Ownership, Competition and Bank Productivity: An Analysis of Indian Banking in the Post-Reform Period

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This paper analyzes differences in productivity across bank types since the 1991 reforms. We investigate the effect of ownership and competition on bank productivity while controlling for size and structure of the bank. We find that Indian private banks dominate the public and foreign banks, both in terms of productivity levels and productivity growth and that competition affects banks differently depending on ownership. Public banks productivity shows little growth over the post reform period, and the new Indian private banks seemed to have led the change in productivity enhancement. However, the results differ in the pre and post-1998 period. The latter period shows a much higher productivity gap between the Indian private banks, and public and foreign banks. This is due to the faster productivity growth of Indian private banks in the post-1998 period. New Indian private banks are hurt by competition, whereas foreign banks thrive under it in the post-1998 period.

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1. Introduction

In India, the 1991 balance of payments crisis led to wide ranging reforms. Policymakers chose to implement financial deregulation gradually, with changes spread over almost the entire decade of the 1990s. This was largely because of the need to establish political consensus (Ahluwalia 1993) and because of the fear that a big bang approach would endanger macroeconomic stability. The reforms combined broad changes designed to correct macroeconomic incentives with bank sector specific measures[1]. One of the primary goals of restructuring was enhancing efficiency of the banking sector. Looking at various measures of performance it is clear that the liberalization has had some positive outcomes. We observe a fall in the share of non-performing loans in bank portfolios[2], increased entry of new private sector banks, branch expansion or financial widening as well as deepening, and the achievement of the capital adequacy ratio by ninety per cent of domestic banks (Ahluwalia 2002).

Most studies find that the reforms have had a positive impact on profitability and efficiency and private banks and new entrants have flourished. There have been steady positive growth rates in total assets and total loans and this increase is against a backdrop of improved competition. This trend held throughout the nineties and clearly captures changes in regulation that liberalized entry and operations of private banks. However, there is little discussion in the literature about the productivity gains on different types of banks since liberalization.

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[1] A detailed account of the reforms overall is provided in Mohan (2005) and Mor *et al* (2006)
[2] This could be a result of macro changes and not the regulatory ones. To account for this in the regressions we control for macroeconomic changes.

This paper is an attempt to address this question by carefully analyzing bank productivity and its relationship with bank ownership during the post-reform period. We find that the average productivity has increased considerably in the post-reform period (Figure 1), although productivity growth has been mixed (Figure 2), with downturns in 1996 and 2001. We want to analyze which types of banks have contributed to these changes in absolute productivity and productivity growth. Specifically, this paper focuses on the relationship between total factor productivity and productivity growth and ownership while controlling for market and individual bank characteristics. It also studies the interaction between ownership and competition to see which types of banks have been affected by market competition. The idea is to study both absolute productivity and the incremental productivity gains by various types of banks. The aim of the reforms was to increase productivity of large public banks. Therefore comparing productivity growth and absolute levels of productivity allows us to directly evaluate whether the reforms have achieved their target.

The primary findings are that Indian private banks dominate the public and foreign banks, both in terms of productivity levels and productivity growth and that competition affects banks differently depending on ownership. Indian private and foreign banks react very unfavorably to competition for both performance measures, while public banks remain unaffected. Public banks productivity shows little growth over the post reform period and the new Indian private banks seemed to have led the change in productivity enhancement. We also find that on average, as a bank increases in size its productivity first increases and then decreases, although the overall effect is positive. Also, as the range of services offered increases and banks diversify, bank productivity is

negatively affected while growth remains unaffected. We also find that output expansion leads to greater productivity. The derivation of these results and the detailed analysis follow. Section 2 gives a brief background of the banking reforms and related literature, data and methodology are in Section 3, Section 4 presents results, and the last section concludes.

2. Background and Related Literature

Regulation, administered interest rates, poor asset quality, and market segmentation had severely compromised banking profitability in the pre-reform era. Many banks had low capital adequacy and were earning less than reasonable rates of returns. One complication in the Indian context was the constrained nature of the Central Bank's role. Traditionally, the Reserve Bank of India's primary responsibility was the management of government debt and the monetization of the government's fiscal deficit (Reddy 2002) through the extension and rolling over of short-term credit, typically non-marketable treasury bills. RBI credit to the government was nearly 92 percent of the monetary base in 1990, suggesting a high degree of financial repression. A large part of debt management involved turning commercial banks into a captive market for low interest government paper through the statutory liquidity ratio requirement imposed by the RBI. Along with the cash reserve requirement, this pre-empted nearly two-thirds of the banks' deployable resources. In recent years, monetary and credit policy announcements place increasing emphasis on stabilizing inflation, which is in line with the recommendations of the Narasimham Committee, the Chakravarty Committee, and

the Vaghul Working Group. Interest deregulation and easier entry into the banking sector have also been features of the financial liberalization. However, problem areas remain: the implementation of contractual law, bankruptcy provisions, enforcement of creditor and property rights, and continued domination of public sector banks, which own 76 percent of the assets of the banking sector, necessitating the periodic recapitalization of weak public sector banks and obstructing the market from working effectively to promote survival of the fittest.

In general, experience from other countries show that deregulating and restructuring the banking sector leads to efficiency gain, however, the gain is different depending on bank type. Kumbhakar *et al*. (2001) have examined how deregulation affected the profitability of Spanish savings banks between 1986 and 1995 and they find declining levels of output technical efficiency, high rates of technical progress, and increasing trend growth in productivity. In a related paper for Portugal, Kanhato and Dermine (2003) show that deregulation has increased the efficiency of new domestic banks. Evidence from Poland and the Czech Republic also show that owned banks are more efficient than domestic banks (Weill 2003). Work on the Indian banking sector display some of the same patterns.

The Indian bank liberalization has generated a rich body of research that investigates different impacts of the deregulation policies on various efficient measures. Since regulation remains restrictive on foreign acquisitions in banking, most foreign investment in the sector is green-field and not through mergers and acquisitions. The empirical literature on Indian banks therefore largely examines differences in operational efficiency and profitability across private and state-owned banks as opposed to

differences across foreign and domestic banks (Ataullah et. al. 2004; Sabi 1996). Bhattacharyya, Lovell, and Sahay (1997) find that the impact of deregulation depends on ownership in the Indian case, though researchers point out that in most developing countries deregulation occurred after public sector banks became too dominant to be motivated to change (Denizer 1997; Sarkar and Bhaumik 1998).

The general perception is that public sector involvement in the banking sector blunts incentives to effectively respond to market-based reforms (Bhattacharya and Patel 2003; Kumbhakar and Sarkar 2003) so that deregulation benefits private banks. There is some evidence that private banks in India are more profitable than the public sector banks (excluding the State Banks of India and their branches) (De 2003). There is also evidence that even though nationalized banks appear to be less profitable than private and foreign banks, ownership is not the key determinant of efficiency and profitability. Intermediation costs depend on operating costs, priority sector lending, nonperforming loans, investment in government securities, and the composition of deposits (Koeva 2003). However, most of the studies are based on the early phase of liberalization. Bhaumik and Dimova (2004) however find that the results are different depending on time period studied. They find that private-sector and foreign banks were more efficient than public-sector banks initially, but after 1998–1999, neither ownership nor competition affects bank performance.

