Role of Financial Intermediation in Promoting Productivity Growth- Evidence from India

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Introduction

Growth in the neoclassical framework stems from two sources: factor accumulation and productivity growth. Growth driven by increased factor accumulation cannot be sustainable because of the decreasing availability of some factor inputs in future such as labour, as well as diminishing returns to factors. Hence, economists have emphasized on Total Factor Productivity (TFP) growth.

Ever since the pioneering works of Patric (1966) and Goldsmith (1969) , the relationship between financial development and economic growth has remained an important subject in development literature. Both theoretical and empirical studies suggest a positive relationship between financial development and economic growth. The dominant theme, formulated by McKinnon (1973) and Shaw (1973) and extended by subsequent researchers, asserts that the development of financial sector should have positive repercussions on real growth performance. The main policy implication of this school of thought is that government restrictions on the banking system (such as interest rate ceilings, credit rationing, and entry barriers) impede the process of financial development and, consequently, reduce economic growth in most less developed countries (LDCs). Similar conclusions are also reached by the endogenous literature (e.g.,Greenwood and Jovanovic, 1990; and Roubini & Sala-i-Martin, 1992), in which the services provided by financial intermediaries are modelled and emphasized. Financial development induces real growth through several channels. For example, the establishment of domestic financial markets may enhance the efficiency

of capital accumulation and financial intermediation can contribute to raising the saving rate and, thus, the investment rate. Modern financial systems, therefore, play the role of activating economic growth by transferring resources from backward sectors to advanced sectors and by stimulating entrepreneurial responses.

In the theoretical literature, it has long been recognized that financial development can contribute to the growth of Total Factor Productivity (TFP) by either raising the marginal productivity of capital or by improving the allocation efficiency of capital. Financial sector can play an active role in raising productivity through allocating investment funds to projects with higher returns (with higher risks) and enhancing technical progress through providing important financial resources for R&D activities. Endogenous growth theory (Bencivenga and Smith, 1991) emphasizes that the development of financial intermediaries enhances liquidity and mitigates idiosyncratic risk through risk diversification and improves the allocation efficiency of funds.

There is very few literature to examine the role of financial intermediation in promoting India's productivity growth. The current study attempts to fill this void by using banking intermediation data from 'Basic Statistical Returns of Scheduled Commercial Banks in India' –annual publication of the Reserve Bank of India and industry data from the Annual Surveys of Industries. Using panel data of 15 major Indian states from the period 1979-80 to 2003-04, I investigated whether there is any impact of financial intermediation on Total Factor Productivity growth in Indian manufacturing. India's financial market is fragmented, both across regions and sectors. Given this fragmentation, the investment activities and lending-borrowing behaviours of local banks can significantly affect the local economic performance. In this paper I have investigated whether different development level of local financial intermediaries in different Indian states has been an important factor in determining

its productivity growth in manufacturing industry. Further I have explored the channel through which financial sector development has promoted TFP growth. Also I have examined, whether financial development contributed to productivity growth through boosting technical progress or through mitigating the inefficiency.

In India, banks play a leading role in mobilizing savings and allocating capital to the corporate sector. However, after liberalization, the importance of stock market has been increasing over the years. According to Demirguc-Kunt and Levine's (1999) classification, India's financial structure can be classified as underdeveloped and still largely bank-based. In a recent study (RBI, 2007) also, same conclusion was reached that although both the stock market and the banking sector assist the level of economic activity or industrial activity in the country, the relationship between stock market and industrial activity is not strong in India but bank credit plays a very significant role which confirms the bank-dominated financial system in India. Given this back ground, I have considered banking sector development indicators as explanatory variables, to assess relationship between financial development and productivity growth.

The rest of the chapter is organized as follows. Section 2 provides a brief review of the literature on the relationship between financial development and productivity growth. Section 3 presents a brief review of the financial development and section 4 presents trends of TFP growth in India. Section 5 describes the empirical model, section 6 shows the results and section 7 concludes.

2. Financial Development and Productivity growth: Review of literature

Many theoretical studies suggest the importance of financial development in raising productivity and promoting economic growth (e.g., Goldsmith 1969; McKinnon 1973; Shaw 1973; Greenwood and Jovanovic 1990; Bencivenga and Smith 1991). In the traditional growth theory, factor accumulations are considered as the main driving forces behind economic growth. However, financial development can also contribute to the growth of TFP by either raising the marginal productivity of capital (Goldsmith 1969), or improving the efficiency of capital allocation so as to increase the aggregate saving rate and investment level (McKinnon 1973; Shaw 1973). However, in the traditional framework, the capital stock suffers from diminishing returns to scale, which greatly limits the impacts of financial development on growth.

The emergence of endogenous growth literature pioneered by Romer (1986) provides important insights and new theories, underpinning the analysis of the relationship between financial development, productivity, and growth, in which endogenous technological progress through research and development (R&D), along with their positive externalities on aggregate productivity, might result in non-diminishing returns to capital.

Consequently, the role of financial intermediaries in raising productivity has been re-enforced in recent endogenous growth literature. Greenwood and Jovanovic (1990) developed an endogenous model, in which they highlight two essential functions of financial intermediaries in enhancing productivity and promoting growth, i.e., collecting and analyzing information of investment projects, and increasing investment efficiency through allocating the funds to the projects with the highest

expected returns. Similarly, in the endogenous model of Bencivenga and Smith (1991), they focus on another key function of financial intermediations for the development process. They argue that by enhancing liquidity and mitigating idiosyncratic risk through risk diversification, the development of financial intermediaries improves the allocation efficiency of funds, and thus highly contributes to productivity growth. In addition, the importance of portfolio diversification and risk sharing via stock markets in inducing sustained growth is also explored in a number of studies (e.g., Levine 1991; Saint-Paul 1992). Therefore, all these works suggest that financial development can affect long-run growth through different channels and various aspects of innovation or productive activities.

These theoretical implications seem to be well consistent with empirical evidence. The positive relationship between finance and growth has received considerable support from empirical studies (e.g., King and Levine 1993; Beck, Levine, and Loayza 2000; Levine, Loayza, and Beck 2000). In a recent paper, Benhabib and Spiegel (2000) examined whether financial development affects growth solely through its contribution to factor accumulations via the "primitive" channels suggested in the traditional growth theory, or whether it also enhances economic growth via the channels of productivity improvement that are mainly attributed to knowledge creation and technological progress, as predicted by the endogenous growth literature. Their results suggest that financial development is positively correlated with growth in both TFP and capital accumulation. Recently, modern economic theories have shown that productivity is the sole viable engine for sustainable long-term economic growth. In this sense, the contribution of financial development to productivity enhancement should be more important than that to

factor accumulations. Using panel data covering 42 countries and 36 industries, Rajan and Zingales (1998) found that industries that are naturally heavy users of external finance grow relatively faster in economies with higher levels of financial development. Because these industries are usually R&D-intensive, in which more advanced technologies are used or new technologies are created, the financial development might contribute to productivity growth through providing necessary financial support to the development and expansion of these industries. More recently, Beck and Levine (2002) have used a cross-industry and cross-country panel to examine the relationship between financial structure, industry growth, and new establishment formation. They found that financial development, along with effective contract enforcement mechanisms and efficient legal system, can foster new establishment formation, and enhance aggregate productivity growth. Consequently, as summarized by Levine (1997), both theoretical and empirical works provide strong evidence to show that more efficient and better functioning financial systems might lead to faster capital accumulation and higher productivity growth by increasing diversification and reducing risk, mobilizing savings and allocating resources to its best uses, monitoring managers and exerting corporate control, reducing monitoring cost and facilitating exchange of goods and services.

3. Financial Sector Development in India: A Review

After independence, the financial system in India has built up a vast network of financial institutions and markets over time, and the sector is dominated by the banking sector which accounts for about two-thirds of the assets of the organised financial sector. The nationalization of banks in 1969 marked the beginning of India's financial reforms. Explicit quantitative targets were set for Nationalized banks to

expand their network in rural areas and to direct credit to priority sectors. They played a positive role in increasing financial savings. But while performance was satisfactory in resource mobilization, it was very unsatisfactory as regards credit allocation.

In Table 1, we present some useful financial indicators that characterize the development of financial intermediation in India. To measure financial sector development, we consider different types of variables- institution variable, financial variable etc. Number of bank offices, the ratio of deposits to GDP, the ratio of credit to GDP, and that of broad money (M3) to GDP are taken as important indicators of financial sector development in India. From the table, it may be observed that number of bank offices increased rapidly and became almost double by 1991. After 1991-92, the growth rate of offices has declined steadily. We find that both the ratio of deposits to GDP and credit to GDP grew rapidly over the last two decades. The deposits-to-GDP ratio increased from 0.25 in 1979-80 to 0.53 in 2003-04; the credit-to-GDP ratio also rose from 0.16 to 0.31 during the same period. The depth of the financial sector, measured by the M_3 /GDP has also experienced a remarkable increase and amounted to 0.65 in 2003-04, which was almost double the number in 1979-80. To reflect the evolving pattern of competition in the Indian banking sector, bank competition, which is measured by the share of credit issued by banks other than the nationalized banks (i.e. private and foreign banks) is presented in table 1 along with other financial indicators. We find that bank competition rose from 0.09 in 1979-80 to 0.27 in 2003-04, indicating a steady increase in the level of India's banking competition over this period.

By 1991, the banks had been unprofitable, inefficient, and financially unsound. Large scales of non-performing assets (NPAs) in India's banking sector hindered the further development of financial intermediaries. Heavy burden of "priority sector lending," poor banking operation and management, government intervention and lack of efficient banking supervision system were some of the causes behind the accumulation of NPAs in India. Interest rate controls, use of reserve requirements and other direct monetary control instruments were typical features of the pre-reform financial system in India. Entry into banking business was restricted and public sector-owned banks dominated the industry.

Development of financial sector was not uniform across various states. Table 2 through Table 5 presents different financial indicators for major Indian states. We can observe that there is wide variation in growth rates of bank expansion in various states. However, we can observe uniformly for all the states that, the growth rate of bank expansion is much higher before 1991 than after 1991. The poorer states like Assam, Bihar, Madhya Pradesh and Orissa had experienced very high growth rate of bank expansion of around 10 percent per annum in 1980s. However, Gujarat, Kerala and Punjab experienced lower annual growth rate of bank expansion, which was less than 5 percent in the same period.

