_i + \alpha \text{ SLR}_t + \beta \text{ SLR}_t * \text{Dummy for} \\ & \text{PSBs Banks}_i + \delta \text{ GDP Growth}_t + \lambda \text{ Size}_{it} + \theta \text{ Fiscal Deficit}_t + \eta \text{ Fiscal Deficit}_t * \text{Dummy for} \\ & \text{PSBs Banks}_i + \varepsilon_{it} \quad (2) \end{aligned}$$

We get the counterintuitive result in Column I, Table 5, that a decline in the SLR is associated with an increase in investment in government securities by the private banks as well as by the public banks, and the increase is larger for public banks. The results are, however, substantially different when we include the fiscal deficit in the regression, Column II. Now, the coefficients of the SLR terms are not significantly different from zero, whereas the coefficients of the fiscal deficit terms are positive and significant, suggesting that it is not the SLR, but the fiscal deficit, that matters for credit allocation by the banks. Furthermore, the coefficient of the interaction between the fiscal deficit and the public banks dummy is positive and significant, indicating that public banks increase holdings of government securities by more than the private banks in response to an increase in the deficit. More specifically, the results in Column II show that banks increase their share of assets in government and approved securities by 1 percentage point for a 1 percentage point increase in the gross fiscal deficit to GDP ratio, and the public banks increase the investment in government and approved securities by 1.6 percentage points.

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<sup>13</sup> We also check the robustness of the results on cash holdings by including the fiscal deficit in the regressions. But its coefficient is insignificant, and when we include it, it does not affect the coefficients of other variables.

**Table 5: Investment in Government Securities, Statutory Liquidity Requirement, and Fiscal Deficit: Private and Public Banks**

Dependent Variable: Investment in Government and Other Approved Securities/Assets  
(in percent)

	I	II	III	IV	V	VI
Lagged, GDP Growth	-0.44*** [-5.65]	0.06 [0.65]	0.01 [0.10]		0.08 [0.92]	0.06 [0.65]
Return on Assets					-4.39** [-2.39]	
Size (share in assets)	-0.21 [-0.74]	-0.32 [-1.33]	-0.31 [-1.30]	-0.31 [-1.43]	0.11 [0.23]	-0.32 [-1.34]
SLR	-0.10** [-2.27]	0.08 [1.65]	0.07 [1.34]		0.08 [1.55]	0.08 [1.61]
SLR*Public Banks	-0.03 [-0.59]	0.03 [0.55]	0.05 [0.74]	0.03 [0.50]	0.06 [0.94]	0.05 [0.79]
Fiscal Deficit		1.02*** [5.64]	0.98*** [4.82]		0.64*** [3.07]	1.01*** [5.57]
Fiscal Deficit* Public Banks		0.60*** [2.65]	0.68** [2.45]	0.54** [2.55]	0.78*** [3.26]	0.63*** [2.76]
GDP Growth Lag*Public Banks			0.08 [0.43]			
Capital Injection						0.19 [1.22]
SLR*Size					-0.01 [-0.82]	
Fiscal Deficit*Size					-0.02 [-0.51]	
SLR*return on Assets					0.02 [0.70]	
Fiscal Deficit* return on Assets					0.51*** [3.27]	
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	Yes	No	No
Observations	787	787	787	787	787	787
R-squared	.54	.59	.59	.69	.60	.59
Number of Banks	52	52	52	52	52	52

Robust t statistics are in parentheses. \*, \*\*, \*\*\* indicate that the coefficients are significant at 10, 5 and 1 percent levels respectively.

Using the specification in Column II as the benchmark, we run a number of robustness tests to account for potential omitted variables, but find that our key result – that it is not the changes in the SLR but the size of the fiscal deficit that matters for banks' decision to invest in government securities and that in this respect, public banks behave differently from private banks, is robust. In Column III we include the interaction of GDP growth and ownership to see if the fiscal deficit is associated with other macro economic conditions and the demand for credit. In Column IV we include year fixed effects. In Column V we include the interaction terms for bank characteristics such as the health of the banks or the size of the

banks with fiscal deficit and SLR, just so that the ownership is not a proxy for these bank characteristics.

Another important robustness test we do is to account for recapitalization of public sector banks, usually conducted through the issuance of government debt, by including capitalization as a percentage of bank's assets as an independent variable in the regressions. The results, in the last column of Table 5, show that including this variable does not affect the coefficients of other variables, and that this variable has a positive but insignificant coefficient.<sup>14</sup>