Bank performance is typically measured by return on assets (Berger and Mester, 2003; Bhaumik and Dimova, 2004; DeYoung et al.,1993; Hirschey,1999; Nippani and Green, 2002). However, this may not be the best measure of efficiency in an expanding sector where profitability may increase simply because of a combination of increasing

output prices and stable input costs, without any underlying efficiency gain. Focusing on productivity may help in understanding bank performance better. However, relatively few studies have focused on productivity directly ([1, 2] Bhattacharya et. al. 1997). Papers that address similar issues as those in this paper are primarily based on a cost function approach (Kumbhakar and Sarkar 2003). These find that liberalization has not yet yielded efficiency gains in general, though private banks have increased profitability by expanding output. In a similar vein, Das and Sanmugam (2004) employ a stochastic frontier function methodology and find that foreign banks are more technically efficient than their counterparts over 1992-99. We build on this literature by studying the impact of ownership on bank productivity directly while controlling for the impact of scale, diversification and market competition in a static AR (1) corrected panel data model. Specifically, we analyze how productivity has changed for different banks with reference to a base year performance. This allows us to directly observe which banks have had the largest productivity gains and the factors determining those gains.

3. Data and Methodology

Our dataset covers 106 banks over the decade immediately following the reforms. The main source of data is the Reserve Bank of India (RBI). Balance sheets and profit and loss statements are available for all banks in a consistent format over the period 1989-90 through 2003, although, employee data are available from 1996 for the new private banks and from 1992 for the rest. Thus our sample period is 1996-2004 for new Indian private banks and 1992-2004 for all others. The banks are classified into four

categories: eight State Banks of India, twenty nationalized or public sector banks, forty-five foreign banks (up from twenty-three in 1990), and thirty-four Indian private banks that can be further split up into "old private" and "new private" banks. Following the 1991 reforms, the total number of private banks increased from 47 to 70. The number of public sector banks remained more or less unchanged. It is important to emphasize again that all the new private banks are green-field ventures. Change in ownership through mergers and acquisitions have not been a feature of Indian banking.

Comparing some key statistics, we find that the overall trends in Indian banking, after deregulation, have been positive. We find that throughout the nineties, banks operating in India have seen a steady increase in assets, interest earned, loans and deposits (Table 1a). When comparing the different types of banks we find that there are significant differences in loans and deposits by ownership type (Table 1b) and these differences become more pronounced in the latter half of the nineties.

3.1 Measuring Productivity

There are two main approaches to measuring bank efficiency: the intermediation approach or the production function approach. The intermediation approach uses a combination of data envelopment analysis (DEA) and the Malmquist index (Charnes 1978; Ray 1991; Wheelock and Wilson 1999; Canhoto and Dermine 2003). These methods are based on a linear programming input-output technique, and estimate the relative efficiency of an organization. The primary advantages of this method are its non-parametric approach and the use of multiple inputs and outputs. The major drawback is

that "the frontier is defined on the outliers rather than on the whole sample and thereby particularly susceptible to extreme observations and measurement error" (Colwell and Davis 1992).

As an alternative, researchers have used the production function method which is based on the stochastic frontier approach and uses a parametric translog cost function to estimate the efficiency frontier (Berger and Humphrey 1990; Berg and Kim 1991; Allen and Rai 1996; Altunbas et. al 2001; Kumbhkar et. al 2001; Weill 2003). Although superior in some respects to the DEA, this too has some drawbacks. This method does not correct for the endogeneity of inputs, selection bias, and unobserved permanent heterogeneity across banks. Endogeneity arises from the fact that capital structure is correlated with current productivity since both are likely to depend on historical productivity. This will affect current input choice, so that banks with a larger capital stock may continue to produce even at low productivity levels. The coefficient on capital may therefore be biased downward. The selection bias exists because OLS does not control for bank exit, which may be correlated with a negative productivity shock. To incorporate these corrections, we use a different technique to calculate the total factor productivity (TFP) of banks.

The productivity estimates in this paper are based on a two-stage modified version of the Olley-Pakes (1996) firm productivity estimation that was developed by Levhinson and Petrin (2003)[3]. We use loans plus deposits as the measure of output[4]. The input vector comprises labor (number of employees), capital (fixed capital) and an intermediate

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[3] The L-P method does not correct for selection effects. However, there are negligible exits in the Indian banking sector and this is not of major concern.
[4] In Sanyal & Shankar, 2007 we have used 3 alternative measures of output: total income, loans and loans plus deposits. For current purposes loans plus deposits seem to be the best measure to use. However, the other measures do not yield significantly different results in terms on our variables of interest.

input (expenditures on communication)[5]. We use non-linear least squares to estimate the production function and TFP is calculated as the residual (difference between the estimated and observed productivity). We also construct a productivity growth measure[6] based on the above statistics. Summary statistics are presented in Table 2a and Figure 3 and 4 displays the productivity and productivity growth measure by bank type.

One striking fact that emerges is the dominance of the Indian private banks. The banking reforms, as discussed before, were primarily aimed at increasing the productivity and efficiency of the public sector banks. The private and foreign banks were operating in a less constrained environment when compared to the public banks even before liberalization and their productivity gains in the post-liberalization period have been modest. From Figure 3 however, it seems that at least in terms of productivity levels, the public banks still lag far behind their foreign counterparts. However this may not give us the entire picture as public banks began from a very low level of productivity and maybe playing catch up. In order to investigate this we look at the trends in productivity growth. From Figure 4a it seems that public banks have displayed very little productivity growth (almost zero), and the private and foreign banks show mixed results.

But we need to formulate an empirical model that will investigate the influence of bank deregulation on gains in productivity by various bank ownership types controlling for other confounding effects. The next section does just that.

3.2 Empirical Specification

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[5] For a detailed analysis please refer to Sanyal & Shankar, 2007.
[6] Productivity Growth=$((TFP_{ijt}-TFP_{ijt-1})/TFP_{ijt-1})*100$, where i=bank, j=ownership type and t=year.

With these productivity estimates in hand, we study two primary questions. First, we investigate whether ownership is a critical determinant of bank productivity. Second, we study whether competition has a different impact on productivity depending on ownership. We estimate the following specification by a feasible GLS model controlling for bank specific characteristics and time fixed effects and correcting for panel heteroskedasticity and first order auto correlation.

$$p_{it} = \alpha + \theta\delta_j + \beta x_{it} + \chi T_t + \lambda Z_t \varepsilon_{it} \qquad (2)$$

where: p_{it} are the productivity difference measures, δ_j is a dummy variable that captures the ith bank's ownership category such that the coefficient indicates the impact of ownership j relative to the excluded ownership category, x_{it} contains bank-specific explanatory variables listed in Table 2b, T_t are year dummies, z_t contains macro variables, α is the intercept, and ε_{it} is the error term. Ownership categories are the State Banks of India, nationalized banks, old private banks, foreign banks, and new private banks (incorporated after 1995). "j" therefore goes from 1 to 5, "i" from 1 to 299, and "t" from 1992 to 2004. To control for contemporaneous correlation and endogeneity issues, several of the right hand variables in x_{it} are included with a lag.

In addition to ownership, competition is a primary variable of interest. Our measure of competition[7] is a four bank concentration ratio. We compute four different market shares based on total income of the bank, total assets owned, loans and loans plus deposits. We also ran estimates with a measure based on the Herfindahl index. Including an interaction term, between ownership and competition, allowed us to analyze the

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[7] Competition index = 1-Herfindahl Index or 1- Concentration Ratio. These are calculated as follows: Herfindahl Index = Σ(market share of bank i)^2 where i=all banks in the country. Concentration Ratio = Σ(market share of bank i) where i denotes the 4 largest banks (by market share). Both are bounded above by 1.

response of different bank types to growing competition in the market for intermediary services – loans and deposits. The main results are robust to alternative definitions. For the final concentration ratio measure, we use total income for defining market share. We base our choice on the fact that the loans and deposits measures may give a partial picture by focusing on specifics and the total asset definition does not quite capture current changes as well as the total income measure.