Table1. Some Important Indicators of Development of Banking Sector in India

Year	No. of Bank Offices	Growth of No. of offices	Deposit-GDP Ratio	Credit-GDP Ratio	M3-GDP	Bank Competition
1980	32412		0.251	0.161	0.330	0.090
1981	36037	0.112	0.260	0.160	0.328	0.093
1982	40180	0.115	0.264	0.171	0.345	0.089
1983	43209	0.075	0.269	0.173	0.338	0.087
1984	45747	0.059	0.282	0.190	0.354	0.096

1985	52638	0.151	0.306	0.196	0.375	0.085
1986	54429	0.034	0.325	0.198	0.392	0.086
1987	55150	0.013	0.337	0.198	0.406	0.094
1988	56650	0.027	0.332	0.186	0.399	0.094
1989	58993	0.041	0.333	0.199	0.406	0.097
1990	60515	0.026	0.334	0.203	0.415	0.100
1991	61724	0.020	0.338	0.209	0.420	0.115
1992	62121	0.006	0.348	0.201	0.429	0.136
1993	62774	0.011	0.348	0.205	0.435	0.120
1994	63358	0.009	0.350	0.190	0.431	0.119
1995	63817	0.007	0.350	0.195	0.441	0.145
1996	64456	0.010	0.338	0.202	0.439	0.169
1997	65111	0.010	0.357	0.203	0.458	0.188
1998	65828	0.011	0.369	0.204	0.465	0.196
1999	66677	0.013	0.391	0.214	0.504	0.197
1900	67061	0.006	0.427	0.239	0.548	0.208
2001	67525	0.007	0.452	0.256	0.583	0.217
2002	67897	0.006	0.496	0.290	0.627	0.249
2003	68078	0.003	0.501	0.297	0.646	0.260
2004	68645	0.008	0.529	0.308	0.652	0.270

Sources: Basic Statistical Returns, Reserve Bank of India, various issues

While Deposit-SDP ratios are higher in Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Kerala, Punjab and Uttar Pradesh, it is lower in Assam, Rajasthan, Orissa and Haryana. However, in the post-reform period Deposit-SDP ratio in Bihar, Madhya Padesh and Orissa had increased approximately two folds.

Credit-SDP ratios are higher in the southern states like Maharashtra, Karnataka, Kerala and Tamil Nadu and lower in Assam, Bihar, Madhya Pradesh, Orissa, Uttar Pradesh and Rajashthan. However, we can observe substantial improvement in the credit-SDP ratio in Bihar and Madhya Pradesh after 1991.

Bank competition from private and foreign banks is the highest in Kerala followed by Tamil Nadu, West Bengal and Maharashtra. Contribution from private and foreign

banks is lower in Bihar, Gujarat, Madhya Pradesh, Orissa and Punjab. However, bank competition has improved significantly in Gujarat in 1990s.

Based on the recommendations of Narasimham Committee on financial system, further reform was initiated in 1992 aiming at (i) removing the external constraints (i.e. those pertaining to the regulatory environment in which the banks function) having a bearing on the profitability of banks, (ii) improving the financial health of banks by introducing appropriate prudential norms for income recognition, asset classification and provisioning and (iii) institutional strengthening including improving the competiveness of the financial system.

Banks have been recapitalized and became healthier than they were. The government control on banks has been reduced and there has been a move towards greater competition to improve upon bank's performance. The competition in the Indian banking system has intensified with the entry of private banks and increased presence of foreign banks. The interest rate has been deregulated.