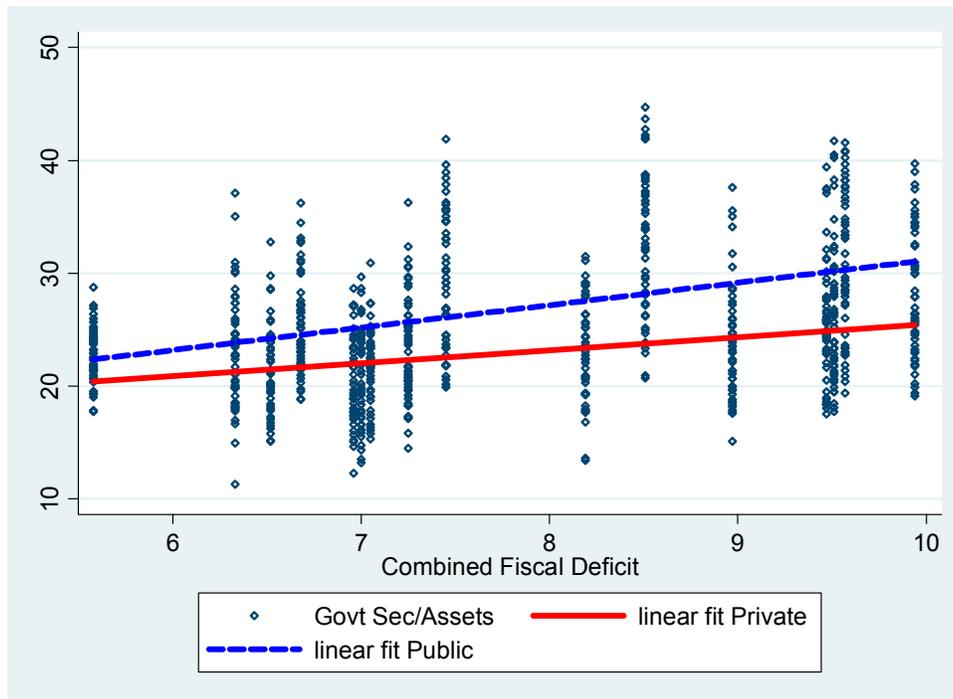
Just like we did for a decrease in CRR, we use another approach in which we compare the investment in government securities and other approved securities during selective years when the SLR was reduced sharply. Thus we look at two close periods, 1995-97 when the SLR averaged 33.2 percent and 1999-2001 when it averaged 25 percent. Incidentally, the fiscal deficit also increased substantially between these periods, from an average of 6.6 percent of GDP during 1995-1997, to 9.3 percent during 1999-2001. Consistent with the regression results, we find that the investment in government securities increased during this period and the increase was sharper for public banks, see Table 6. Finally, we compare the investment in government securities in 1999-2001 and in 2007 when the SLR remained unchanged at 25 percent but the fiscal deficit declined to 5.6 percent of GDP in 2007. Interestingly, the investment in governments securities declined for all banks and the decline was sharper for public banks. Thus, what is evident from the table is that the public banks hold a larger share of their assets in government securities in the periods considered here and that their response to a change in fiscal deficit is sharper than that of private banks, both for an increase and for a decline in the fiscal deficit.

**Table 6: Investment in Government Securities by Private and Public Banks in Selected Years (annual averages for the periods indicated)**

	Average SLR	Combined Fiscal Deficit (% of GDP)	Investment in Government and Approved Securities (% of assets)	
			Private Banks	Public Banks
I: 1995-1997	33	6.6	42.5	53.3
II: 1999-2001	25	9.3	46.8	58.4
III: 2007	25	5.6	44.3	47.3

<sup>14</sup> We include bond yields in the regressions too, but its coefficient is insignificant, and it does not affect our other results.

**Chart 10: Investment in Government and Other Approved Securities (% of assets) by Private and Public Banks and Fiscal Deficit (% of GDP)**



Finally, we graphically show the in which we plot the relationship between the fiscal deficit and investment in government securities for public and private banks in Chart 10, where the relationship is seen to be positive for all banks and to be steeper for public banks.

#### **D. Credit to the Private Sector, SLR, and Fiscal Deficit**

To the extent that besides government securities and credit to the private sector, there are other items in the banks' balance sheets, trends in private credit may not just be a mirror image of investment in government securities. Hence, it might also be informative to analyze the trends in credit to private sector as a percentage of assets in response to changes in the SLR, CRR and fiscal deficit to ask whether the resources freed up by a decline in the CRR and SLR make their way to the private sector? The basic framework we use remains as in Equation 2, but now we use credit to private sector as percentage of GDP as the dependent variable. The results are in Table 7 below.

**Table 7: Credit to the Private Sector, Statutory Liquidity Requirement and Fiscal Deficit: Public and Private Banks**

Dependent Variable: Credit to Private Sector/Assets (in percent)

	I	II	III	IV	V
Size (share in assets)	1.56*	-0.30	1.52*	1.67	1.59
	[1.72]	[0.22]	[1.66]	[1.36]	[1.29]
Lagged, GDP Growth	0.06		0.17	0.06	0.06
	[0.49]		[0.77]	[0.51]	[0.47]
GDP Growth Lag*Public Banks			-0.20		
			[0.85]		
SLR	0.02		0.04		-0.11
	[0.19]		[0.39]		[0.85]
SLR*Public Banks	-0.14	-0.08	-0.19*		0.14
	[1.60]	[0.89]	[1.85]		[1.00]
Fiscal Deficit	-1.08***		-0.97***	-1.03***	-1.11***
	[4.12]		[3.25]	[4.05]	[4.19]
Fiscal Deficit* Public Banks	-0.69**	-.63**	-0.88**	-0.71***	-0.62**
	[2.46]	[2.30]	[2.56]	[2.68]	[2.22]
CRR				0.10	0.20
				[0.66]	[1.12]
CRR*Public Banks				-0.28***	-0.43***
				[2.94]	[2.72]
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No	No	No
Observations	787	787	787	787	787
R-squared	0.64	0.66	0.65	0.65	0.65

Robust t statistics are in parentheses. \*, \*\*, \*\*\* indicate that the coefficients are significant at 10, 5 and 1 percent levels respectively.

Column I shows that the share of assets extended to the private sector declines for all banks when the fiscal deficit increases, and that the decline is sharper for public banks. For a 1 percent increase (decrease) in the fiscal deficit, private banks decrease (increase) the share of credit to private sector in their assets by 1 percentage point, and public banks by 1.77 percentage points. In Column II we include year dummies, in Column III, we include the interaction of GDP growth with the dummy for public banks; in Column IV we include the CRR and its interaction with the dummy for public banks dummy; and in the last column, we include all three variables SLR, fiscal deficit and CRR in the regression and their interactions with the dummy for public sector banks. Overall our main result that the public banks reduce the credit to the private sector by a larger amount in response to an increase in the fiscal deficit, than do the private banks, holds in these additional specifications.

In all the regressions reported above we include bank fixed effects, but when we estimate these same regressions by including the dummy for public banks, rather than bank specific fixed effects, we find that the dummy for public banks has a positive and significant coefficient for investment in government securities, and cash holdings and a negative coefficient for credit to private sector variable (the results are not shown for brevity). Thus in

general, we find that public banks invest a larger share of their assets in government securities and hold larger cash balances, and lend less to the private sector than the private banks.