We also included bank-specific controls such as the size of the bank (as measured by total assets)[8], share of non-interest expenditure (a measure of operational efficiency or output expansion) and a diversification measure (share of non-interest income which may be interpreted as a bank quality measure and indicates range of bank output). In addition two macro variables: a lagged term in GNP per capita to control for business cycle effects and a stability measure (1/ inflation). For the growth regressions we include an additional variable that measures the size growth of a bank. Also, we use a lagged per capita GNP growth variable instead of log GNP per capita. For both sets of regressions, we include a regime change dummies that indicate the rules changes in 1996 to account for structural changes in the economy. Mor *et al* (2006) presents evidence that serious micro restructuring of firms and banks began only in mid-1996, after the "low quality" investment boom which followed the 1991 reforms. We also include bi-yearly dummies to control for other macro shocks. 2003 marked the end of that first phase of reforms and can be said to be the beginning of real improvements in productivity, at least in other firms. Thus, we may expect the 2003-2004 dummy to be positive and significant.

From the summary statistics presented in Appendix Table 2a and 2b, some facts stand out. First, the productivity of the Indian public banks is an order of magnitude

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[8] Using total income as a size measure leaves results unchanged

lower than that of private banks. Surprisingly, foreign bank productivity is also much lower than that of Indian private banks. When looking at the growth patterns we see that there has been negligible productivity growth for the public banks and the old Indian private banks show positive but declining growth rates. Foreign banks seem to have taken a negative hit in the post-1997 period and actually have slightly negative productivity growths. The only banks that seemed to have increased growth rates are the new Indian private banks, although these rates are still lower than the old Indian private banks. These trends are best captured in Figures 2a and 2b. In the next section we investigate whether these differences by ownership persist even when other banks characteristics re controlled for.

4: Results

4.1 Productivity

Appendix Tables 4A and B present evidence that even in the post-deregulation period, there are significant differences between public and private banks (Table 4A), and between Indian domestic and foreign banks (Table 4B). These appendix tables present the coefficients from the regressions models. However, the interactions between the ownership dummy and competition make the interpretation of the coefficients difficult. Thus in Table 1 below we compute the aggregate elasticities[9] for these appendix tables.

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[9] See Halvorsen, R. and Palmquist, P. (1980), and Kennedy, P. (1981) for interpretation of the dummy variable when the dependent variable is in logarithms. These papers show that if b is the estimated coefficient on a dummy variable and V(b) is the estimated variance of b, then an estimate of the percentage impact of the dummy variable on the variable being explained is given by $100 (\exp(b - V(b)/2) - 1)$.

TABLE 1
ELASTICITIES AND SEMI-ELASTICITIES FOR TABLE 4A & 4B
PRODUCTIVITY LEVEL REGRESSIONS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Base category for ownership: Public Banks (TABLE 4A)				Base category for ownership: Foreign Banks (TABLE 4B)			
	Elasticity/ Semi-Elasticity							
Private Bank Dummy	38.256*** (16.706)							
Domestic Bank Dummy					27.499** (14.069)			
Indian Private Bank Dummy		62.833*** (1.010)				52.808*** (0.648)		
Old Indian Private Bank Dummy			61.424*** (0.987)				51.562*** (0.770)	
New Indian Private Bank Dummy				84.846*** (4.565)				213.121 (210.202)
	Public Banks				Foreign Banks			
Competition Measure (Lag 1 Yr.)	No effect	-0.243** (0.098)	-0.197** (0.090)	No effect	-0.335*** (0.105)	-0.842*** (0.145)	-0.760*** (0.135)	-0.288** (0.211)
	Private Banks	Indian Pvt. Banks	Old Indian Pvt.	New Indian Pvt.	Domestic Banks	Indian Pvt. Banks	Old Indian Pvt.	New Indian Pvt.
	0.229 *** (0.084)	1.462*** (0.126)	1.524*** (0.121)	-0.309*** (0.104)	-0.086 (0.103)	0.864*** (0.154)	0.885*** (0.150)	-0.288** (0.128)
Size	0.356*** (0.023)	-0.061** (0.027)	-0.071*** (0.026)		0.592*** (0.035)	0.082*** (0.025)	0.108*** (0.029)	0.147*** (0.031)

Note: In table 4A and 4B the dependent variable is the estimated productivity (in logs). The elasticity for the ownership dummies is calculated following Halvorsen, R. and Palmquist, P. (1980), and Kennedy, P. (1981) The result developed in these papers show that if b is the estimated coefficient on a dummy variable and V(b) is the estimated variance of b, then an estimate of the percentage impact of the dummy variable on the variable being explained is given by 100 (exp(b - V(b)/2) - 1).

From Appendix Table 4A column 1 we find that the interaction between the ownership dummy and competition is positive and significant implying that as competition increases the productivity of private banks (both Indian and foreign) is higher than that of public banks. From the elasticities presented in Table 1 column 1 above, we find that private bank productivity is 38 percent higher than that of public banks. This is not a surprising result since we expect private banks to have higher productivity compared to public banks. We also find that competition has no impact on public banks. Private banks however, react positively to competition, and their productivity increases by 0.23 percent as competition increases by a percent. However, the difference is smaller than we would expect. Private banks constitute a heterogeneous category comprising of old Indian private banks, new Indian private banks, and foreign banks. To investigate which type of private bank is leading the productivity difference, we separate them into different cohorts and then compare them to public banks.

In Table 1 column 2, we compare the public banks to the Indian private banks to get a clearer picture of where the productivity differences are originating. We find that Indian private bank productivity is about 63 percent higher than that of public banks. In addition, a 1 percent increase in competition decreases public bank productivity 0.24 percent. A plausible explanation is that after years of being protected by the government, public banks are not well-equipped to handle competitive pressures. Now we observe that the private banks thrive under competition and productivity increases by 1.5 percent with a 1 percent increase in competition. However, Indian private banks are not a homogenous group and the behavior of old and new banks are quite different. To gain further understanding of how ownership and competition affects bank productivity, we further

divide Indian private banks into old and new banks and compare each category to the public banks (Table 1 column 3and 4). We find that there is a larger difference in productivity between new Indian private banks and the public banks than the old private and public banks. We also observe that the earlier competition results are driven by the old private banks. New private banks actually suffer productivity losses when competition increases. Putting the results together, it appears that private ownership has a positive impact on productivity, although the effect of competition is more nuanced and depends on the type of private ownership.

To investigate the above results further, we analyze how productivity differs between the domestic and foreign owned banks (Appendix Table 4B). From the elsaticities presented in Table 1 column 5 we find a surprising result. Domestic banks are approximately 27.5 percent more productive than their foreign counterparts. It seems that the post liberalization period has not been favorable to the foreign banks (as borne out earlier in the summary statistics). To study whether this difference between domestic and foreign banks is driven by the higher productivity of the Indian private banks, in column 6 we compare Indian private banks to foreign banks. From the aggregate elasticities presented in column 4 we find that the Indian private banks are 52.8 percent more productive than the latter. From columns 7 and 8 we observe that the productivity difference between domestic and foreign banks is being driven primarily by the old Indian private banks whose productivity is 52.6 percent higher than the foreign banks. As with the comparison with domestic banks, we find that old Indian private banks thrive under competition while the new ones suffer. Foreign bank productivity always suffers when competition increases.