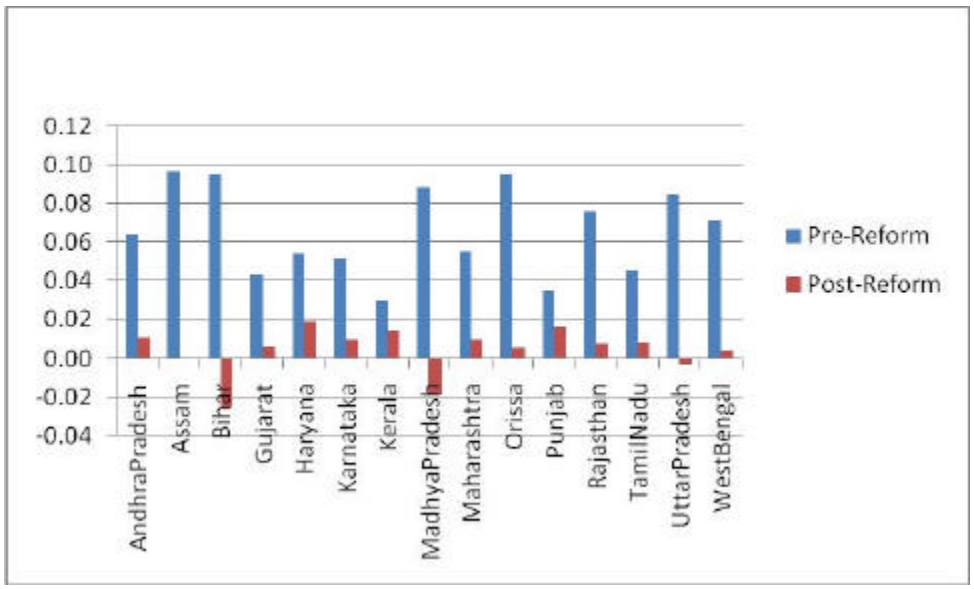

Figure 1 Annualized Growth Rates of Number of Offices in Various States

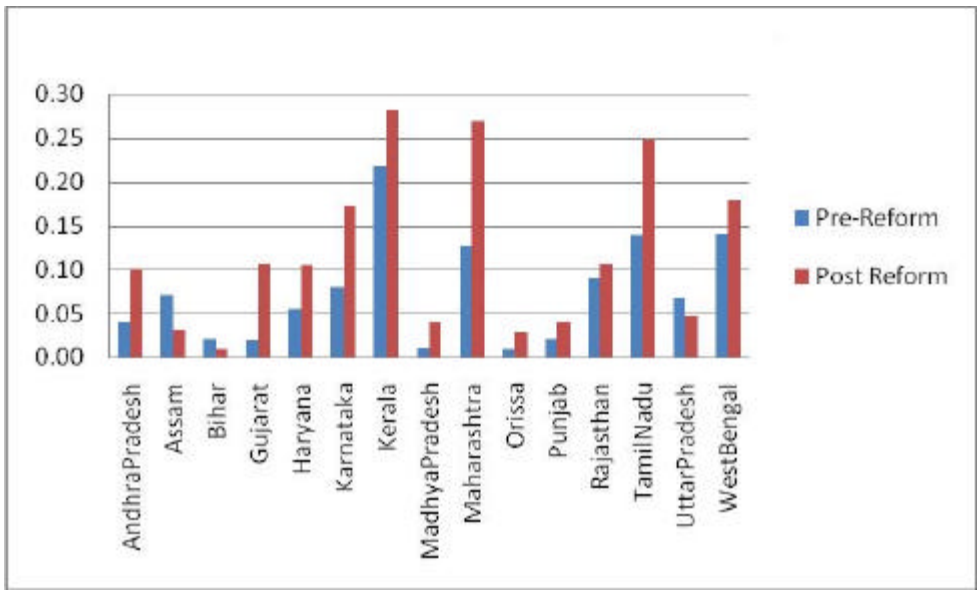

Figure 2 Indicators of Bank Competition in Various States

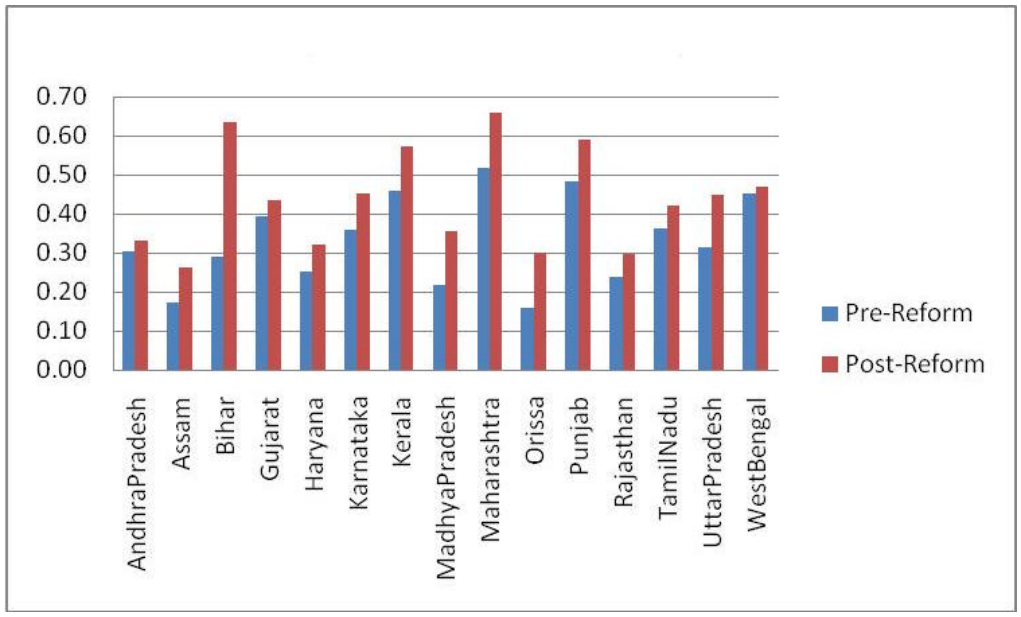

Figure 3 Deposit-SDP Ratios of Various States

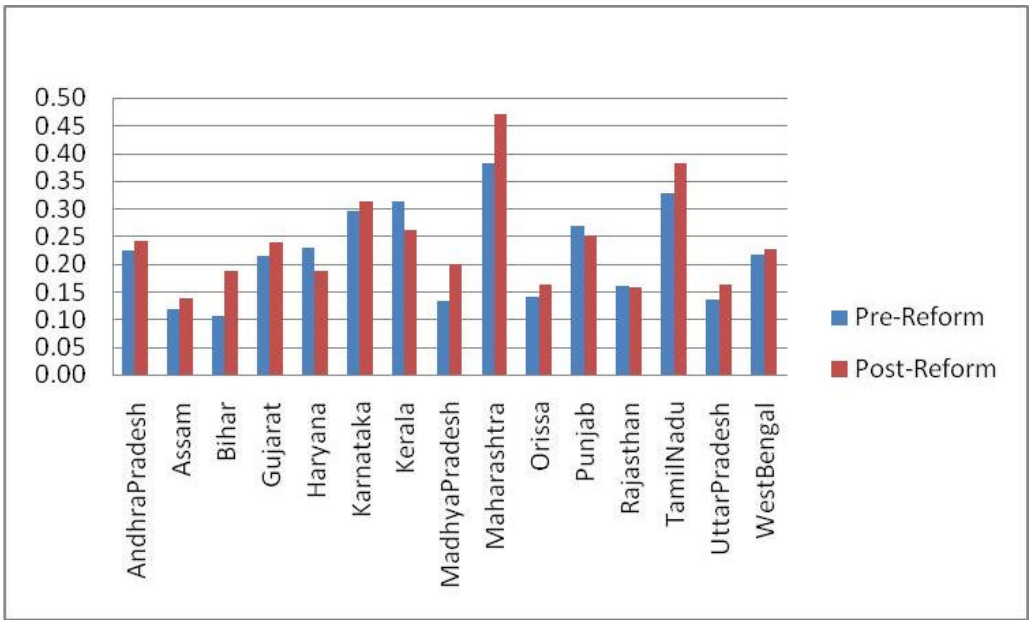

Figure 4 Credit-SDP Ratios of Various States- Pre and Post Reform

Table 2. Number of Bank Offices in Various States of India

Bihar	Gujarat	Haryana	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal
1897	2245	749	2635	2152	1858	3309	824	1542	1478	2811	3730	2045
2458	2344	830	2823	2357	2214	3627	975	1587	1642	3052	4140	2267
2882	2486	891	3060	2468	2555	3994	1255	1695	1804	3312	4901	2528
3100	2641	954	3237	2542	2829	4214	1342	1807	1948	3488	5488	2707
3219	2758	1010	3485	2597	3202	4406	1491	1850	2178	3628	5945	2734
4005	3076	1103	3918	2741	3678	4914	1701	2020	2644	3978	7257	3268
4277	3162	1127	4029	2784	3796	5070	1761	2042	2726	4049	7448	3499
4294	3186	1155	4073	2787	3878	5133	1793	2072	2755	4074	7591	3573
4361	3240	1237	4133	2840	3985	5283	1832	2096	2845	4176	7867	3753
4544	3370	1266	4269	2877	4258	5565	1904	2139	2948	4324	8178	3961
4708	3449	1273	4349	2906	4353	5689	2046	2170	3071	4404	8394	4075
4906	3471	1280	4407	2912	4414	5775	2103	2178	3105	4434	8591	4303
4929	3484	1290	4419	2925	4444	5807	2127	2184	3120	4460	8654	4329
4959	3518	1316	4463	2966	4496	5868	2158	2218	3160	4522	8723	4359
4976	3546	1336	4494	3043	4504	5919	2174	2247	3202	4593	8760	4376
4985	3585	1365	4523	3119	4491	5951	2179	2285	3219	4653	8792	4391
5003	3575	1384	4589	3161	4490	6057	2187	2353	3275	4728	8854	4423
5016	3619	1413	4644	3198	4517	6179	2183	2415	3306	4782	8897	4444
5048	3650	1461	4703	3239	4520	6285	2209	2476	3329	4816	8978	4472
5070	3699	1495	4786	3286	4549	6411	2238	2523	3362	4882	9072	4493
5078	3732	1508	4840	3318	4562	6434	2247	2548	3365	4906	9063	4525
5088	3777	1529	4881	3362	4580	6498	2249	2571	3379	4932	9101	4535
5093	3750	1567	4907	3417	4576	6531	2262	2615	3392	4900	9181	4558
5091	3741	1606	4937	3463	4561	6517	2261	2658	3402	4902	9176	4546
0.10	0.04	0.05	0.05	0.03	0.09	0.06	0.10	0.03	0.08	0.05	0.08	0.07
0.00	0.01	0.02	0.01	0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.00

Table 3. Deposit-SDP Ratios of Various States of India

	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal
1980	0.23	0.15	0.22	0.37	0.19	0.30	0.34	0.15	0.41	0.10	0.39	0.18	0.32	0.22	0.39
1981	0.24	0.13	0.24	0.35	0.20	0.32	0.39	0.17	0.45	0.12	0.41	0.19	0.30	0.26	0.43
1982	0.26	0.14	0.23	0.37	0.21	0.33	0.39	0.17	0.45	0.13	0.43	0.20	0.33	0.26	0.43
1983	0.27	0.14	0.25	0.32	0.23	0.32	0.39	0.18	0.46	0.12	0.46	0.19	0.35	0.29	0.42
1984	0.31	0.15	0.25	0.38	0.25	0.33	0.43	0.21	0.51	0.14	0.47	0.23	0.35	0.30	0.40
1985	0.34	0.18	0.29	0.42	0.25	0.38	0.48	0.22	0.54	0.15	0.49	0.26	0.38	0.32	0.44
1986	0.37	0.19	0.30	0.41	0.28	0.38	0.50	0.26	0.61	0.16	0.53	0.28	0.38	0.34	0.49
1987	0.36	0.20	0.33	0.48	0.31	0.39	0.53	0.25	0.58	0.19	0.54	0.30	0.38	0.37	0.47
1988	0.33	0.22	0.34	0.40	0.28	0.40	0.54	0.25	0.56	0.19	0.55	0.26	0.39	0.37	0.50
1989	0.32	0.20	0.37	0.42	0.30	0.40	0.53	0.26	0.54	0.19	0.52	0.28	0.39	0.36	0.50
1990	0.31	0.20	0.36	0.42	0.28	0.41	0.54	0.25	0.56	0.24	0.52	0.25	0.41	0.36	0.49
1991	0.31	0.21	0.37	0.45	0.27	0.37	0.52	0.28	0.58	0.22	0.49	0.28	0.42	0.36	0.52
1992	0.32	0.21	0.38	0.40	0.29	0.38	0.56	0.28	0.64	0.24	0.49	0.27	0.42	0.37	0.54
1993	0.27	0.20	0.54	0.39	0.27	0.37	0.51	0.28	0.61	0.22	0.48	0.25	0.37	0.37	0.50
1994	0.27	0.20	0.54	0.34	0.26	0.37	0.51	0.30	0.62	0.21	0.50	0.24	0.35	0.37	0.50
1995	0.28	0.23	0.70	0.38	0.29	0.39	0.49	0.32	0.57	0.22	0.52	0.25	0.37	0.39	0.42
1996	0.27	0.24	0.61	0.34	0.29	0.41	0.49	0.33	0.55	0.27	0.52	0.24	0.37	0.37	0.42
1997	0.31	0.25	0.71	0.39	0.31	0.41	0.52	0.35	0.59	0.26	0.55	0.25	0.36	0.41	0.40
1998	0.31	0.27	0.74	0.39	0.32	0.41	0.54	0.36	0.64	0.28	0.56	0.26	0.38	0.45	0.41
1999	0.34	0.27	0.81	0.44	0.33	0.45	0.58	0.38	0.61	0.30	0.60	0.29	0.41	0.49	0.44
2000	0.37	0.30	0.89	0.54	0.35	0.49	0.61	0.48	0.71	0.38	0.66	0.34	0.44	0.55	0.46
2001	0.40	0.32	1.00	0.54	0.37	0.57	0.68	0.49	0.73	0.41	0.70	0.35	0.50	0.60	0.48
2002	0.43	0.34	1.02	0.56	0.40	0.60	0.70	0.59	0.84	0.48	0.78	0.43	0.53	0.64	0.51
2003	0.44	0.36	1.16	0.51	0.42	0.65	0.74	0.56	0.86	0.42	0.79	0.37	0.57	0.67	0.50
Average															
re 1991	0.30	0.17	0.29	0.39	0.25	0.36	0.46	0.22	0.52	0.16	0.48	0.24	0.36	0.31	0.45
e 1991	0.33	0.26	0.73	0.44	0.32	0.45	0.57	0.39	0.66	0.30	0.59	0.30	0.42	0.46	0.47

Table 4. Credit-SDP Ratios of Various States of India

	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal
1980	0.17	0.08	0.09	0.20	0.18	0.23	0.22	0.08	0.31	0.06	0.26	0.13	0.26	0.10	0.18
1981	0.16	0.07	0.09	0.19	0.18	0.24	0.29	0.10	0.32	0.09	0.21	0.14	0.28	0.12	0.19
1982	0.18	0.10	0.11	0.20	0.19	0.25	0.28	0.10	0.31	0.10	0.24	0.14	0.34	0.12	0.23
1983	0.21	0.12	0.10	0.19	0.23	0.26	0.29	0.12	0.39	0.11	0.29	0.16	0.32	0.13	0.21
1984	0.23	0.13	0.09	0.19	0.27	0.27	0.30	0.13	0.47	0.12	0.35	0.18	0.30	0.14	0.19
1985	0.25	0.13	0.09	0.21	0.26	0.30	0.33	0.13	0.48	0.12	0.39	0.19	0.31	0.13	0.20
1986	0.27	0.11	0.10	0.21	0.29	0.33	0.32	0.16	0.47	0.14	0.32	0.19	0.32	0.15	0.20
1987	0.27	0.13	0.11	0.26	0.27	0.37	0.38	0.16	0.40	0.18	0.26	0.19	0.34	0.15	0.20
1988	0.24	0.15	0.11	0.22	0.21	0.35	0.37	0.15	0.35	0.18	0.23	0.15	0.35	0.14	0.22
1989	0.25	0.16	0.12	0.25	0.23	0.34	0.35	0.18	0.35	0.21	0.22	0.18	0.39	0.15	0.27
1990	0.26	0.16	0.14	0.27	0.21	0.35	0.34	0.17	0.37	0.23	0.24	0.16	0.39	0.16	0.27
1991	0.25	0.14	0.15	0.28	0.21	0.30	0.31	0.19	0.40	0.16	0.25	0.17	0.41	0.17	0.26
1992	0.26	0.17	0.15	0.23	0.20	0.31	0.29	0.18	0.37	0.17	0.23	0.16	0.37	0.17	0.27
1993	0.22	0.15	0.22	0.22	0.18	0.25	0.24	0.18	0.37	0.15	0.21	0.15	0.32	0.16	0.26
1994	0.20	0.11	0.20	0.17	0.15	0.24	0.22	0.17	0.33	0.13	0.20	0.12	0.29	0.14	0.22
1995	0.21	0.11	0.24	0.19	0.16	0.26	0.22	0.16	0.38	0.12	0.23	0.13	0.32	0.14	0.22
1996	0.22	0.11	0.19	0.19	0.15	0.29	0.22	0.20	0.42	0.15	0.22	0.11	0.35	0.13	0.22
1997	0.24	0.10	0.21	0.20	0.17	0.30	0.24	0.20	0.43	0.13	0.22	0.13	0.35	0.14	0.20
1998	0.22	0.10	0.21	0.21	0.18	0.28	0.24	0.21	0.45	0.14	0.22	0.14	0.35	0.15	0.19
1999	0.24	0.10	0.22	0.24	0.18	0.30	0.24	0.20	0.45	0.13	0.25	0.15	0.37	0.15	0.19
2000	0.24	0.11	0.21	0.29	0.19	0.32	0.26	0.25	0.60	0.16	0.27	0.17	0.38	0.17	0.21
2001	0.26	0.12	0.24	0.29	0.20	0.35	0.29	0.25	0.61	0.17	0.30	0.17	0.45	0.19	0.21
2002	0.29	0.24	0.26	0.30	0.22	0.41	0.31	0.30	0.65	0.25	0.34	0.24	0.47	0.22	0.25
2003	0.30	0.22	0.31	0.29	0.24	0.46	0.32	0.28	0.67	0.24	0.34	0.21	0.53	0.23	0.25
Average															
re1991	0.23	0.12	0.10	0.22	0.23	0.30	0.32	0.13	0.38	0.14	0.27	0.16	0.33	0.14	0.21
e1991	0.24	0.14	0.22	0.24	0.19	0.31	0.26	0.21	0.47	0.16	0.25	0.16	0.38	0.17	0.23