### **E. More Robustness Tests**

In this section we conduct robustness tests and report the results in Table 8. In Column I we separate out the effects when the fiscal deficit is increasing and when it is decreasing, by including separate dummies for 1992-2002, and for 2003-2007 period. The coefficients of fiscal deficit are positive and significant in both the periods, and are larger for public banks. We include state government and central government deficits separately in the regressions (with year fixed effects) in Column II and find that the results are stronger for the interaction of central government deficit with public sector banks. Finally, we allow for different coefficients for new private banks and old private banks in the regressions, and find that while our results for the public sector banks hold, but for the fiscal deficit variable, the coefficients of new and old private banks differ somewhat (last column).

Although an explicit examination of crowding out is beyond the scope of this paper, the evidence presented here is consistent with the fact that the Indian corporates and SMEs often cite access to finance as a major impediment to their growth, e.g. in the business climate surveys conducted by the World Bank and in Gupta, Hasan and Kumar (2008, 2009). Results here suggest that the private sector in India is perhaps crowded out in the banking sector by the demand for funds by the government, and due to a large presence of public banks.

**Table 8: Credit Allocation, Statutory Liquidity Requirement and Fiscal Deficit: Public and Private Banks, Robustness Tests**

Dependent Variable: Investment in Government Securities (in percent)

	I	II	III
Lagged, GDP Growth	0.05 [0.59]		0.06 [0.68]
Size (share in assets)	-0.34 [-1.51]	-0.35 [-1.58]	-0.37 [-1.53]
SLR	0.19*** [3.56]		0.09* [1.95]
SLR*Public	0.01 [0.16]	-0.05 [-0.79]	0.02 [0.36]
SLR*New Private Banks			-0.29*** [-3.18]
Fiscal Deficit*Dummy for pre 2003	0.87*** [4.20]		
Fiscal Deficit*Dummy for pre 2003*PSB	0.54** [2.33]		
Dummy Post 2003	-7.89*** [-3.79]		
Fiscal Deficit*Dummy for post 2003	2.30*** [8.39]		
Fiscal Deficit*Dummy for post 2003*PSB	0.48* [1.74]		
Central Govt Deficit*Public Banks		0.86*** [2.95]	
State Govt Deficit* Public Banks		0.12 [0.40]	
Fiscal Deficit			1.03*** [5.49]
Fiscal Deficit* Public Banks			0.60** [2.57]
Fiscal Deficit* New Private Banks			0.19 [0.59]
Bank Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No
Observations	787	787	787
R-squared	0.66	0.69	0.60

Robust t statistics are in parentheses. \*, \*\*, \*\*\* indicate that the coefficients are significant at 10, 5 and 1 percent levels respectively.

## V. EXPLAINING THE DIFFERENTIAL BEHAVIOR OF THE PUBLIC BANKS

There can be several potential explanations for the “overinvestment” by public banks in government securities. One possibility is that it is rational for the public banks to invest in government securities because the operating costs of maintaining these investments is lower, and there is no risk of default. In addition, the declining interest rates have meant that the

banks could book trading profits on such investments. If this is indeed the case then we should find the profitability of banks to be correlated positively with investment in government securities, irrespective of ownership.

In order to see if banks with larger investment in government securities have higher profitability we estimate regressions using return on assets as the dependent variable, controlling for year fixed effects, size of the banks, and investment in government securities. For our earlier result on larger investment in government securities during the years of fiscal deficit to be explained by this hypothesis, it must also be true that the investments in government securities are associated with higher profits when the fiscal deficit is high.

The results are in Table 9, where in Column I we find that the dummy for public banks has a negative coefficient, i.e., after controlling for size, the public banks are less profitable, and in Column II we see that the investment in government securities has a negative and significant coefficient, i.e. after controlling for ownership and size, banks investing more in government securities are less profitable. Interestingly we also see that the investment in government securities is associated with relatively higher returns during the periods of high fiscal deficits. When we include these additional variables in the regressions, the coefficient of public sector banks remains negative, though it becomes much smaller now—implying that contrary to the hypothesis that we are testing, the public banks are less profitable in part because of their larger investments in government securities. We further explore the reasons behind the negative coefficient of the public banks, though not directly related to the question in hand, by including overhead costs and loan loss provisions in the regressions. When we do so, the coefficient of the dummy for public banks becomes insignificantly different from zero (results are not shown for brevity) and the coefficients of overhead costs and loan loss provisions are negative. Thus our results show that the public banks are perhaps less profitable because of their larger investments in government securities, higher overhead costs and larger provisions.

**Table 9: Return on Assets, Investment in Government and Other Approved Securities and Ownership** Dependent variable: Return on Assets

	I	II	III
PSBs Dummy	-.47*** [-6.79]	-.29*** [-3.59]	-.26*** [-3.28]
Size (Share in Assets)	0.01*** [2.68]	0.01 [1.49]	0.01 [1.07]
Investment in Govt Securities		-.03*** [-4.30]	-.19*** [-5.30]
Investment in Govt Securities*Fiscal deficit			.02*** [4.95]
Bank Fixed Effects	No	No	No
Year Fixed Effects	Yes	Yes	Yes
Observations	787	787	787
R-squared	0.232	0.248	0.261

Robust t statistics are in parentheses. \*, \*\*, \*\*\* indicate that the coefficients are significant at 10, 5 and 1 percent levels respectively.

Another potential explanation of a large exposure of banks in government securities, and particularly that of public banks, could be that due to the high risk profile of lending to the priority sectors, banks prefer to hold safe and high liquidity government securities. We can test this hypothesis by including priority sector lending separately in the regressions for investment in government and other approved securities. When we do so, by including lagged as well as current levels of priority sector lending (results not shown) we find its coefficient to be negative, i.e. the banks' lending to priority sectors is not necessarily correlated with the larger investment in government securities. Thus the incentive to mitigate risk due to high holdings of priority sector lending does not seem to be the reason behind the higher holdings of government securities.

Mohan (2004), and Patnaik and Shah (2004) have pointed out that in a declining interest rate environment the banks investing in government securities can make larger profits, and this could be one factor driving the higher investment in securities by both private and public sectors. One could test for this possibility by including time fixed effects, or by including the bond yields or interest rates in the regressions. When we do so, by including the available data for interest rates and bond yields in the regressions, the results remain unchanged.