For appendix Tables 4A and B we find that bank size has a non-monotonic relationship with productivity and this relationship is influenced by the types of banks in the estimation sample. For samples that include foreign banks, we find that that as a bank increases in size its productivity first increases and then decreases, although the overall effect (from Table 1) is positive, and ranges between 0.1 and 0.4 percent. However when foreign banks are excluded (Table 1 column 2-4), we find the reverse effect – a 1 percent increase in size decreases productivity by 0.07 percent. Thus, the positive results on bank size appear to be driven by the foreign banks. We interpret the results as evidence that expansion by foreign banks can lead to productivity increases, whereas domestic bank expansion may not be optimal. This result has implications for bank consolidation and optimal bank size in the Indian context.

In India it is widely believed that the improving market share of private banks is associated with an improvement in the range and quality of services offered to the consumer. As the range of services offered increases, and as banks move away from core activities (such as small deposit mobilization) and diversify, non-interest income (fees and commissions) as a proportion of total income is expected to increase. From Appendix Table 4A and B we find that bank productivity is negatively affected by diversification, a result contrary to findings in the literature. We hypothesize that banks in India are still new to lines of business other than their core activity of credit creation. Thus the negative effect shows that they have not been able to diversify efficiently as of date.

Another result, contrary to expectation, is the positive sign on the share of non-interest expenditure when foreign banks are included in the sample. When foreign banks are excluded (Appendix Table 4A, column 2-4), this variable has a negative coefficient.

If we interpret this variable as measuring operational efficiency (i.e. greater this ratio, the more inefficient a bank is), then the positive coefficient implies that less efficient banks are more productive. However, we believe that this variable is proxying for output expansion instead of capturing operational efficiency. When banks expand they need to spend on infrastructure, advertising and deposit mobilization. We believe that these are the quantities captured in the share of non-interest expenditure. Hence we can interpret our result as output expansion leading to greater productivity only for the foreign banks. Last, the 1996 dummy and the macro-economic variables have little or no impact on bank productivity.

4.2 Productivity Growth

The previous results all pertain to the level of bank productivity. We find that public bank productivity stills lags far behind that of private banks and foreign banks have not fared well in the post-liberalization period. This may imply that in terms of fundamental productivity enhancement, the reforms may not have been very successful for the public banking sector. However, it may be the case that public and foreign banks are learning to cope in the newly liberalized Indian market and are growing at a faster pace than their private counterparts and may eventually catch up. Therefore in the next section we analyze productivity growth for the various banks in the post-reform period. As before, the raw coefficient estimates are presented in Appendix Tables 5A (compares public and private banks) and B (compares domestic and foreign banks). Table 2 below provides the aggregate elasticities.

TABLE 2
ELASTICITIES AND SEMI-ELASTICITIES FOR TABLE 5A & 5B
PRODUCTIVITY GROWTH REGRESSIONS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Base category for ownership: Public Banks (TABLE 5A)				**Base category for ownership: Foreign Banks (TABLE 5B)**			
	Elasticity/ Semi-Elasticity							
Private Bank Dummy	1.424*** 0.243							
Domestic Bank Dummy					0.840*** (0.235)			
Indian Private Bank Dummy		3.128*** (0.377)				2.527*** (0.263)		
Old Indian Private Bank Dummy			3.217*** (0.417)				2.533*** (0.269)	
New Indian Private Bank Dummy				6.376*** (2.424)				5.970*** (2.020)
Competition Measure (Lag 1 Yr.)	Public Banks				Foreign Banks			
	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
	Private Banks	Indian Pvt. Banks	Old Indian Pvt.	New Indian Pvt.	Domestic Banks	Indian Pvt. Banks	Old Indian Pvt.	New Indian Pvt.
	-13.806*** (2.382)	-12.992*** (3.007)	-13.705 *** (2.948)	-30.707 ** (13.785)	8.817 *** (2.410)	-7.233** (2.841)	-6.826 *** (2.565)	-19.146 * (10.702)

Note: In table 6A and 6B the dependent variable is the estimated productivity growth (in percentage)

From Table 2 above we find that private bank productivity growth is 1.4 % higher than that of public banks (column 1). When comparing the Indian private banks to the public ones we find that both old and new Indian private banks show a higher productivity growth compared to the public banks, with the new ones having 6.4% higher growth than public banks (column 4). The same pattern in observed when we compare the domestic and foreign banks (columns 5 – 8). Domestic banks have a higher productivity growth than foreign banks and this difference is primarily driven by the new Indian private banks whose productivity grow is 6 percent higher than that of their foreign counterparts (column 8). The productivity growth of Indian public banks and foreign banks are unaffected by competition. However, all types of Indian private banks are adversely affected. Combining the results we conclude that Indian private bank productivity is growing at a faster pace than that of public banks, and that the new Indian private banks are leading the charge. Foreign bank productivity is growing at a much slower pace when compared to the Indian private banks. In addition, competition is hampering productivity growth for the Indian private banks.

From Appendix Tables 5A and B, we also find that on average size growth is negatively related to productivity growth, i.e. a bank that is expanding has lower productivity growth when compared to one that is not expanding. In addition larger banks show lower productivity growth. As seen in the levels regression, the share of non-interest expenditure has a positive sign, and the interpretation is the same as previously described. Other variables have no impact on productivity growth. In summary, we find that even in terms of productivity growth, Indian private banks outperform the public and foreign banks. However, their productivity growth is adversely affected by competition.

4.3 Stability

The above results show the mean relation between ownership, competition and productivity for the entire sample period. However, there were significant changes in the Indian banking landscape in the latter half of the 1990s. Specifically, the entry of new Indian private banks around 1996-1997, introduced greater competition in the market. Thus we want to test whether the relationship found above is stable across the sample period, or whether there are significant changes in the relationship in the latter parts on the 1990s. To investigate this question we divide our sample into pre-1998 and post-1998 periods and re-estimate our earlier productivity level and growth regressions for each sample period. We first compare the public banks with all the private banks and then with the Indian private banks. Next we compare the foreign banks with the universe of domestic banks and then again with the Indian private banks. The coefficient estimates are presented in Appendix Table 6. Columns 1a-4b present the results for the productivity levels equation and columns 5a-8b present the results for the growth regressions.

The first fact that emerges from Appendix Table 6 is difference between the two sample periods. Ownership and competition have differing impact on productivity and productivity growth in the two cohorts. First, we find that private bank productivity, and especially Indian private bank productivity is greater than public bank productivity in the post-1998 period (column 1a-2b). We find the same pattern when we compare the domestic banks to the foreign banks. In addition the competition effect is different in the two periods. In Table 3 below we compute the aggregate elasticities when the interaction between competition and ownership is taken into account.