Table 5. Indicators of Bank Competition in Various States of India

Year	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	We Ber
1980	0.04	0.13	0.02	0.02	0.07	0.08	0.23	0.01	0.11	0.01	0.03	0.10	0.14	0.10	0
1981	0.04	0.10	0.02	0.02	0.07	0.08	0.25	0.01	0.11	0.01	0.03	0.10	0.14	0.08	0
1982	0.04	0.10	0.02	0.02	0.07	0.08	0.22	0.01	0.12	0.01	0.03	0.07	0.13	0.07	0
1983	0.04	0.07	0.02	0.02	0.06	0.08	0.23	0.01	0.11	0.01	0.02	0.08	0.14	0.12	0
1984	0.04	0.05	0.02	0.02	0.05	0.08	0.23	0.01	0.10	0.01	0.02	0.10	0.15	0.17	0
1985	0.04	0.05	0.02	0.02	0.05	0.08	0.24	0.01	0.09	0.01	0.02	0.10	0.16	0.06	0
1986	0.04	0.05	0.02	0.02	0.04	0.07	0.20	0.01	0.11	0.01	0.02	0.09	0.14	0.05	0
1987	0.04	0.06	0.02	0.02	0.03	0.07	0.19	0.01	0.15	0.01	0.02	0.09	0.13	0.04	0
1988	0.04	0.05	0.02	0.02	0.04	0.07	0.19	0.01	0.16	0.01	0.01	0.08	0.13	0.04	0
1989	0.04	0.05	0.02	0.02	0.07	0.08	0.19	0.01	0.16	0.01	0.02	0.08	0.12	0.04	0
1990	0.04	0.02	0.00	0.01	0.01	0.06	0.17	0.01	0.03	0.00	0.00	0.07	0.07	0.02	0
1991	0.03	0.00	0.00	0.01	0.01	0.06	0.18	0.01	0.03	0.00	0.00	0.08	0.08	0.02	0
1992	0.03	0.00	0.00	0.01	0.01	0.06	0.20	0.01	0.03	0.00	0.00	0.08	0.09	0.02	0
1993	0.04	0.00	0.00	0.01	0.01	0.08	0.23	0.01	0.04	0.00	0.00	0.08	0.09	0.02	0
1994	0.05	0.01	0.00	0.01	0.01	0.09	0.25	0.01	0.05	0.00	0.00	0.08	0.12	0.02	0
1995	0.06	0.01	0.00	0.02	0.01	0.10	0.26	0.01	0.08	0.00	0.00	0.09	0.14	0.02	0
1996	0.06	0.01	0.00	0.04	0.01	0.10	0.29	0.02	0.09	0.00	0.00	0.11	0.16	0.02	0
1997	0.08	0.01	0.00	0.05	0.02	0.12	0.31	0.02	0.12	0.00	0.01	0.10	0.17	0.02	0
1998	0.10	0.01	0.00	0.07	0.02	0.13	0.31	0.03	0.12	0.00	0.02	0.10	0.20	0.03	0
1999	0.10	0.01	0.00	0.09	0.03	0.13	0.30	0.04	0.14	0.00	0.03	0.11	0.20	0.03	0
2000	0.12	0.01	0.01	0.12	0.03	0.13	0.30	0.04	0.15	0.01	0.03	0.12	0.21	0.02	0
2001	0.12	0.01	0.00	0.12	0.06	0.14	0.30	0.04	0.17	0.01	0.04	0.10	0.21	0.02	0
2002	0.17	0.01	0.03	0.23	0.07	0.22	0.31	0.09	0.21	0.12	0.06	0.12	0.26	0.09	0
2003	0.19	0.01	0.05	0.27	0.08	0.22	0.28	0.10	0.23	0.14	0.07	0.13	0.26	0.10	0
Average															
Before 1991	0.04	0.07	0.02	0.02	0.05	0.08	0.21	0.01	0.11	0.01	0.02	0.09	0.13	0.07	0
Since 1991	0.09	0.01	0.01	0.08	0.03	0.12	0.27	0.03	0.11	0.02	0.02	0.10	0.17	0.03	0

Like banking sector, the Indian equity market has also witnessed a series of reforms since the early 1990s. The reforms have been implemented in a gradual and sequential manner, based on international best practices, modified to suit the country's needs. The reform measures were aimed at (i) creating growth-enabling institutions; (ii) boosting competitive conditions in the equity market through improved price discovery mechanism; (iii) putting in place an appropriate regulatory framework; (iv) reducing the transaction costs; and (v) reducing information asymmetry, thereby boosting the investor confidence. These measures were expected to increase the role of the equity market in resource mobilization by enhancing the corporate sector's access to large resources through a variety of marketable securities. Institutional development was at the core of the reform process. The Securities and Exchange Board of India (SEBI), which was initially set up in April 1988 as a non-statutory body, was given statutory powers in January 1992 for regulating the securities markets. SEBI and the Government have brought about a significant structural transformation in the Indian capital market. As a result, the Indian equity market has become modern and transparent. The total stock market capitalization as percentage of GDP rose from 19.4 per cent in 1991 to more than 86 per cent in 2007 (see Table 6).

However, its role in capital formation continues to be limited. The private corporate debt market is active mainly in the form of private placements,while the public issue market for corporate debt is yet to pick up. It is the primary equity and debt markets that link the issuers of securities and investors and provide resources for capital formation. A growing economy requires risk capital and long-term resources in the

form of debt for enabling the corporate to choose an appropriate mix of debt and equity. Long-term resources are also important for financing infrastructure projects.

Table 6 India's Total Stock Market Capitalization as Percentage of GDP (as on end March).

Year	Market Capitalization as% of GDP
1991	19.4
1992	54.2
1993	30.6
1994	46.6
1995	46.7
1996	48.2
1997	35.7
1998	38.7
1999	33.0
2000	46.8
2001	27.2
2002	26.8
2003	23.3
2004	43.4
2005	54.3
2006	84.7
2007	86.5

Source: RBI publication

Also, the role of stock market in Indian economic activity, compared to bank credit is limited. In a recent study (RBI, 2007), it has been found that although both the stock market and the banking sector assist the level of economic activity and industrial activity in the country, the relationship between stock market and industrial activity is not strong and bank credit plays a very significant role which confirms the bank dominated financial system in India.

Apart from capital market, rapid developments have also occurred in India's bonds market, money market, foreign exchange market, and other aspects of financial sector, which greatly contributed to India's economic growth.

4. Total Factor Productivity growth and its two components in India

There are several methods of computing TFP index. Before the mid-1990s, most studies estimated the total factor productivity using Solow's residual method or the growth accounting method. In this approach, it is assumed that all firms are operating on its production frontier and TFP is treated analogous to technical change. In this paper, I have used Malmquist Productivity Index (MPI) (which does not assume that all firms are operating on the production frontier) for computing productivity and efficiency index. Malmquist Productivity Index has certain advantages over other TFP indexes. Firstly, Malmquist index does not require assumptions with regard to objectives of the firms- that is, the profit maximization or cost minimization, which could be inappropriate in certain situations. Secondly, it is the preferred method when inputs and outputs price information is not available. Lastly, if panel data is available, the productivity changes can be decomposed into technical efficiency change (also called the catching up index) and the technical change (also called the changes in best practice index). It's drawback is that it requires the computation of distance function. However, the linear programming technique of Data Envelopment Analysis (DEA) can be used to solve the problem. I employ output distance function to construct the various measures of efficiency and productivity.

The distance function and Malmquist productivity index are defined as below:

Let P(x) denote an output-set, P(x), which represent the set of all output vectors, y which can be produced using the input vector, x.