Yet another potential explanation for our result that public banks increase their investment in government securities when the fiscal deficit is high could be due to the low demand for private credit (Mohan, 2004). To test for this, we include private capital formation in the regressions and also control for the alternative sources of funds for the private sector, such as the stock market and the external commercial borrowings. If these factors are indeed important in explaining the asset allocation and not the fiscal deficit, then the coefficient of the variable fiscal deficit\*dummy for public banks would be driven to zero after including these variables.

The results in Table 10 allow us to rule out this as well. In the specifications in Table 10 we include private capital formation and in Columns II and IV we include external commercial borrowings and stock market capitalization as well in the regressions. The dependent variables are investment in government and other approved securities in the first two columns and credit to the private sector (both calculated as percentage of assets) in the last two columns. Results here show that when the demand for private investment is high, the credit allocation to the private sector increases and investment in government securities declines. Interestingly, in the last three columns, the coefficient of the fiscal deficit becomes insignificant for private banks but remains significant for public banks. One interpretation for this result could be that while the investment in government securities or credit to private sector may reflect demand side considerations, public banks' decisions also seem to be driven by some other objectives.

**Table 10: Investment in Government Securities, Credit to Private sector and the Demand for Private Credit**

Dependent Variables	(I)	(II)	(III)	(IV)
	Investment in Govt and Other Approved Securities	Investment in Govt and Other Approved Securities	Private Credit	Private Credit
Private Capital Formation/GDP, Lagged	-0.86*** [-5.58]	-0.68*** [-4.85]	0.33* [1.93]	0.16 [0.92]
External Commercial Borrowings/GDP, Lagged		-2.76*** [-12.1]		0.10 [0.36]
Stock Market Capitalization/GDP, Lagged		-0.04*** [-3.85]		.06*** [3.57]
Lagged, GDP Growth	0.28*** [2.90]	-0.08 [-0.86]	0.08 [0.67]	0.02 [0.18]
Return on Assets	0.06 [0.36]	-0.23 [-1.54]	0.06 [0.33]	0.08 [0.47]
Size (Share in Assets)	-0.31 [-1.28]	-0.29 [-1.34]	-0.10 [-0.41]	-0.12 [-0.48]
SLR	-0.17** [-2.56]	-0.05 [-0.80]	-0.03 [-0.31]	0.00 [0.00]
SLR*Public Banks	0.04 [0.64]	-0.00 [-0.00]	-0.07 [-0.72]	-0.07 [-0.73]
Fiscal Deficit	-0.61* [-1.84]	0.16 [0.49]	-0.51 [-1.16]	-0.32 [-0.72]
Fiscal Deficit* Public Banks	0.61*** [2.63]	0.50** [2.33]	-.66** [-2.28]	-.64** [-2.27]
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No
Observations	787	787	787	787
R-squared	0.61	.68	.64	.64
Number of Banks	52	52	52	52

Robust t statistics are in parentheses. \*, \*\*, \*\*\* indicate that the coefficients are significant at 10, 5 and 1 percent levels respectively.

The remaining hypotheses that we cannot test for directly but seem relevant include the following: first, as pointed out in Ahluwalia (2002), Mohan (2004), and Banerjee et al (2004), the public banks face an asymmetric incentive structure in which their high profitability is not rewarded but a loan decision that turns bad can be investigated by the Central Vigilance Commission leading to punishment. Thus, it leaves the public sector banks managers with little incentive to lend to the private sector. We cannot test for this hypothesis directly, but it certainly seems like a plausible one. What we would like to note, however, is that while this hypothesis can explain the higher share of government securities in the portfolio of public banks, it cannot, by itself, explain the larger increase in investment in government securities by public banks when the fiscal deficit increases.

A second plausible hypothesis is that government ownership gives rise to moral hazard due to the perception that the government will come to the support of public banks, if and when necessary. This could lead to reduced efforts on their part to maximize profits, and to hold greater amounts of cash and government paper. That such a perception of greater government support for public institutions exists in India is demonstrated by Acharya et al (2010). Specifically, they show that during the recent global financial crisis, investors rewarded Indian public sector firms with greater systemic risk while penalizing private sector firms with similar risk. Acharya et al attribute this finding to the explicit and implicit government backing of public sector banks.

Third, and finally, there is the possibility that public sector banks are more sensitive to the needs of the government and hence likely to take actions that may not be driven strictly by their commercial interests alone. Whether such actions result from moral suasion by government, or from unilateral decisions taken by the public banks themselves to assist their majority shareholder, i.e. the government, they are consistent with the finding that public banks increase their holdings of government paper by more than do private banks when the fiscal deficit increases.

To sum up, it appears that the over investment by public banks in government securities could be due to a combination of “lazy” behavior, and moral suasion or prioritization by the public banks themselves to assist the government finance its deficit. This differential behavior between private and public banks does not seem to be driven by the objective to earn higher returns, to control overhead costs, or simply as a means to improve asset quality.

## VI. CONCLUSION

This paper studies some aspects of the Indian experience with the liberalization of the financial sector. The objectives of the liberalization agenda were both to increase the operational efficiency of banks at the institution level and to improve the efficacy of resource allocation economy-wide. The paper confirms past studies’ conclusions that financial liberalization and increased entry of private banks has increased competition and has significantly improved the efficiency and profitability of public banks to the point where they

are now comparable to private banks. However, this paper also demonstrates that some elements of the reform program, in particular the steps to reduce state preemption of resources through the CRR and the SLR, may have been less effective in changing public banks' behavior compared to private banks. These results suggest that the objectives of the liberalization agenda have not been fully met.

The continued prevalence of public sector banks in India, taken together with the results of this paper, provides some possible explanations for why the lack of finance for the private sector continues to be a key constraint to growth in India. That such lack of finance is a constraint to growth has shown up in survey data, such as the World Bank's Investment Climate Survey. It has also been demonstrated empirically elsewhere, for example by Gupta et al. (2008) who show that industries more dependent on external finance have witnessed slower growth in India and have fared much worse in terms of opening up of new factories, employment generation as well as new investment relative to those less dependent on external finance, and by Banerjee et al. (2004) who show that Indian firms are credit constrained, partly due to underlining by the public banks.