TABLE 3
ELASTICITIES AND SEMI-ELASTICITIES FOR TABLE 6
STABILITY: PRODUCTIVITY LEVEL REGRESSIONS

Sample	Pre-1998	Post-1998	Pre-1998	Post-1998	Pre-1998	Post-1998	Pre-1998	Post-1998
			PRODUCTIVITY					
Base category for ownership: Public Banks					**Base category for ownership: Foreign Banks**			
	1a	1b	2a	2b	3a	3b	4a	4b
Private Bank Dummy	16.552 (20.232)	49.993*** (2.280)						
Indian Private Bank Dummy			48.786*** (1.298)	74.971*** (1.203)			39.927*** (0.723)	120.552* (72.332)
Domestic Bank Dummy					24.557* (14.268)	47.326 (34.006)		
Competition Measure (Lag 1 Yr.)	Public Banks				Foreign Banks			
	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
	Private Banks		Indian Pvt. Banks		Domestic Banks		Indian Pvt. Banks	
	No effect	-0.346** (0.169)	0.576*** (0.092)	-0.264** (0.128)	0.153* (0.078)	No effect	0.653*** (0.091)	No effect

Note: The coefficient estimates for these tables are presented in Appendix Table 6, columns 1a-4b. The elasticity for the ownership dummies is calculated following Halvorsen, R. and Palmquist, P. (1980), and Kennedy, P. (1981) The result developed in these papers show that if b is the estimated coefficient on a dummy variable and V(b) is the estimated variance of b, then an estimate of the percentage impact of the dummy variable on the variable being explained is given by 100 (exp(b - V(b)/2) - 1)

First, from Table 3 column 1a and b above, comparing public and private banks we find that private bank productivity id almost 50 percent higher than that of public bank productivity in the post-1998 period. There is no significant difference between the two in the pre-1998 period. This pattern is even more pronounced for the Indian private banks which are more productive compared to the public banks in the latter years than the earlier ones. When compared to foreign banks, domestic banks show higher productivity in the post-1998 period. However, when the sample is restricted to Indian private banks (columns 4a and b) we find that these are more productive than the foreign banks in both periods, but the difference is an order of magnitude greater. On average, competition increases Indian private bank productivity in the earlier period and either adversely affects, or has no significant effect, on productivity in the latter period. Thus to summarize, the productivity gap between public and private banks, and between the Indian and foreign banks are greater in the post-1998 period.

To investigate what explains this divergence, in Appendix Table 6, columns 5a-8b we compare the productivity growth of different types of banks in these two periods. We find that all private banks and Indian private banks in particular, have had a much higher productivity growth when compared to the public or foreign banks. However, as seen in the productivity levels results, competition has a substantial detrimental effect on these banks primarily in the post-1998 period. In Table 4 below we compute the aggregate elasticities and find that although on average, Indian private banks productivity growth is about 2 percent higher when compared to both public and foreign banks, they take a tremendous hit as competition increases (column 2b and 4b). Foreign banks however, seem to thrive under competition in the post-1998 period.

TABLE 4
ELASTICITIES AND SEMI-ELASTICITIES FOR TABLE 6
STABILITY: PRODUCTIVITY GROWTH REGRESSIONS

Sample	Pre-1998	Post-1998	Pre-1998	Post-1998	Pre-1998	Post-1998	Pre-1998	Post-1998
	PRODUCTIVITY							
	Base category for ownership: Public Banks				Base category for ownership: Foreign Banks			
	1a	1b	2a	2b	3a	3b	4a	4b
Private Bank Dummy	2.038*** (0.292)	1.472*** (0.314)						
Indian Private Bank Dummy			No effect	2.800*** (0.524)			No effect	2.041*** (0.324)
Domestic Bank Dummy					No effect	No effect		
Competition Measure (Lag 1 Yr.)	Public Banks				Foreign Banks			
	No effect	No effect	No effect	No effect	No effect	No effect	No effect	66.692** (32.834)
	Private Banks		Indian Pvt. Banks		Domestic Banks		Indian Pvt. Banks	
	-8.237* (4.302)	-44.451*** (10.745)	No effect	-81.921*** (13.405)	No effect	No effect	No effect	-85.772** (37.113)

Note: The coefficient estimates for these tables are presented in Appendix Table 6, columns 5a-8b.

5. Conclusions

In this paper we investigate whether these reforms have indeed worked in a way that had been envisioned by the policy makers. We take a different approach from papers that examine similar issues. Our measure of performance is not profitability. For this paper we want to focus of bank productivity and productivity growth after liberalization. For Indian banks, specially the public sector ones, the government often bails out ailing entities by pumping money into them. This is almost a 'free' injection of cash into their system and measures of profitability may thus be contaminated and not contain appropriate information about performance. Bank productivity however, does not suffer from such problems. It is measured by the total factor productivity which is essentially the difference between the output and input of a bank.

In this paper we use estimates of bank total factor productivity (TFP) that are calculated from bank production functions using the Levihnson-Petrin technique which corrects for endogeneity and selection issues. We investigate the impact of ownership and competition on productivity gain while controlling for bank specific characteristics, the macro environment of the country and regime changes in the financial market. In addition we test whether the effect of ownership and competition is different across the sample period.

The primary findings for the entire sample period are that Indian private banks dominate the public and foreign banks, both in terms of productivity levels and productivity growth, and that competition affects banks differently depending on ownership. We find that Indian private bank productivity is much higher than that of public banks, and that both old and new Indian private banks have much higher

productivity than the public banks. Domestic banks have a higher productivity than foreign banks and this difference is being driven primarily by the old Indian private banks whose productivity is 52.6 percent higher than the foreign banks. However, on the productivity growth side the new Indian private banks are leading the charge and their productivity growth is 6 percent higher than that of their foreign counterparts. However, this higher growth rate is hampered by increasing competition.

The above results however hide important differences across the sample period. Comparing pre- and post-1998 periods we find that ownership and competition have differing impact on productivity and productivity growth in these two periods. Indian private bank productivity is higher than both public banks and foreign banks in both periods. However, the post-1998 period, shows a much higher productivity gap than the pre-1998 period. This is explained by the productivity growth regressions where we find that Indian private bank productivity is growing at a faster pace in the post-1998 period when compared to the public and foreign banks. In addition, the negative effect of competition on Indian private banks productivity is a post-1998 phenomenon. Foreign banks seem to thrive under competition during this period.

Putting the results together it appears that private ownership has a positive impact on productivity, although the effect of competition is more nuanced and depends on the type of private ownership. Although currently both old and new Indian private banks are faring better than their foreign counterparts, the latter may close the gap in the future. However, public bank productivity stills lags far behind that of private banks. The banking reforms were primarily aimed at increasing the efficiency of the large public

banks and in this paper we present preliminary evidence that they may not have been successful, at least in terms of raising productivity.

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APPENDIX
TABLE 1A
MEANS FOR SOME KEY VARIABLES
(ALL BANKS)

Year	Means				Totals			
	Loans	Deposits	Interest Earned	Total Assets	Loans	Deposits	Interest Earned	Total Assets
1992	2.725	4.831	0.601	9.827	193.463	343.012	42.643	697.746
1993	2.678	5.008	0.590	9.365	192.803	360.611	42.512	674.285
1994	2.483	5.342	0.562	8.929	178.800	384.594	40.430	642.863
1995	2.847	5.717	0.606	8.964	204.955	411.644	43.596	645.425
1996	2.788	5.238	0.626	7.942	231.422	434.767	51.931	659.154
1997	2.818	5.649	0.681	7.724	239.514	480.163	57.871	656.571
1998	2.832	5.805	0.655	7.312	260.537	534.021	60.219	672.736
1999	3.050	6.384	0.723	7.717	283.675	593.746	67.280	717.688
2000	3.428	6.986	0.765	8.132	329.131	670.698	73.410	780.713
2001	4.031	7.943	0.870	9.000	386.950	762.536	83.484	863.999
2002	5.298	9.403	0.979	10.857	471.491	836.887	87.120	966.242
2003	5.967	10.517	1.087	11.428	519.148	915.010	94.560	994.197
2004	7.069	12.543	1.137	13.088	586.703	1041.047	94.349	1086.29

Note: Main State Bank of India excluded. All numbers are in Rupees Crores (tens of millions) (1999 prices).