$P(x) ? \{y : x$ can produce y$\}$ (1)

It is assumed that the technology satisfies the following axioms (see Coelli, Prasada Rao & Battese 1998, pp.62-7):

i) $0 ? P(x)$: it is possible to produce nothing out of a given set of inputs(i.e. inaction is possible)

ii) non-zero output levels cannot be produced from zero level of inputs

iii) $P(x)$ satisfies strong disposability of outputs: if $y ? P(x)$ and $y^{?} ? y$ then $y^{?} ? P(x)$

iv) $P(x)$ satisfies strong disposability of inputs: if y can be produced from x then y can be produced from $x^{?} ? x$

v) For all x, $P(x)$ is closed and bounded set

vii) For all x, $P(x)$ is convex

It can be seen that the above axioms are free from any behavioural assumptions and reflect only the inter-relationship between inputs and outputs of every production process. Efficiency, in this axiomatic approach, is measured by distance function. The output distance function is defined on the output set P(x) as

$d_0(x, y) ? \min\{? ? 0 : (y /?) ? P(x)\}$ (2)

From the definition of the distance function, $d_0(x, y)$ and using the axioms on the technology, it can be easily verified that:

1. $d_0(x,y) < 1$ if y is an element of the feasible production set, $P(x)$
2. $d_0(x,y) = 1$ if y belongs to the boundary of the feasible production set P(x) or on the production possibility frontier (PPF).
3. $d_0(x,y) > 1$ if y is located outside the feasible production set. It needs to be scaled down so that it is feasible to produce it using x.

An observation (x,y) can be considered technically efficient if and only if $d_0(x,y)=1$.

Malmquist Total Factor Productivity change index measures the TFP change between two data points by calculating the ratio of the distances of each data point relative to a common technology. Following Coelli (1998), Malmquist (output-oriented) TFP change index between period t and t+1 is defined as follows :

$$MPI(y_{t?1}, x_{t?1}; y_t, x_t) ? \left(? \frac{d_0^t(y_{t?1}, x_{t?1})}{d_0^t(y_t, x_t)} ? \frac{d_0^{t?1}(y_{t?1}, x_{t?1})}{d_0^{t?1}(y_t, x_t)} ? \right)^{1/2} \quad (3)$$

where $d_0^s(y_t, x_t)$ represents the distance of a representative firm at year t from the PPF at year s. $MPI(y_{t?1}, x_{t?1}; y_t, x_t)$ represents the productivity of the production point(x_{t+1},y_{t+1}) relative to the production point (x_t,y_t). A value greater than one indicates positive TFP growth from period t to t+1 while a value less than one indicates a TFP decline. This index is, in fact, the geometric mean of two output-based Malmquist TFP indices. One index uses period t technology and the other period t+1 technology. m_0 can be decomposed as follows:

$$MPI(y_{t?1}, x_{t?1}; y_t, x_t) ? \underbrace{\frac{d_0^{t?1}(y_{t?1}, x_{t?1})}{d_0^t(y_t, x_t)}}_{OTEC} ? \underbrace{\left(? \frac{d_0^t(y_{t?1}, x_{t?1})}{d_0^{t?1}(y_{t?1}, x_{t?1})} ? \frac{d_0^t(y_t, x_t)}{d_0^{t?1}(y_t, x_t)} ? \right)^{1/2}}_{TECH} \quad (4)$$

where the first term is called overall technical efficiency change (OTEC) and measures the change in the output-oriented measure of Farrell overall technical efficiency from period t to t+1. The second term in equation (4) is a measure of technical change (TECH) and represents a shift in frontier from period t to period t+1 based on the constant-returns-to-scale benchmark. It is the geometric mean of the shift in technology between the two periods, evaluated at x_t and x_{t+1}. TECH represents new

product and process innovation, new management systems, or external shock, which shifts the productivity frontier.

When the concept of the distance function is applied to a variable returns-to-scale (VRS) benchmark, rather than a constant-returns-to-scale (CRS) benchmark, OTEC in equation (4) can be decomposed further into Pure efficiency change (PEC) and Scale Efficiency Change (SEC) and m_0 can be written as follows:

$$MPI = \underbrace{\frac{v_0^{t+1}(y_{t+1}, x_{t+1})}{v_0^t(y_t, x_t)}}_{PEC} \times \underbrace{\left[\frac{v_0^t(y_t, x_t)}{d_0^t(y_t, x_t)} \Big/ \frac{v_0^{t+1}(y_{t+1}, x_{t+1})}{d_0^{t+1}(y_{t+1}, x_{t+1})}\right]}_{SEC} \times \underbrace{\left[\frac{d_0^t(y_{t+1}, x_{t+1})}{d_0^{t+1}(y_{t+1}, x_{t+1})} \times \frac{d_0^t(y_t, x_t)}{d_0^{t+1}(y_t, x_t)}\right]^{1/2}}_{TECH}$$

(5)

where $v_0^t(y_t, x_t)$ is the output distance function based on VRS benchmark. The ratio $v_0^{t+1}(y_{t+1}, x_{t+1}) / v_0^t(y_t, x_t)$ is the pure efficiency change index (PEC) from time t to t+1, based on VRS technology. The ratio $d_0^t(y_t, x_t) / v_0^t(y_t, x_t)$ is the scale efficiency index (SE) at time t, which measures the output difference between the VRS technology and the CRS technology at time t. The ratio of this SE at time period t and t+1 is the scale efficiency change index (SEC) from time t to t+1. It indicates the change in efficiency due to the scale of production between the two periods.

Malmquist Productivity index requires the computation of distance functions. Four distances functions that appear in equation (3) are calculated based on CRS benchmark which involves four LP problems for each pair of adjacent time periods using Data Envelope Analysis (DEA) described by Coelli et al (1998) and Coelli's

(1996) DEAP software. Similarly two other distance measures appearing in equation (5) are calculated based on VRS benchmark.

Malmquist Productivity Index (MPI)

Table 7 presents annual average value of Malmquist Productivity index along with its components. The figures in the table indicate change in Malmquist index and its components between two adjacent years. Values of Malmquist index or any of its components less than unity denote regression or deterioration in performance between two adjacent years and vice versa. It can be seen from Table 7 that there is no steady upward trend of Malmquist index. On the contrary, it indicates productivity decline for all categories of industry in early reform period viz.1991-92. It can be observed that in the traditional industry, the average annual rate of productivity growth has declined during post-reform period than its preceding regime and the same has increased significantly in basic and hi-tech industry. During Pre-reform period, on an average TFP has increased by 1.1 percent, 2.4 percent and 1.5 percent in traditional , basic and Hi-tech industries respectively, whereas, in post-reform period, it has decreased by 0.8 percent in traditional industries and increased by 3.6 percent and 3.8 percent in basic and Hi-tech industries respectively.

In the pre-reform period, we can observe substantial improvement in Technical progress (TECH). On an average, during 80's Technical progress (TECH) has increased by 3.6 percent, 2.8 percent and 2.3 percent for traditional, basic and hi-tech industries respectively. On contrary, in the post reform period, Technical progress has decreased in traditional industries by 2.7 percent. However, in basic and hi-tech industries, post reform Technical progress has increased substantially by 6.4 and 4.2

percent respectively, which are much more than pre-reform period. Therefore, it can be concluded that, the productivity rise in basic and hi-tech industries in the post-reform period is not due to increase in efficiency but because of technical progress.

It is observed that there is a wide disparity among states' manufacturing according to their productivity growth. While, the average annual productivity growth of West Bengal and Tamil Nadu was substantially less than other states, the same for Gujarat, Maharashtra, Karnataka and Rajasthan was higher than others. Productivity growth of so-called BIMARU states is also not uniform. The average annual productivity growth of Bihar, Madhya Pradesh and also Rajasthan was substantially higher than the same for Orissa and Uttar Pradesh.

The impact of reform on productivity has been different for different industry groups. We can observe an overall declining trend of TFP in Traditional industries in the post-reform period and a rising trend in basic and hi-tech industries for most of the states. In majority of the states productivity growth is the highest in basic industry followed by hi-tech industry and productivity growth in Traditional industry is the lowest.

It is observed that, annual average efficiency growth is negative for most of the states especially in basic and hi-tech industry. Further, the overall efficiency growth rate and the scale efficiency growth rate have declined in the basic industry during the post reform period for all the states except Kerala and West Bengal.

We can observe substantial improvement in Technical progress in basic and hi-tech industries in the post-reform period. However, Technical progress has decreased

substantially in traditional industries in the post-reform period. In traditional industry, all the states had experienced declining growth rate in technical progress in the post reform era. On the contrary, in the basic industry, all the states except Kerala and Punjab and in the hi-tech industry, all the states except Andhra Pradesh and Kerala have experienced improvement in technical progress in the post-reform period. It may be concluded that the productivity growth in the basic and hi-tech industry is not due to decline in inefficiency but due to improvement in technical progress.