The paper may also have lessons for other countries as they formulate their liberalization agendas. The findings here suggest that in developing countries, where alternative channels of financing may be limited, government ownership of banks, combined with high fiscal deficits, may limit the gains from financial liberalization.

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## Appendix A

Areas of Reform	Initiatives	Dates	Chronology of Reforms
<b>Interest rate deregulation</b>	<b>Deregulation of rupee-denominated deposit rates</b>	1992	First steps toward rate liberalization, with the partial deregulation of rupee-denominated term deposit rates. The initial reform measure involved the substitution of the single interest rate for each term deposit category with a ceiling below which banks were free to fix their rates.
		1995-96	The Reserve Bank of India (RBI) gradually eliminated the ceilings on both domestic and Non-Resident External (NRE) rupee deposits with maturities over one year.
		1997	Banks were allowed to determine interest rates on their domestic term deposits of 30 days and above. The interest rates on NRE deposits with maturities over 6 months were deregulated.
		1998	The minimum lock-in period for term deposits was reduced from 30 days to 15 days. In addition, banks were permitted to offer differential interest rates on domestic term deposits above Rs. 1.5 million and to determine their own penalties for early withdrawal of domestic and NRE deposits and loans against fixed deposits.
		2000	The restrictions that prevented banks from charging differential rates on NRE deposits (depending on the deposit size) were relaxed.
		2002	All banks encouraged to put a flexible interest rate system on deposits (with a fixed rate option for depositors)
		2003	The interest rate on savings account offered by banks reduced to 3.5 per cent per annum from 4.0 per cent per
	<b>Deregulation of foreign-currency denominated deposit rates</b>	1993	The Foreign Currency (Non-Resident) Deposit Scheme from the pre-reform period was replaced by a new scheme. Initially, interest rates under the new scheme were stipulated by the RBI. In contrast to the old scheme, however, the exchange rate risk was now shifted from the RBI to the commercial banks.
		1997	Banks were allowed to set interest rates on their Foreign Currency Non-Resident (Bank) [FCNR(B)] deposits, subject to a ceiling imposed by the RBI. Later during the same year, the ceiling rates for certain FCNR(B) deposits were linked to LIBOR, i.e. the floating rate deposits and the deposits with maturity over six months but less than one year. The interest rate for FCNR(B) deposits with maturity over one year was stipulated to be within the ceiling of swap rates for the corresponding currency/maturity configuration.
		1998	As in the case of rupee-denominated deposits, banks were allowed to establish their own penalties for early withdrawal of FCNR(B) deposits.

Areas of Reform	Initiatives	Dates	Chronology of Reforms
		2000	Differential rates on FCNR(B) deposits, depending on deposit size and subject to the overall ceiling rate, were introduced. During the same year, banks were given the option to choose their current swap rates, while offering FCNR(B) deposits.
	<b>Deregulation of lending rates</b>	1992-94	The number of lending categories were reduced from six to three.
		1998	The lending structure was rationalized further, when another category was eliminated.
		1998	The interest rates on loans against term deposits were liberalized, starting with the April 1998 stipulation that the interest rate on loans against domestic and NRE deposits not exceed the bank-specific PLR.
		1999	Banks were given the freedom to charge their own interest rates on advances against domestic/NRE deposits without reference to the PLR ceiling if certain deposit rate conditions were satisfied. Since October 1999, the interest rates on loans against domestic/NRE/FCNR(B) term deposits could be determined without any reference to PLR.
		2000	The restrictions on interest rates on advances up to Rs. 200,000 against third party deposits were removed.
		2003	Banks allowed to determine rates of interest on loans and advances for purchase of consumer durables, to individuals against shares and debentures/bonds, and other non-priority sector personal loans without reference to PLR and regardless of the size of loan.
	<b>Deregulation of Prime Lending Rate (PLR) restrictions</b>	1994	The easing of lending rate restrictions began in October 1994, when banks were permitted to establish their own Prime Lending Rates (PLR) for advances over Rs. 200,000.
		1997	The rules were relaxed further in October 1997, and banks were allowed to charge separate Prime Term Lending Rates (PTLR) for term loans with at least 3-year maturity.
		1998	The bank-specific PLR became the ceiling for loans below Rs. 200,000. At the same time, each bank had to announce its PLR, as well as the maximum spread charged over it.

<b>Areas of Reform</b>	<b>Initiatives</b>	<b>Dates</b>	<b>Chronology of Reforms</b>
		1999	The scheduled commercial banks were given the freedom to offer fixed rate term loans, as long as they adhered to the guidelines of Asset Liability Management (ALM) system. Since April 1999, different PLRs could be used for loans with different maturities. During the same year, banks were allowed to charge interest rates without reference to PLR for: i) loans covered by refinancing schemes of term lending institutions; ii) loans to intermediary agencies; iii) discount of bills.
		2000	Another step toward lending rate liberalization was taken in April 2000, when banks were permitted to offer all loans on fixed or floating rate basis, subject to PLR stipulations.
<b>Reduction in reserve requirement</b>	<b>Reduction in Cash Reserve Ratio (CRR)</b>	1992-1993	The incremental CRR of 10 percent was eliminated.
		1992-2001	The average CRR fall from 15 percent to 5.5 percent.
		2000	The minimum daily requirement of CRR balances was lowered from 85 percent to 65 percent.
		2001	The minimum daily requirement of CRR balances was reduced from 65 percent to 50 percent.
		2001	Interest rate on eligible cash balance of banks with the Reserve Bank aligned with the Bank Rate
		2002	CRR reduced from 5.5 per cent to 5 per cent
		2003	Inter-bank term liabilities with original maturity of 15 days to one year exempted from the prescription of minimum Cash Reserve Ratio (CRR) requirement of 3.0 per cent
		2003	CRR reduced by 50 basis points from 5 percent to 4.5 percent
		2004	CRR raised by 50 basis points to 5 percent
		2006	CRR raised by 50 basis points to 5.5 percent
		2007	CRR raised by 200 basis points in four stages (each 50 bps) to 7.5 percent
		2007	Banks required to maintain a minimum of 70 per cent of the required amount of average daily CRR
		2007	No interest payable on CRR balances of banks with effect from March 31, 2007.