TABLE 1B
MEANS OF LOANS, DEPOSITS AND TOTAL ASSETS BY BANK TYPE

Bank Type	Year	Loans	Deposits	Total Assets
State Bank of India*	1992 -1996	2.668	4.648	8.385
	1997-2000	3.710	6.946	9.046
	2001-2004	6.126	11.304	12.470
Nationalized Banks	1992 -1996	7.708	15.291	25.673
	1997-2000	9.613	21.055	25.179
	2001-2004	15.710	30.778	31.342
Old Private	1992 -1996	0.664	1.230	2.013
	1997-2000	1.253	2.442	2.922
	2001-2004	1.995	3.822	3.876
New Private	1997-2000	1.639	3.259	4.141
	2001-2004	9.123	12.362	17.786
Foreign Banks	1992 -1996	0.802	1.446	2.910
	1997-2000	0.828	1.192	1.951
	2001-2004	1.275	1.704	2.579

Note: *Main State Bank of India excluded. All numbers are in Rupees Crores (tens of millions) (1999 prices).

TABLE 2A
SUMMARY OF PRODUCTIVITY MEASURE

Year		State Banks of India	Nationalized Banks	Old Indian Private Banks	New Indian Private Banks	Foreign Banks
1992 – 1996	Mean	0.00004	0.00000001	0.408	0.547	0.085
	S.D.	0.00001	0.000000006	0.102	0.273	0.046
	Min.	0.00002	0.000000004	0.187	0.070	0.017
	Max.	0.0001	0.00000003	0.757	0.757	0.330
1997 - 2000	Mean	0.00005	0.00000001	0.531	0.593	0.109
	S.D.	0.00001	0.000000006	0.077	0.116	0.090
	Min.	0.00004	0.000000005	0.387	0.439	0.006
	Max.	0.0001	0.00000003	0.705	0.757	0.717
2001 - 2004	Mean	0.00005	0.00000001	0.572	0.524	0.098
	S.D.	0.00001	0.000000005	0.077	0.122	0.051
	Min.	0.00003	0.000000005	0.325	0.285	0.002
	Max.	0.0001	0.00000002	0.757	0.757	0.301

TABLE 2B
SUMMARY OF PRODUCTIVITY GROWTH

Year		State Banks of India	Nationalized Banks	Old Indian Private Banks	New Indian Private Banks	Foreign Banks
1992 – 1996	Mean	0.0006	0	3.747		0.627
	S.D.	0.0005	0	7.043		4.000
	Min.	-0.0002	0	-21.725		-13.183
	Max.	0.0016	0	23.279		20.111
1997 - 2000	Mean	0.0002	0	2.673	0.658	-0.574
	S.D.	0.0007	0	7.233	16.019	5.674
	Min.	-0.0018	0	-21.725	-21.725	-21.725
	Max.	0.0014	0	23.279	23.279	23.279
2001 - 2004	Mean	-0.0002	0	1.345	0.837	-0.445
	S.D.	0.0006	0	6.259	12.566	5.544
	Min.	-0.0013	0	-16.444	-21.725	-21.725
	Max.	0.0016	0	20.191	23.279	19.643

TABLE 4A
PRIVATE V/S PUBLIC BANKS
Dependent Variable: Estimated Productivity (in Logs)

	(1)	(2)	(3)	(4)
Base category for ownership: Public Banks				
Private Bank Dummy	0.038			
	(0.121)			
Indian Private Bank Dummy		-1.218***		
		(0.093)		
Old Indian Private Bank Dummy			-1.242***	
			(0.092)	
New Indian Private Bank Dummy				2.588***
				(0.678)
Competition Measure (Lag 1 Yr.)	-0.069	-0.406**	-0.330**	-0.004
	(0.088)	(0.163)	(0.151)	(0.059)
Interaction: Owner. Dum. & Competition	0.552***	2.851***	2.885***	-3.291***
	(0.202)	(0.155)	(0.154)	(1.105)
Bank Characteristics				
Size	0.374***	-0.062**	-0.072***	0.048
	(0.026)	(0.028)	(0.026)	(0.078)
Size Squared	-0.010***	0.002**	0.002***	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)
Diversification Variable (Lag 1 Yr.)	-0.012	0.001	-0.000	0.003
	(0.020)	(0.040)	(0.038)	(0.020)
Sh. of Non-Interest Expenditure(Lag 1 Yr.)	0.115***	-0.041	-0.056*	0.005
	(0.018)	(0.034)	(0.032)	(0.017)
Other Controls				
Stability	-0.018	-0.041	-0.023	-0.001
	(0.032)	(0.058)	(0.054)	(0.022)
Log (Per Capita GNP) (Lag 1 Yr.)	0.030	0.093**	0.075*	-0.001
	(0.025)	(0.047)	(0.043)	(0.017)
1996 Dummy	-0.002	0.004	0.005	0.001
	(0.005)	(0.018)	(0.009)	(0.006)
Constant	-3.891***	-0.041	0.196	-0.449
	(0.345)	(0.522)	(0.486)	(0.758)
Observations	1089	687	626	399
No. of Banks	106	59	52	33
Wald Stat.: Chi-Sq.	1117.472	1661.189	1595.239	943.324

Note: Private banks comprise both Indian and Foreign private banks. GLS estimation with panel auto-correlated standard errors and hetroskedastic panels, and are bootstrapped. Standard errors in parentheses. Range: 1992 – 2004. All equations contain bi0yearly fixed effects. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 4B
PRODUCTIVITY: DOMESTC V/S FOREIGN BANKS
Dependent Variable: Estimated Productivity (in Logs)

	(1)	(2)	(3)	(4)
Base category for ownership: Foreign Banks				
Domestic Bank Dummy	-0.047			
	(0.110)			
Indian Private Bank Dummy		-1.282***		
		(0.093)		
Old Indian Private Bank Dummy			-1.230***	
			(0.106)	
New Indian Private Bank Dummy				1.367**
				(0.671)
Competition Measure (Lag 1 Yr.)	-0.559***	-1.402***	-1.268***	-0.478**
	(0.175)	(0.242)	(0.226)	(0.211)
Interaction: Owner. Dum. & Competition	0.415**	2.840***	2.744***	-1.439
	(0.184)	(0.156)	(0.178)	(1.094)
Bank Characteristics				
Size	0.601***	0.084***	0.110***	0.150***
	(0.035)	(0.025)	(0.029)	(0.031)
Size Squared	-0.019***	-0.003***	-0.004***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Diversification Variable (Lag 1 Yr.)	0.013	-0.028*	-0.027*	-0.026*
	(0.013)	(0.016)	(0.016)	(0.015)
Sh. of Non-Interest Expenditure (Lag 1 Yr.)	0.106***	0.027*	0.040***	0.060***
	(0.016)	(0.015)	(0.015)	(0.014)
Other Controls				
Stability	0.056	0.011	0.037	0.091
	(0.053)	(0.081)	(0.076)	(0.074)
Log (Per Capita GNP) (Lag 1 Yr.)	0.154***	0.258***	0.247***	0.050
	(0.041)	(0.063)	(0.059)	(0.056)
1996 Dummy	0.008	0.037***	0.029**	0.028
	(0.008)	(0.013)	(0.012)	(0.019)
Constant	-5.813***	-2.153***	-2.347***	-1.288**
	(0.520)	(0.647)	(0.619)	(0.607)
Observations	1089	751	690	463
No. of Banks	106	80	73	54
Wald Stat.: Chi-Sq.	551.942	10668.903	7195.595	980.759

Note: GLS estimation with panel auto-correlated standard errors and hetroskedastic panels and are bootstrapped. Standard errors in parentheses. Range: 1992 – 2004. All equations contain bi-yearly fixed effects. * significant at 10%; ** significant at 5%; *** significant at 1%.