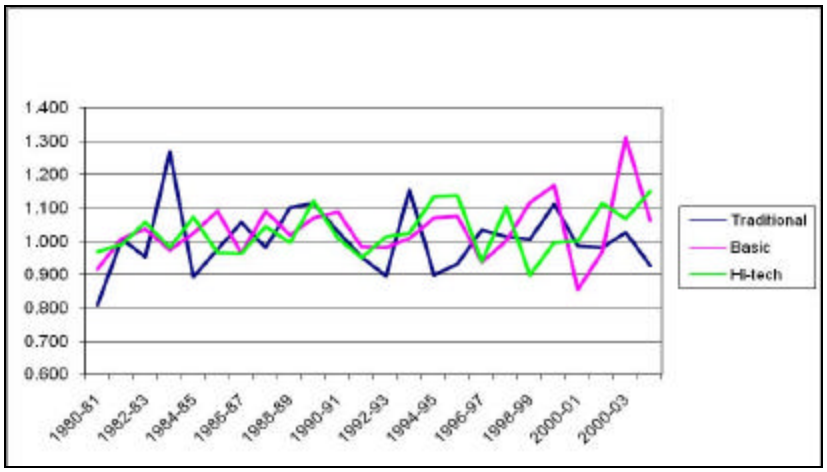

Figure 5. Annual Changes of Total Factor Productivity in Different Industries

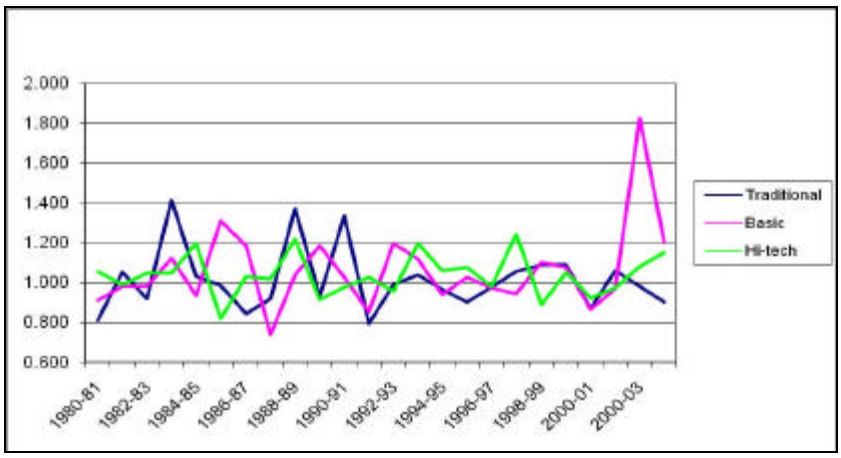

Figure 6. Annual Technical Changes in Different Industries

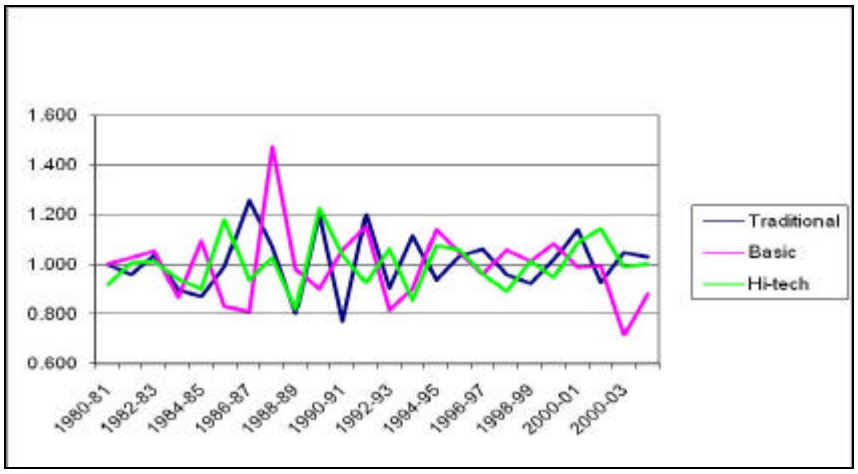

Figure 7. Annual Efficiency Changes in Different Industries

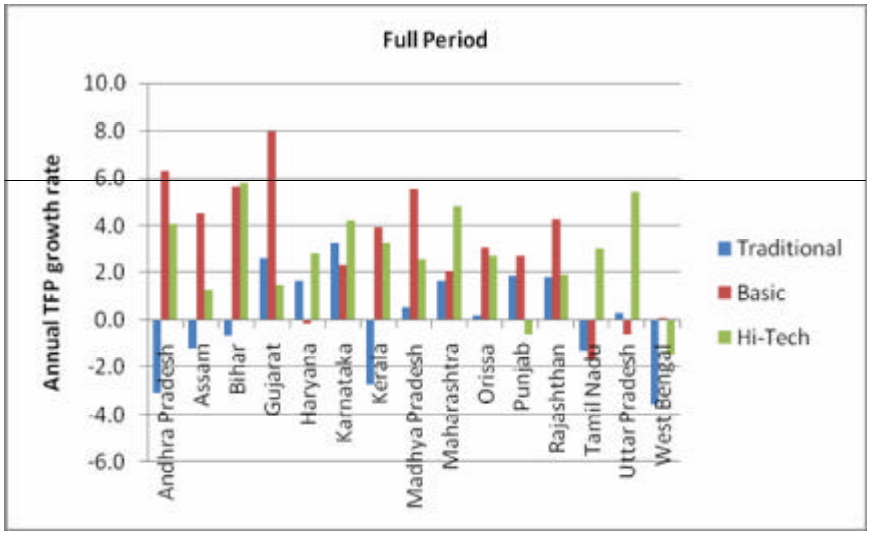

Figure 8. Average Annual TFP Growth Rates (per cent) of Different Industries in Various States

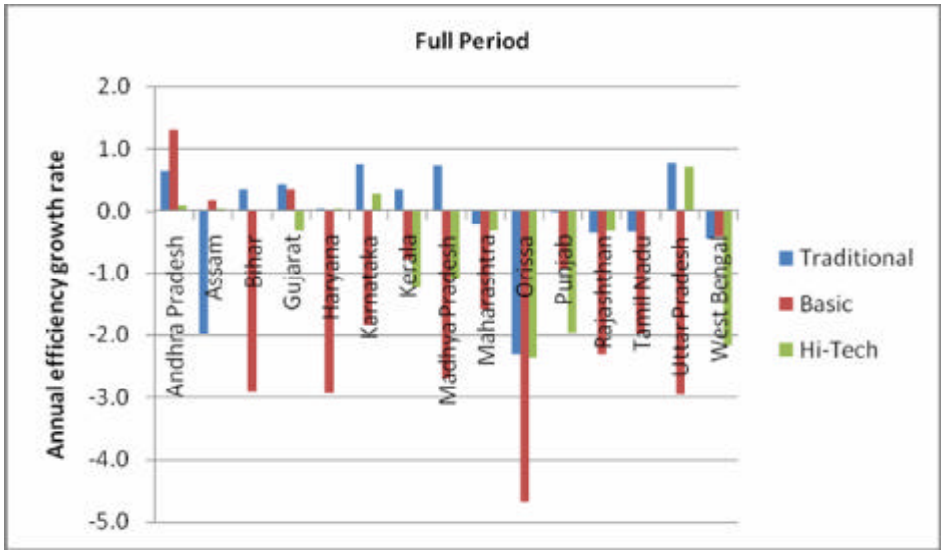

Figure 9. Average Annual Growth Rates of Technical Efficiency of Different Industries in Various States

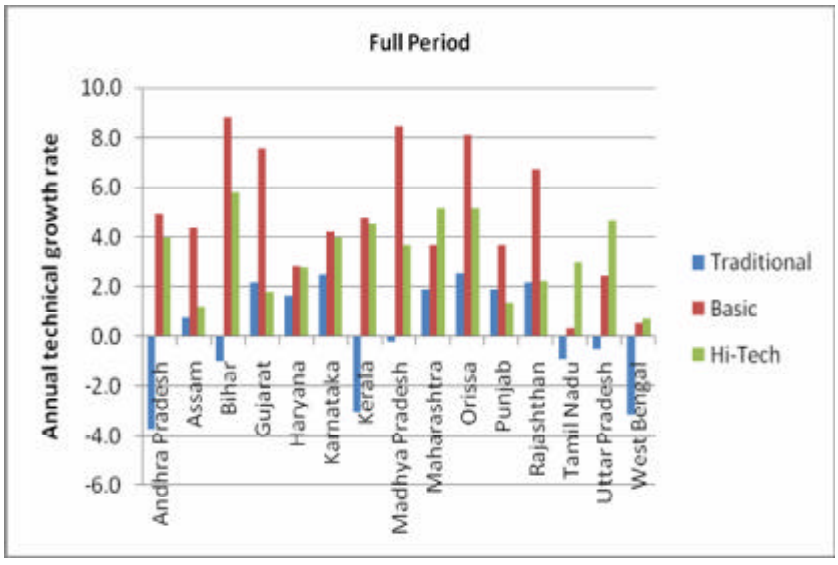

Figure 10. Average Annual Technology Growth Rates (per cent) of Different Industries in Various States

5. Data and Estimation Model

Panel data covering 15 Indian states from the period of 1980-81 to 2003-04, have been used to investigate the relationship between banking development and

productivity growth in India. Since, I have considered dynamic panel model, Generalized Methods of Moments (GMM) estimators have been used. Total factor productivity index (*TFP*) and its two components, i.e., the technical efficiency index (*TE*) and technical progress index (*TECH*), are successively used as dependent variable. In total, 18 models for TFP and its two components TE and TECH are estimated for the three groups of industries-traditional, basic and hi-tech industries separately. Since different productivity indices are considered as dependent variable, it certainly depends on its first lag. Longer lags may also arise reflecting serially correlated technology shocks. Among the explanatory variables, different financial development indicators are considered. In order to measure the level of financial development in various Indian states, initially four financial indicators are included in the regression models, i.e., bank density (Bank_dendity), bank credit (Bank_credit), bank competition (Bank_comp) and SDP per capita (SDP_percapita). The total number of Bank offices per thousand of population measures bank density. Bank credit is measured by the value of credit by banks to the specific industry category as a share of SDP. Bank competition is measured by the share of credit issued by banks other than the nationalized banks. Subsequently, the variable Market_cap is included in the model. Market_cap is measured by the total share market capitalization of the country as a share of GDP. Moreover, since India has experienced rapid financial development and other changes during this period of reform, a dummy variable "reform" has been introduced to capture this transitional characteristic. A variable time trend is also considered. Before carrying out the dynamic panel regression, all the variables were log transformed.

The estimations for TFP enable us to assess the aggregate impacts of financial development on productivity; while the estimations for TE and that of TECH allow us to better identify the channels through which financial development contributes to India's productivity growth.

The regression models for econometric estimation is given below:

Model-I

$$tfp_{i,s,t} = a_0 + a_1 Bank\_Density_{s,t} + a_2 Bank\_credit_{s,t} + a_3 Bank\_Comp_{s,t} + a_4 SDP\_per\_capita_{s,t} + a_5 Time_t + a_6 Reform + a_7 AR(1) + \ldots + a_{7+p-1} AR(p) + \mu_{is} + e_{i,s,t} \quad (6)$$

Model-II

$$eff_{i,st} = ß_0 + ß_1 Bank\_Density_{s,t} + ß_2 Bank\_credit_{i,s,t} + ß_3 Bank\_Comp_{s,t} + ß_4 SDP\_per\_capita_{s,t} + ß_5 Time_t + ß_6 Reform + ß_7 AR(1) + \ldots + ß_{7+p-1} AR(p) + ?_{is} + e_{i,s,t} \quad (7)$$

Model-III

$$tech_{i,s,t} = ?_0 + ?_1 Bank\_Density_{s,t} + ?_2 Bank\_credit_{i,s,t} + ?_3 Bank\_Comp_{s,t} + ?_4 SDP\_per\_capita_{s,t} + ?_5 Time_t + ?_6 Reform + ?_7 AR(1) + \ldots + ?_{7+p-1} AR(p) + ?_{is} + ?_{i,s,t} \quad (8)$$

where subscript i, s and t stands for industry group, state and time respectively.