Areas of Reform	Initiatives	Dates	Chronology of Reforms
		2008	CRR raised by 150 basis points (50 bps each in April, June and July 2008) to 9 percent, reduced by 250 bps in Oct and 100 bps in Nov to 5.5 percent
		2009	CRR reduced by 50 basis points from 5.5 percent to 5 percent
	<b>Reduction in Statutory Liquidity Ratio (SLR)</b>	1992-1994	The SLR on incremental deposits was cut down, and the base date used in the SLR computation was pushed forward several times. The base level SLR was decreased to 33.8 percent. In addition, the statutory liquidity requirement for any increase in NDTL above their level as of September 30, 1994 was stipulated to be 25 percent.
		1997	A uniform SLR of 25 percent came into effect.
		2007	The SLR reduced by 100 basis points to 24 per cent
		2008	The SLR increased to 25 percent in Nov 2009
<b>Entry deregulation</b>	<b>Competition</b>	1993	The rules for establishing new private sector banks were introduced, with the publication of the RBI guidelines on this issue. The main provisions of the new regulations stipulated that the new private banks should have: i) a minimum capital requirement of Rs. 100 million; ii) a limited foreign bank participation of up to 20 percent, with a maximum overall non-resident participation of 40 percent; iii) public listing; iv) computerized environment.
		1994-1996	Nine new private banks (Bank of Punjab Ltd, Centurion Bank Ltd, Global Trust Bank, HDFC Bank, ICICI Bank, IDBI Bank, Indusland Bank Ltd, UTI Bank Ltd, and Times Bank Ltd) were founded between 1994 and 1996.
		2001	The guidelines for licensing new private sector banks were revised in January 2001. The minimum capital requirement was raised and the private bank ownership of large industrial houses were restricted.
		1990-2001	New foreign banks entered the market and existing foreign banks were allowed to open additional branches. In the period from 1990 to 2001, the number of foreign banks increased from 21 to 42. During the past ten years, foreign banks acquired 51 additional offices, bringing up the total number of their branches from 151 in 1992 to 202 in 2001.
	<b>Ownership</b>	1993	The State Bank of India (SBI) Act was amended, and the SBI became the first public bank to raise capital from the public in December 1993.
		1994	Nationalized banks were allowed to raise up to 40 percent of their capital from the market in 1994.

Areas of Reform	Initiatives	Dates	Chronology of Reforms
		1994-2001	Eleven public sector banks accessed the market.
<b>Credit policies</b>	<b>Credit controls</b>	1992-2001	The focus of reform efforts has been on: i) giving banks more freedom to set the credit requirement for their borrowers; ii) relaxing the conditions for consortium lending; iii) withdrawing the regulations on Maximum Permissible Bank Finance (MPBF) and allowing banks to use their own methods in order to assess working capital requirements; iv) allowing banks to use their discretion in levying commitment charges; v) deciding on the level of inventory and receivable holdings of different industries.
	<b>Priority sector lending</b>	1992-2001	The definition of priority sector has been expanded to include: i) bank investments in designated bonds (NABARD, SIDBI, NHB, for example) and contributions to the Rural Infrastructure Development Fund; ii) irrigation, agriculture machinery, food and agro-based processing, and traditional plantation loans; iii) advances to housing, retail trade, software, transport operator industries, subject to various loan-size restrictions; iv) venture capital; v) micro-credit to individuals, extended directly or through intermediaries; vi) credit to NDFCs for small road, water transport operator, and tiny sector lending.
		1992-2001	At the beginning of the reform period, the overall target for Indian banks was 40 percent of net bank credit, with sub-targets of 18 percent for agriculture and 10 percent for weaker sections. In early 1992, the priority sector lending requirements for foreign banks included an export credit target of 15 percent. During the same year, the foreign bank target was revised to 32 percent, with sub-targets for export credit (10 percent) and small scale industry credit (10 percent). In 1993, indirect loans in the amount of 4.5 percent of net bank credit were allowed as part agriculture target of 18 percent. The export credit target was revised to 12 percent in 1996. Currently, the overall priority sector lending targets for domestic and foreign banks remain 40 percent (18 percent for agriculture and 10 percent for weaker sections) and 32 percent (12 percent for export credit and 10 percent for SSI), respectively.
		2009	The Reserve Bank of India revised the guidelines on lending to the priority sector. Under the new guidelines, the priority sector lending target and sub-targets for all banks linked to adjusted net bank credit (ANBC=Net Bank Credit plus investments made by banks in non-SLR bonds held in HTM category) or credit equivalent of off-balance sheet exposure, whichever is higher. For this purpose, outstanding FCNR (B) and NRRR Deposits balances no longer be deducted for computation of net bank credit for priority sector lending purposes.