PRODUCTIVITY GROWTH: PRIVATE V/S PUBLIC BANKS
Dependent Variable: Estimated Productivity Growth (Percentage)

|	(1)	(2)	(3)	(4)
Base category for ownership: Public Banks				
Private Bank Dummy	21.621***			
	(3.482)			
Indian Private Bank Dummy		28.940***		
		(6.027)		
Old Indian Private Bank Dummy			33.333***	
			(6.476)	
New Indian Private Bank Dummy				210.564**
				(93.432)
Competition Measure (Lag 1 Yr.)	1.124	4.440	9.124	0.088
	(14.346)	(25.106)	(27.927)	(22.833)
Interaction: Owner. Dum. & Competition	-33.580***	-43.007***	-50.311***	-337.374**
	(5.793)	(10.087)	(10.821)	(151.451)
Bank Characteristics				
Size	0.102	0.049	-0.024	0.016
	(0.068)	(0.110)	(0.122)	(0.157)
Size Growth (Lag 1 Yr.)	-0.064***	-0.055***	-0.094***	-0.027***
	(0.004)	(0.009)	(0.013)	(0.010)
Diversification Variable (Lag 1 Yr.)	-0.376	1.934	4.228	0.446
	(0.920)	(2.353)	(2.788)	(2.823)
Sh. of Non-Interest Expenditure(Lag 1 Yr.)	1.563*	3.793*	3.723	1.104
	(0.866)	(2.319)	(2.405)	(2.938)
Other Controls				
Stability	1.130	-0.758	2.416	0.847
	(4.697)	(8.148)	(9.203)	(7.954)
Per Capita GNP Growth (Lag 1 Yr.)	0.010	0.027	0.082	0.006
	(0.057)	(0.099)	(0.111)	(0.097)
1996 Dummy	0.790*	0.490	0.369	
	(0.470)	(0.835)	(0.911)	
Constant	-4.025	-5.537	-7.951	-1.206
	(7.459)	(13.049)	(14.416)	(12.087)
Observations	975	626	572	366
No. of Banks	99	58	51	33
Wald Stat.: Chi-Sq.	320.645	168.32	178.469	12.72

Note: Private includes Indian and Foreign private banks. GLS estimation with panel auto-correlated standard errors and hetroscedastic panels and are bootstrapped. Standard errors in parentheses. Range: 1992 – 2004. All equations contain bi-yearly fixed effects. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 5B
PRODUCTIVITY GROWTH: DOMESTC V/S FOREIGN BANKS
Dependent Variable: Estimated Productivity Growth (Percentage)

	(1)	(2)	(3)	(4)
Base category for ownership: Foreign Banks				
Domestic Bank Dummy	-12.999***			
	(3.753)			
Indian Private Bank Dummy		17.944***		
		(6.017)		
Old Indian Private Bank Dummy			18.733***	
			(6.056)	
New Indian Private Bank Dummy				148.294*
				(81.206)
Competition Measure (Lag 1 Yr.)	-18.540	-21.426	-27.344	-47.902
	(23.305)	(44.570)	(42.645)	(48.809)
Interaction: Owner. Dum. & Competition	23.008***	-25.587***	-26.940***	-235.070*
	(6.290)	(10.050)	(10.123)	(131.396)
Bank Characteristics				
Size	-0.365***	-0.124*	0.104	-0.148*
	(0.069)	(0.076)	(0.074)	(0.082)
Size Growth (Lag 1 Yr.)	-0.076***	-0.075***	-0.080***	-0.069***
	(0.004)	(0.004)	(0.005)	(0.004)
Diversification Variable (Lag 1 Yr.)	0.400	-1.009	-0.950	-0.947
	(1.001)	(0.843)	(0.951)	(0.790)
Sh. of Non-Interest Expenditure(Lag 1 Yr.)	0.784	2.138**	1.827**	1.596*
	(1.001)	(0.917)	(0.918)	(0.923)
Other Controls				
Stability	0.822	-4.569	5.606	7.533
	(7.647)	(13.618)	(13.151)	(14.821)
Per Capita GNP Growth (Lag 1 Yr.)	0.026	0.020	0.116	-0.035
	(0.092)	(0.165)	(0.159)	(0.180)
1996 Dummy	0.519	-	0.569	-
	(0.729)		(1.461)	
Constant	16.552	10.244	12.498	23.674
	(12.041)	(22.973)	(21.966)	(25.177)
Observations	975	663	609	403
No. of Banks	99	73	66	48
Wald Stat.: Chi-Sq.	360.225	465.61	447.988	293.20

Note: GLS estimation with panel auto-correlated standard errors and hetroscedastic panels and are bootstrapped. Standard errors in parentheses. Range: 1992 – 2004. All equations contain bi-yearly fixed effects. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 6
STABILITY

Sample	Pre-1998	Post-1998	Pre-1998	Post-1998	Pre-1998	Post-1998	Pre-1998	Post-1998
PRODUCTIVITY								
Base category for ownership: Public Banks					**Base category for ownership: Foreign Banks**			
	1a	1b	2a	2b	3a	3b	4a	4b
Private Bank Dummy	0.168	0.891***						
	(0.174)	(0.235)						
Indian Private Bank Dummy			-0.769***	1.064***			-0.948***	0.845**
			(0.186)	(0.244)			(0.179)	(0.328)
Domestic Bank Dummy					-0.094	0.414*		
					(0.119)	(0.231)		
Competition Measure (Lag 1 Yr.)	0.039	0.086	0.616	-0.133	0.644	-0.042	0.614	-0.439
	(0.525)	(0.088)	(0.832)	(0.218)	(0.529)	(0.320)	(0.949)	(0.466)
Interaction: Owner. Dum. & Competition	0.264	-0.783**	2.039***	-0.815**	0.644	-0.339	2.243***	-0.596
	(0.299)	(0.381)	(0.326)	(0.394)	(0.529)	(0.375)	(0.311)	(0.531)
Observations	448	635	305	380	448	635	292	453
PRODUCTIVITY GROWTH								
Base category for ownership: Public Banks					**Base category for ownership: Foreign Banks**			
	5a	5b	6a	6b	7a	7b	8a	8b
Private Bank Dummy	14.807**	64.560***						
	(6.668)	(15.230)						
Indian Private Bank Dummy			19.694*	160.810***			11.516	154.505***
			(12.096)	(25.833)			(14.843)	(29.474)
Domestic Bank Dummy					-7.881	21.882		
					(8.301)	(16.130)		
Competition Measure (Lag 1 Yr.)	-35.476	14.349	10.361	24.840	-34.615	20.172	-6.331	107.622**
	(42.170)	(16.271)	(60.485)	(26.339)	(56.619)	(31.831)	(71.222)	(52.984)
Interaction: Owner. Dum. & Competition	-22.370*	-101.812***	-28.367	-255.075***	15.475	-34.339	-15.694	-246.033***
	(11.682)	(24.610)	(21.227)	(41.740)	(14.528)	(26.073)	(25.967)	(47.594)
Observations	356	608	242	376	356	608	374	426