Generalized Methods of Moments estimation

The methodology of GMM for panel data analyses proposed by Arellano and Bond (1991) and then further developed by Blundell and Bond (1998) has been used in this study. The GMM estimator has been widely used in recent empirical works

especially, where endogeneity is present among a subset of the explanatory variables. Beck, Levine, and Loayza (2000) argued that the GMM panel estimator is good in exploiting the time-series variation in the data, accounting for unobserved individual specific effects, allowing for the inclusion of lagged dependent variables as repressors, and therefore providing better control for endogeneity of all the explanatory variables.

Arellano-Bond estimator for dynamic panel data model has been used in the study. Arellano-Bond estimator is described as follows:

Consider the following model

$$y_{it} = a_1 y_{it-1} + ... + a_p y_{it-p} + b_1 x_{it} + b_2 w_{it} + v_i + e_{it} \quad i = \{1,...,N\}; \quad t = \{1,...,T\}, \quad (9)$$

where x_{it} is a $(1 \times k_1)$ vector of strictly exogenous covariates, w_{it} is a $(1 \times k_2)$ vector of predetermined covariates and endogenous covariates (predetermined variables are assumed to be correlated with past errors, while endogenous ones are assumed to be correlated with past and present errors), v_i are the unobserved group-level effects that are independent and identically distributed (iid) over the groups and e_{it} are iid over the whole sample. It is also assumed that the v_i and the e_{it} are independent for each i over all t and there is no autocorrelation in the e_{it}.

First differencing the equation (9) eliminates the unobservable group-specific effects v_i and produces an equation that is estimable by instrumental variables and it can be rewritten as:

$$y_{i,t} - y_{i,t-1} = a_1(y_{i,t-1} - y_{i,t-2}) + ... + a_p(y_{i,t-p} - y_{i,t-p-1}) + b_1(x_{i,t} - x_{i,t-1}) + b_2(w_{i,t} - w_{i,t-1})$$

$$+ (e_{i,t} - e_{i,t-1}) \qquad i = \{1,...,N\}; \quad t = \{1,...,T\}, \quad (10)$$

Arellano and Bond (1991) derived a Generalized Method of Moments estimator for $a_1,...,a_p$, b_1, and b_2 using lagged levels of the dependent variable and the predetermined variables and differences of the strictly exogenous variables. Instrumental-variable approaches are applied to deal with the endogeneity of explanatory variables in equation (10), where the predetermined and endogenous variables in first differences are instrumented with appropriate lags of the specified variables in levels, while strictly exogenous regressors are first-differenced for use as instruments.

6. Results

The dynamic panel model is estimated using the Arellano-Bond estimator. For each regression, we have tested our specification with the Sargan test for instrument validity, and with the serial correlation test for the higher order serial correlation not specified in the model. The results of the tests suggest that instruments are valid, and there exists no evidence of higher order serial correlation in our regressions. Empirical results of GMM estimation for the relationship between TFP and financial development are reported in Table 8. Estimation results show that there is a positive relationship between financial development and productivity growth of India's manufacturing. However, we find that the impact of financial sector development on productivity growth is quite varied across different industry groups. We observe that, the co-efficient of Bank_density and Bank_comp are positive for both traditional and basic industry but negative for hi-tech industry. In the case of traditional industry, both the co-efficients are significant at 1 percent level of significance. Hence we may conclude that increasing banking network as well as bank competition is associated with an increase in the productivity growth in traditional industry. However,

increasing bank network is negatively associated with productivity growth in hi-tech industry, which can be observed by negative and significant co-efficient of bank_density for hi-tech industry. The co-efficient of SDP_percapita is positive and significant for basic industry indicating that there is increase in productivity growth of basic industry with the increase in per capita income of a state. However, the co-efficient of SDP_percapita is negative (though insignificant) for traditional and hi-tech industry. Bank_credit is not significant for any industry group, however, it is positive for basic industry. We have found negative impact of reform on productivity growth for all the three groups of industry. However, financial reforms are already captured in the explanatory variables and reform variable controls only for residual of reforms. Hence we do not conclude much on it except that in 1990s TFP growth in Indian manufacturing has not improved. We observe positive co-efficient of time trend for traditional and basic industry and it is significant for basic industry. The indicator of bank's expansion Bank_density is positive and significant (at 1 percent level of significance) for traditional industry and it is negative and significant (at 1 percent level of significance) for hi-tech industry. This indicates that bank expansion, which occurred especially in rural areas, has helped in improving the productivity of traditional industry group, however it has negative impact on the productivity of hi-tech industry group. Perhaps the relative importance of finance of hi-tech industry has changed from bank based to market based. We have tried to imperfectly control it by time variable. However, I have also tried an explicit variable to proxy development of stock market. After nationalization of Banks in 1969, the main target of the banks was to expand their network in rural areas. They played a positive role in increasing financial savings. But while performance was satisfactory in resource mobilization, it was very unsatisfactory as regards resource allocation. Thus banking system had built

a number of inefficient and unproductive banks by 1991. After reform in 1991, several supervisory measures were introduced to improve the health of the banks.

To better identify the channels through which financial development, contributes to India's productivity growth, I have estimated the models for technical efficiency index and for technical progress index, respectively.Results are reported in Table 9 and Table 10. We find a great difference between these two regressions. From the regression of technical efficiency (TE), it is observed that, the coefficients of Bank_density are negative for both traditional and basic industry groups. In the Technical efficiency equation, the co-efficient of Bank_comp is positive and significant for traditional industry, indicating that bank competition has positive impact on technical efficiency in traditional industry. Competition in the banking sector can help to improve productivity in industry by lowering the cost of capital and improving marginal productivity of capital as well as by improving the allocative efficiency of capital. It is also observed that, the co-efficient of Bank_credit is positive and significant for traditional industry, indicating positive association between bank credit and productivity growth in traditional industry through improvement in technical efficiency. It is observed negative co-efficient of Bank_credit in hi-tech industry. However, the co-efficient is not statistically significant. We have observed in technical efficiency (TE) regression that, co-efficient of SDP_percapita is negative and significant for traditional and hi-tech industry and positive and significant for basic industry, suggesting association of higher efficiency in basic industry and lower efficiency in traditional and hi-tech industry with the richer states. In the TE regression, time trend is negative and significant for basic industry and positive and significant in hi-tech industry, which suggests that over the

time there is positive growth in technical efficiency in hi-tech industry and negative growth in basic industry. The co-efficient of reform in Technical efficiency (TE) equation is negative except for traditional industry and negative and significant for hi-tech industry. Since financial reforms are already captured in the explanatory variables, we do not conclude much on it except that in 1990s growth in efficiency has not improved much specially in the basic and hi-tech industry.

From the results of the TFP equation, we have observed that the co-efficient of Bank_density and Bank_comp were positive for traditional and basic industry. It is also observed from the equation of technical progress (TECH) that the co-efficient of Bank_density is positive for both the industry groups in the equation of technical progress (TECH), indicating that Bank_density contributes to productivity growth in traditional and basic industry through improving technical progress rather than through improving technical efficiency since, we have found negative coefficients of Bank_density for both traditional and basic industry groups in technical efficiency (TE) equation. In the Technical progress equation, the co-efficient of Bank_comp is positive for all the industry groups and significant for traditional industry, indicating that bank competition has positive impact on technical progress in traditional industry. It is observed that, the co-efficient of Bank_credit is negative and significant for hi-tech industry. It is also observed that co-efficient of Bank_credit in hi-tech industry is negative in the technical efficiency (TE) equation, which could be due to omission of some variables. We have observed in technical progress (TECH) regression that, co-efficient of SDP_percapita is positive and significant for all thethree industries, suggesting association of higher technical progress with the richer states. In this regression, time trend is positive and significant for traditional and basic industry,

which suggests that over the time there is growth in technical progress. We have found negative and significant co-efficient of time trend for hi-tech industry. However, the co-efficient of time trend for hi-tech industry is very small. The co-efficient of reform in is negative and significant for traditional industry and positive and significant for hi-tech industry which suggests that reform has helped in technical progress in hi-tech industry and not in traditional industry.

Since, we have observed negative co-efficient of bank credit for high-tech industry for all the three equations-viz. TFP, TE and TECH, we have included Market_cap in the model to see whether development of stock market captured by stock market capitalization has any affect on productivity of industrial sector especially, hi-tech industry. However, Market_cap indicating share market capitalization as percentage of GDP remains the same for all the states. Also, because of non-availability of data for the whole sample, Market_cap is considered only for the reform period or in other words, interaction between Market_cap and reform is considered.

There are not many changes in the results of traditional or basic industry in TFP regression after inclusion of Market_cap, but in the hi-tech industry, we find that the co-efficient of Bank_comp and Bank_credit have become positive which were negative without Market_cap variable.

In the technical efficiency (TE) regression too there is not much changes in the result of all three industry groups, after inclusion of the variable Market_cap. However, the co-efficient of Market_cap is negative and significant for basic industry but positive and significant for hi-tech industry, which indicates that there is positive association between stock market development and technical efficiency in hi-tech industry.

In the technical progress equation (TECH) also the results are consistent with the results when Market_cap was not included in the model. However, we find that, Market_cap is positive and significant for basic industry, which suggests that development of share market improves productivity of basic industry through stimulating technological progress i.e. through providing financial support to R&D and innovation and not through improving efficiency. However, it is negative and significant for traditional industry showing negative association between share market development and technological progress in traditional industry.

7. Conclusion

Theoretical literature on finance, productivity, and growth suggests that financial development can enhance productivity growth in many ways, by raising capital allocation efficiency, and stimulating technological progress through providing financial support to R&D and innovation.

In the present study, I have investigated whether different development level of local financial intermediaries in different Indian states has been an important factor in determining its productivity growth in manufacturing industry. Further I have explored the channel through which financial sector development has promoted TFP growth. Also I have examined, whether financial development contributes to productivity growth through boosting technical progress or through mitigating the inefficiency.

To examine the relationship between finance and productivity, I have used a panel data covering 15 major states from the period of 1979-80 to 2003-04 to investigate the impact of financial development on productivity growth of Indian Manufacturing industry. We find that financial development significantly contributes to India's productivity growth. However, empirical evidence suggests that the impact of financial sector development on productivity growth is quite varied across different industry groups. Also the channel through which financial development enhances India's productivity growth depends on industry group.