<b>Areas of Reform</b>	<b>Initiatives</b>	<b>Dates</b>	<b>Chronology of Reforms</b>
<b>Bank Finance/Lending</b>	<b>Call Money</b>	2001	Phasing out of non-bank participation in call money market to be done in four stages started in 2001
		2002	Prudential limit stipulated on the exposure of SCBs in call money market: SCBs fortnightly average lending in the call/notice money market not to exceed 25 per cent of their owned funds; fortnightly average borrowings not to exceed 100 per cent of their owned funds or 2.0 per cent of aggregate deposits as at the end of March of the previous financial year, whichever is higher. They will be allowed to lend and borrow a maximum of 50 per cent and 125 per cent, respectively, of their owned funds on any day during a fortnight
	<b>Domestic Stock Market</b>	2001	According to the revised guidelines issued on bank financing of equities and investments in shares, the ceiling of 5 per cent was made applicable to total exposure of a bank to stock markets
		2002	The Reserve Bank liberalised the norms for issue and pricing of shares by private sector banks. All private sector banks - listed or unlisted - will be free to issue bonus and rights issues without prior approval of the Reserve Bank. For initial public offerings and preferential shares, however, the Reserve Bank's approval will be necessary.
	<b>Overseas</b>	2002	The limit on banks to borrow and invest from/in overseas market increased from 15 per cent to 25 per cent of their unimpaired Tier I capital
		2002	Consolidated guidelines issued on foreign direct investment (FDI) in the banking sector. It was clarified that FDI from all sources in private banks is permitted under the automatic route up to 49 per cent. FDI and portfolio investment in PSBs, including State Bank of India, however, is permitted up to 20 per cent. The maximum limit of 49 percent is applicable also to foreign banks having branch presence in India and wishing to make FDI in private banks.
		2008	Banks allowed to borrow funds from their overseas branches and correspondent banks up to a limit of 50 per cent of their unimpaired Tier I capital
<b>Other Actions</b>		2001	The guidelines for entry of the FIs into insurance business formulated
		2003	Less complex Over the Counter (OTC) interest rate rupee options permitted.
		2002	The Reserve Bank introduced the supervisory rating system based on "CAMELS" model for the FIs, on lines similar to banks.
		2003	Banks/FIs allowed to deal in exchange traded interest rate derivatives in a phased manner

<b>Areas of Reform</b>	<b>Initiatives</b>	<b>Dates</b>	<b>Chronology of Reforms</b>
		2003	Foreign banks operating in India permitted to remit net profits/surplus (net of tax) earned out of their Indian operations, in the normal course of business on a quarterly basis to their Head Offices without prior approval of the Reserve Bank, provided they meet the specified conditions.
		2004	Prudential guidelines on banks' investment in non-SLR debt securities issued to contain risks arising out of non-SLR investment portfolio of banks, in particular through private placement. The guidelines require that banks should not invest in non-SLR securities of original maturity of less than one year and also in unrated debt securities and unlisted shares of AIFIs
		2004	With a view to providing boost to the infrastructure lending, banks allowed to raise long term bonds with a minimum maturity of five years.
		2005	Introduction of asset-backed commercial paper (ABCP) to further deepen the CP market
		2005	Banks allowed to extend financial assistance to Indian companies for acquisition of equity in overseas joint ventures
		2005	The policy for authorisation of the branches of banks in India liberalised and rationalised
		2007	Banks permitted to undertake Pension Fund Management (PFM) through their subsidiaries set up for the purpose, subject to their satisfying the eligibility criteria prescribed by PFRDA for Pension Fund Managers and as per guidelines set out by the Reserve Bank.
		2009	Liberalisation of the FCCBs buyback policy

### Appendix B. Variables Definitions

Variable	Details
Return on Assets	Income minus expenses and provisions as percent of assets
Operating Profit/Assets	Return on Assets defined above plus provisions as percent of assets
Operating Expenses/assets	Sum of payments to employees, rent, taxes, printing, stationary, advertising, depreciation, post, telephone, insurance, and other expenditure as percent of assets
Wages/Assets	Payments to and provisions of employees as percent of assets
Nonwage Expenses/Assets	Operating expenses other than wages as percent of assets
Cash/Assets	Cash in hand and balances with the RBI as percent of assets
Credit (Other)/Assets	Advances made to "others" (i.e. to non government, non priority, and non bank sectors) as percent of assets
Investment in Government Securities/assets	Investment in Government Securities as percent of assets
Investment in Approved Securities/Assets	Investment in other approved Securities as percent of assets

The source of data for banking sector related variables is the RBI's database "*Statistical Tables Relating to Banks in India*" and "*Basic Statistical Returns*".

**Appendix C: Summary Statistics of the Variables**

<i>Variable</i>	<i>Number of Observations</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Minimum</i>	<i>Maximum</i>
Return on Assets	787	0.52	1.10	-7.51	2.34
Operating Profit/Assets	787	1.75	0.93	-1.83	4.49
Operating Expenses/assets	787	2.49	0.60	0.93	4.70
Wages/Assets	787	1.62	0.62	0.12	3.89
Nonwage Expenses/Assets	787	0.87	0.35	0.41	3.49
Cash/Assets	787	9.04	4.13	2.47	26.26
Credit (Other)/Assets	787	23.95	7.47	0.00	59.51
Investment in Government Securities/assets	787	25.11	6.05	11.29	44.74
Investment in Approved Securities/Assets	787	28.05	5.86	11.29	46.18
Statutory Liquidity Ratio	17	29.47	5.73	25	38.5
Gross Fiscal Deficit	17	5.45	1.1	3.45	7.84
Combined Fiscal deficit	17	7.91	1.37	5.58	9.94