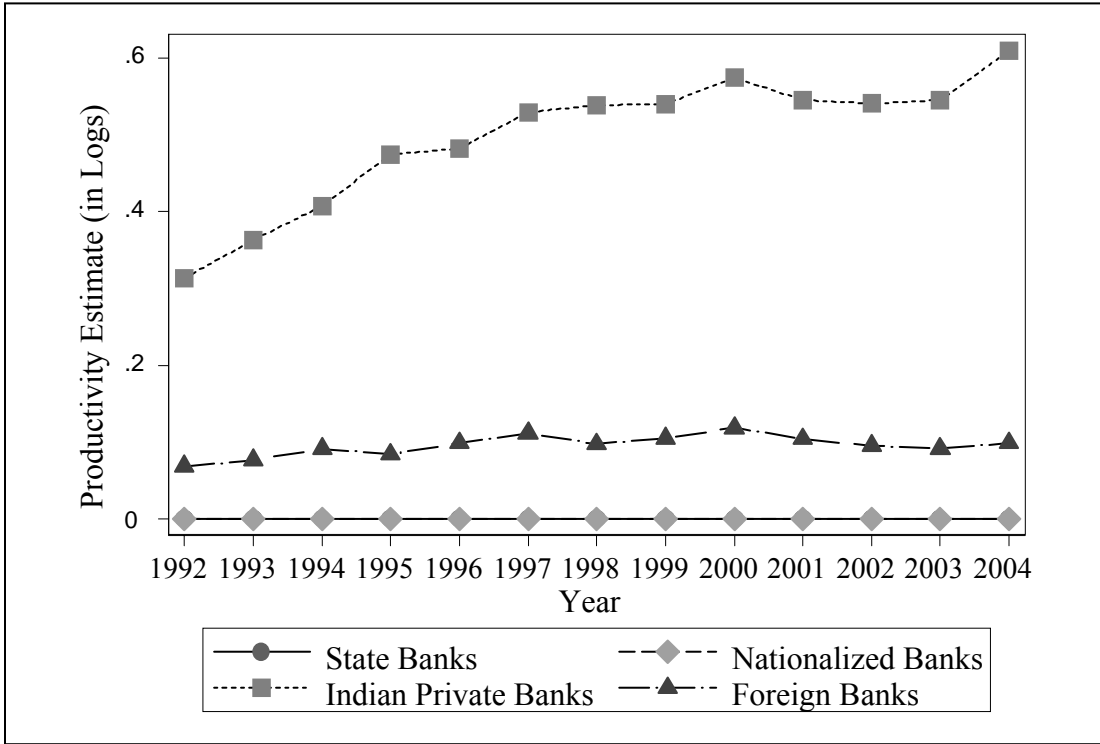**MEAN PRODUCTIVITY ESTIMATE FOR ALL BANKS (1992 – 2004)**
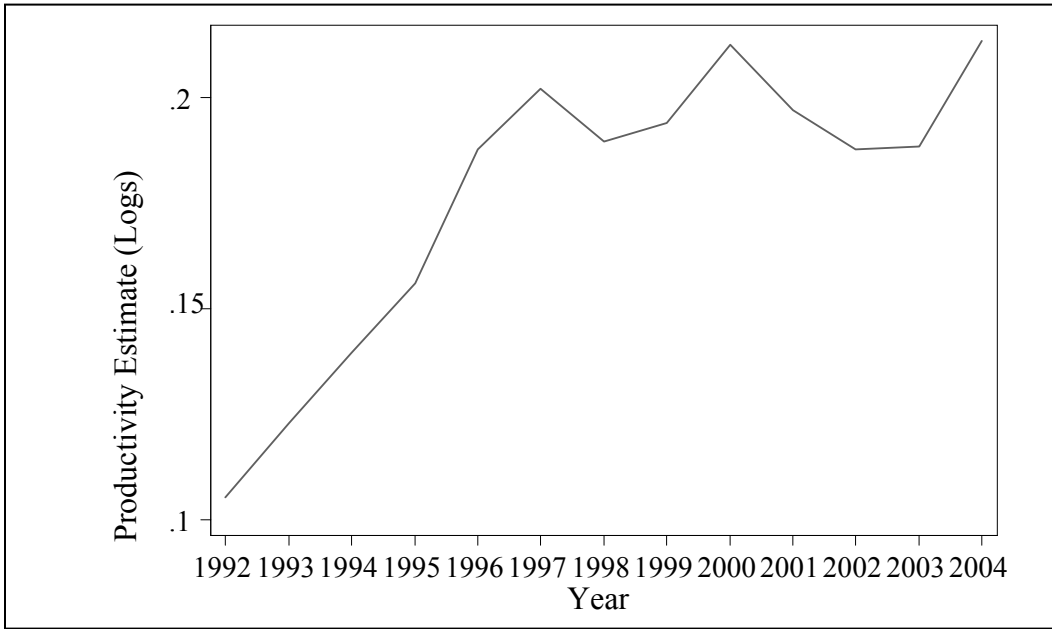
FIGURE 2
MEAN PRODUCTIVITY GROWTH FOR ALL BANKS (1992 – 2004)
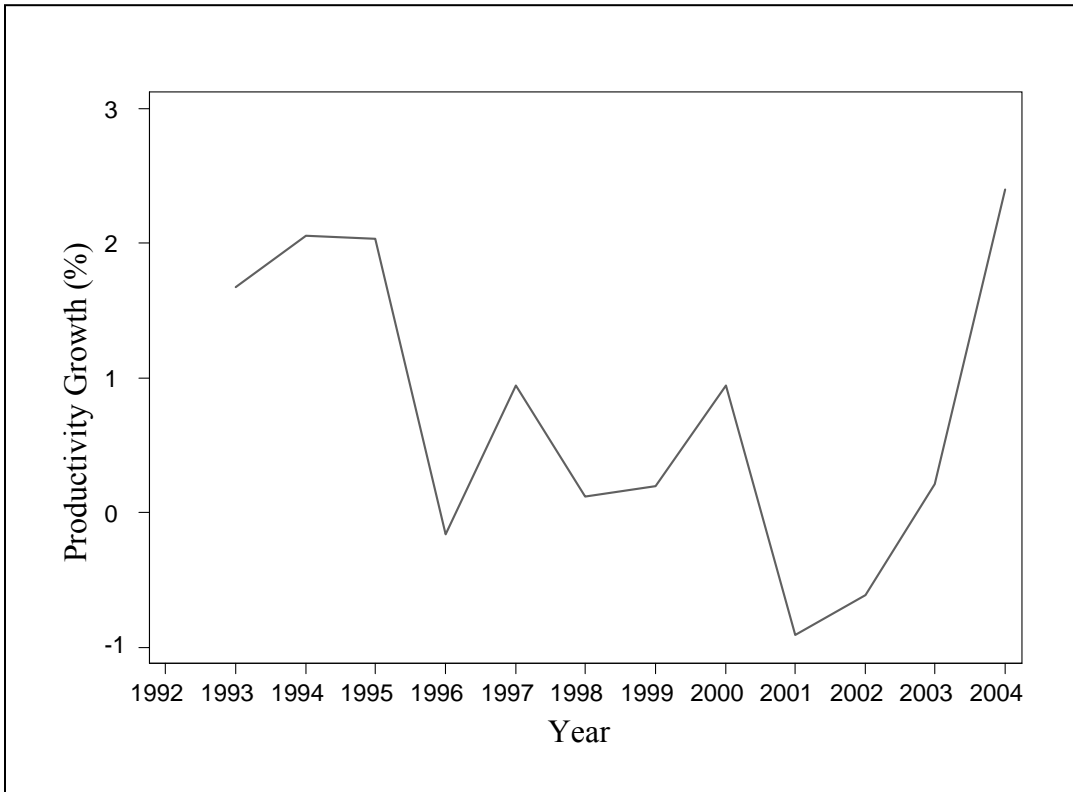
FIGURE 3

PRODUCTIVITY ESTIMATE BY BANK TYPE (1992 – 2004)

FIGURE 4
PRODUCTIVITY GROWTH BY BANK TYPE (1992 – 2004)