### Appendix D: Banks and Ownership Details

<i>Banks</i>	<i>Ownership</i>	<i>Dropped</i>	<i>Comments</i>
Allahabad Bank	PSB		Included with no change
Andhra Bank	PSB		Included with no change
Axis Bank	PVT		UTI bank's name changed to Axis bank. UTI was established in 1995. Dropped the data for 1995, 1996.
Bank of Baroda	PSB		Bareilly Corporation bank merged in 1998 and Benaras State Bank merged in 2002. Added the data for all three banks.
Bank of India	PSB		Bank of Karad Merged in 1993--use data from 1993 for the merged bank
Bank of Madura		dropped	Merged with ICICI in 2001. Added the data in ICICI Bank.
Bank of Maharashtra	PSB		Included with no change
Bank of Punjab	PVT	dropped	Merged with Centurion bank in 2005. Added the data for the banks.
Bank of Rajasthan	PVT		Included with no change
Bareilly Corporation Bank	PVT	dropped	Merged with bank of Baroda in 1998
Benares State Bank	PVT	dropped	Merged with Bank of Baroda in 2002
Bharat Overseas Bank	PVT		Included with no change
Canara Bank	PSB		Included with no change
Catholic Syrian Bank	PVT		Included with no change
Central Bank of India	PSB		Included with no change
Centurion Bank	PVT	dropped	Name changed in 2005 to Centurion Bank of Punjab after merger with Bank of Punjab. The bank was created in 1995
Centurion Bank of India	PVT		Added the data for Bank of Punjab and Centurion Bank and used from 1997, since Centurion Bank was created in 1995. Merged with HDFC in 2008.
City Union bank	PVT		Included with no change
Corporation Bank	PSB		Included with no change
Dena Bank	PSB		Included with no change
Development Credit Bank	PVT		Included with no change
Dhanalakshmi Bank	PVT		Included with no change
Federal Bank	PVT		Merged with Ganesh bank in 2006. Added the data all through.
Ganesh Bank of Kurundwad	PVT	dropped	Merged with federal bank in 2006
Global Trust Bank	PVT	dropped	Merged with oriental Bank of Commerce in 2004. Global Bank was created in 1995. Thus use the data of the merged bank from 1997.
HDFC Bank	PVT		Times bank merged in 1999. Added the data throughout. HDFC created in 1995, thus use the data from 1997. (Centurion bank merged in 2008)
ICICI Bank	PVT		Merged Bank of Madura in 2001. Added the data. Merged ICICI personal finance and ICICI capital services in 2002. We do not have data for these entities. We drop 2002 and 2003 from the data. ICICI was created in 1995. Drop 1995, 1996 from the database. Merged Sangli bank in 2007, but

<i>Banks</i>	<i>Ownership</i>	<i>Dropped</i>	<i>Comments</i>
			since data for Sangli Bank is available till 2007 we do not do any corrections for this merger.
IDBI Bank	PVT		Merged with IDBI LTD. No data for IDBI LTD prior to 2005. Thus we use the data till 2004. The bank was created in 1995, thus we use the data from 1997.
IDBI LTD.	PSB	dropped	Created in 2005, merged IDBI Bank. Merged United Western Bank in 2006.
Indian Bank	PSB		Included with no change
Indian Overseas Bank	PSB		Included with no change
INDUSIND Bank	PVT		Bank created in 1995. Use the data from 1997
ING Vysya Bank	PVT	dropped	Data are available from 2003, when ING took over the Vysya bank and it was renamed as ING VYSYA bank in 2003. We use the data from 2004 as a new bank.
Jammu and Kashmir Bank	PVT		Included with no change
Karnataka Bank	PVT		Included with no change
Karur Vysya Bank	PVT		Included with no change
Kotak Mahindra Bank	PVT	dropped	Created in 2004.
Lakshmi Vilas Bank	PVT		Included with no change
Lord Krishna Bank	PVT		Included with no change
Nainital Bank	PVT		Included with no change
Nedungadi Bank	PVT	dropped	Merged with Punjab National Bank in 2003.
New Bank of India	PSB	dropped	Merged with Punjab national bank in 1993.
Oriental Bank of Commerce	PSB		Merged Punjab Cooperative bank in 1996; and Global Trust Bank in 2004. Added the data for all three banks all through.
Punjab and Sind Bank	PSB		Included with no change
Punjab Cooperative Bank	PVT	dropped	merged with Oriental Bank of Commerce in 1996
Punjab National Bank	PSB		Merged New Bank of India in 1993 and Nedungadi Bank in 2003. Added the data of all three banks all through.
Ratnakar Bank	PVT		Included with no change
Sangli Bank	PVT		Acquired by ICICI in 2007. Included with no change till 2006 (?)
SBI commercial and International Bank	PVT	dropped	Subsidiary of SBI , data from 1997. Not sure how to treat. Therefore dropped
South Indian Bank	PVT		Included with no change
State Bank of Bikaner and Jaipur	PSB		Included with no change
State Bank of Hyderabad	PSB		Included with no change
State Bank of India	PSB		Included with no change
State Bank of Indore	PSB		Included with no change
State Bank of Mysore	PSB		Included with no change
State Bank of Patiala	PSB		Included with no change
State Bank of Saurashtra	PSB		Included with no change
State Bank of Travancore	PSB		Included with no change
Syndicate Bank	PSB		Included with no change

<i><b>Banks</b></i>	<i><b>Ownership</b></i>	<i><b>Dropped</b></i>	<i><b>Comments</b></i>
Tamilnad Mercantile Bank	PVT		Included with no change
Times Bank	PVT	dropped	Merged with HDFC in 1999
UCO Bank	PSB		Included with no change
Union Bank of India	PSB		Included with no change
United Bank of Indian	PSB		Included with no change
United Western Bank	PVT		merged with IDBI in 2007
Vijaya Bank	PSB		Included with no change
Vysya Bank	PVT		Included till 2002. Merged with ING after that
Yes Bank	PVT	dropped	New bank data from 2005

Note: PSB refers to public sector bank, and PVT refers to private banks.

We started with the sample of all the banks which are included in the RBI's database and use the following procedure to clean up the data. We first drop the banks which do not exist since 1991. For the banks which were opened during the sample period we drop the data for the first two years after the banks were opened. Nine new banks were opened during 1994-1996: Bank of Punjab limited, Centurion Bank Limited, Global Trust Bank, HDFC Bank, ICICI, IDBI Bank, Indusind Bank, UTI Bank Limited and Times Bank Limited. We drop the banks which were opened only after 2004, these include Yes bank, IDBI Limited, and Kotak Mahindra Bank.

In case the name of a bank changed during the sample period we matched the name changes of the banks. We also record the information on mergers. In most instances the mergers were between a very small bank and a large bank. We dropped the merged bank from the database. For the parent bank we add up the balance sheets of the parent and merged bank and make it a merged bank from the beginning of the sample. In one case the merger of a bank in the database occurred with the financial companies not in the database—i.e. the ICICI's merger with the financial companies ICICI personal finance and capital services in 2002. We dropped the data for 2002 and 2003 for ICICI bank from the database. Our final sample consisted of the banks in Appendix Table above.