We have found positive association between banking sector development and productivity growth in traditional industry. However, we have not found strong evidences of this association in basic and hi-tech industry. In traditional industry, banking development exerts a positive and significant impact on productivity both through credit expansion to this industry and through competition enhancement in the banking sector, which in turn promotes productivity growth.

In case of basic and hi-tech industry, development of stock market has positive and significant impact on productivity. While development of stock market improves productivity of basic industry through stimulating technological progress i.e. through providing financial support to R&D and innovation and not through improving efficiency, it improves productivity in hi-tech industry through mitigating inefficiency.

We have observed positive and significant co-efficient of SDP_per_capita in technical progress (TECH) regression for all the three industries, suggesting association of higher technical progress with the richer states. In technical progress regression

(TECH), time trend is positive for traditional and basic industry, which suggests that many other explanatory variables (time trend) tend to affect productivity in traditional and basic industry mainly through influencing technical progress.

These findings have important policy implications to India's future development, given the striking facts that the efficiency in India has not improved much after reform, and the TFP improvement in basic and hi-tech industry is due to technical progress only. As shown in the present study, financial sector can also play an important role in raising productivity. After a decade of market-oriented transition, the increase in productivity might require a fundamental reorientation of economic development strategy, and the introduction of new mechanism, institutions, and policy.

Table 7. Average Annual Changes of Total Factor Productivity (TFP) and its Components-Geometric Means (Year-wise)

	Tradi-tional					Basic					Hi-tech				
Year	OTEC	PEC	SEC	TECH	MPI	OTEC	PEC	SEC	TECH	MPI	OTEC	PEC	SEC	TECH	MPI
1980-81	0.999	0.976	1.024	0.811	0.809	1.003	1.118	0.897	0.913	0.916	0.919	0.955	0.963	1.054	0.969
1981-82	0.957	0.964	0.993	1.051	1.006	1.027	0.971	1.058	0.982	1.009	1.002	0.988	1.014	0.99	0.992
1982-83	1.035	1.038	0.997	0.92	0.952	1.056	1.06	0.996	0.983	1.038	1.009	1.002	1.007	1.048	1.057
1983-84	0.898	1.019	0.881	1.414	1.269	0.866	0.888	0.976	1.123	0.973	0.938	0.938	0.999	1.046	0.981
1984-85	0.87	0.932	0.934	1.029	0.895	1.093	1.009	1.083	0.936	1.023	0.899	0.933	0.964	1.195	1.074
1985-86	0.991	0.979	1.012	0.985	0.976	0.833	0.845	0.986	1.311	1.091	1.179	1.134	1.039	0.82	0.966
1986-87	1.257	1.092	1.151	0.841	1.058	0.812	1.029	0.79	1.186	0.963	0.935	1.006	0.93	1.029	0.963
1987-88	1.068	1.066	1.002	0.919	0.982	1.474	1.269	1.162	0.741	1.091	1.025	0.97	1.057	1.018	1.044
1988-89	0.803	0.883	0.909	1.373	1.102	0.979	0.918	1.066	1.04	1.018	0.818	0.93	0.879	1.219	0.997
1989-90	1.201	1.117	1.075	0.929	1.116	0.901	0.887	1.016	1.187	1.069	1.224	1.137	1.076	0.917	1.122
1990-91	0.77	0.946	0.815	1.335	1.029	1.058	1.049	1.009	1.029	1.088	1.034	0.991	1.044	0.976	1.01
1991-92	1.201	1.036	1.159	0.793	0.953	1.151	1.21	0.951	0.854	0.983	0.925	0.952	0.972	1.028	0.951
1992-93	0.906	0.948	0.956	0.99	0.897	0.818	0.772	1.059	1.199	0.98	1.061	1.015	1.045	0.955	1.013
1993-94	1.114	1.013	1.099	1.039	1.157	0.903	0.929	0.971	1.118	1.009	0.855	0.896	0.954	1.198	1.025
1994-95	0.936	0.98	0.954	0.962	0.9	1.14	1.137	1.003	0.939	1.07	1.073	1.038	1.034	1.058	1.134
1995-96	1.033	0.984	1.049	0.903	0.933	1.047	1.024	1.022	1.027	1.075	1.055	1.082	0.975	1.077	1.137
1996-97	1.062	1.003	1.059	0.976	1.036	0.96	1.004	0.956	0.976	0.937	0.96	0.975	0.984	0.98	0.94
1997-98	0.959	1.021	0.939	1.057	1.014	1.06	1.036	1.023	0.945	1.001	0.889	0.967	0.92	1.242	1.104
1998-99	0.923	0.945	0.977	1.09	1.006	1.013	1.001	1.012	1.103	1.117	1.012	0.98	1.033	0.889	0.899
1999-00	1.02	0.987	1.034	1.089	1.111	1.084	1.102	0.983	1.078	1.168	0.947	0.911	1.04	1.052	0.996
2000-01	1.138	1.079	1.054	0.867	0.986	0.987	0.994	0.993	0.867	0.855	1.084	1.023	1.061	0.924	1.002
2001-02	0.926	1.047	0.885	1.059	0.981	0.995	1.068	0.931	0.971	0.967	1.141	1.153	0.99	0.975	1.113
2002-03	1.048	0.978	1.072	0.981	1.028	0.718	0.791	0.907	1.827	1.311	0.989	0.988	1.001	1.081	1.069
2003-04	1.03	1.002	1.028	0.9	0.927	0.882	0.956	0.923	1.203	1.062	0.998	0.99	1.008	1.153	1.15
Pre-reform	0.976	0.999	0.977	1.036	1.011	0.996	0.997	0.999	1.028	1.024	0.992	0.996	0.996	1.023	1.015
Post-reform	1.019	1.001	1.018	0.973	0.992	0.973	0.994	0.979	1.064	1.036	0.996	0.996	1.001	1.042	1.038
Overall	0.999	1.000	0.999	1.002	1.001	0.984	0.996	0.988	1.047	1.030	0.994	0.996	0.998	1.033	1.027

Note: OTEC= Overall Technical Efficiency Change, PEC = Pure Efficiency Change, SEC= Scale Efficiency Change, TECH= Technical Change, MPI= Malmquist Productivity Index

Table 8. *Relationship Between Financial Development and Productivity in India over the Period of 1980-81–2003-04*: Results of GMM Estimation-Dependent Variable= ?log(tfp_index)

Variable	Traditional	Basic	Hi-tech	Traditional	Basic	Hi-Tech
? log(tfp index)				Variable Market_Cap included		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Bank_density	0.779***	4.948	-9.756***	-4.045***	3.265	-17.860***
	(2.65)	(5.13)	(5.89)	(4.69)	(5.96)	(8.67)
Bank_comp	0.032***	0.012	-0.005	0.026***	0.023	0.001
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)
Bank_credit	-0.024	0.116	-0.027	-0.052	0.096	0.691
	(0.10)	(0.10)	(0.38)	(0.10)	(0.10)	(0.77)
Market_Cap				-0.052	0.048	-0.067
				(0.06)	(0.09)	(0.09)
SDP_percapita	-0.447	1.277***	-0.658	-0.237	-0.277***	-0.926
	(0.86)	(0.41)	(0.50)	(1.17)	(1.30)	(0.62)
Time	0.004	0.023***	-0.024	-0.010	0.013***	-0.032
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
Reform	-0.071***	-0.030**	-0.187*	-0.133***	-0.009**	-0.307**
	(0.06)	(0.08)	(0.09)	(0.07)	(0.12)	(0.17)
Const	0.036**	-0.478**	0.635	0.290**	-0.166**	0.791
	(0.22)	(0.35)	(0.37)	(0.34)	(0.39)	(0.46)
AR(1)	-0.100***	0.459	-0.214***	0.159***	0.348	0.010***
	(0.19)	(0.25)	(0.36)	(0.34)	(0.28)	(0.23)
AR(2)						0.209
						(0.34)
Wald test	57.61	177.97	96.84	256.32	55.06	147.99
Sargan test	7.26	3.91	6.51	7.59	7.6	5.37
	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)
Auto-correlation2	-0.56	0.47	0.24	0.27	0.2	0.13
	(0.58)	(0.64)	(0.81)	(0.79)	(0.84)	(0.90)
Number of Obs	330	330	330	330	330	315
Number of Groups	15	15	15	15	15	15

Notes: ***, ** and * indicate statistical significance at the 1 percent, 5 percent and 10 percent level,
respectively. For all regressions, the t-statistics values are presented in the parenthesis.

Table 9. *Relationship Between Financial Development and Productivity in India over the Period of 1980-81–2003-04*: Results of GMM Estimation-Dependent Variable= ? log(eff_index)

Dependent Variable	Traditional	Basic	Hi-Tech	Traditional	Basic	Hi-Tech
? log(eff index)				Variable Market_Cap included		
	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Bank_density	-0.731	-3.378***	1.735	-0.085	-3.672***	1.346
	(0.97)	(1.83)	(0.87)	(0.71)	(1.78)	(1.28)
Bank_comp	0.036***	-0.027	-0.003	0.042***	-0.029	-0.006
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
Bank_credit	0.106**	0.089	-0.053	0.100*	0.039	-0.041
	(0.04)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)
Market_Cap				-0.105	-0.172***	0.123*
				(0.05)	(0.07)	(0.04)
SDP_percapita	-0.329**	0.442***	-0.067*	-0.286**	0.392***	-0.029
	(0.14)	(0.25)	(0.14)	(0.16)	(0.22)	(0.15)
Time	-0.002	-0.013**	0.010***	-0.001	-0.013**	0.008***
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Reform	0.005	-0.022	-0.044***	0.019	-0.045	-0.036***
	(0.03)	(0.04)	(0.02)	(0.02)	(0.04)	(0.02)
Const	0.055	0.152	-0.115	0.018	0.177	-0.092
	(0.06)	(0.14)	(0.06)	(0.06)	(0.13)	(0.09)
AR(1)	-0.091	0.259***	0.223	-0.036	0.227***	0.223
	(0.07)	(0.09)	(0.07)	(0.08)	(0.07)	(0.08)
Wald test	296.87	167.97	85.57	95.3	160.52	52.25
Sargan test	12.78	9.61	7.74	13.14	8.78	8.03
	(0.92)	(0.98)	(1.00)	(0.90)	(0.99)	(1.00)
Auto-correlation2	-0.16	0.37	0.33	-0.23	0.43	0.39
	(0.87)	(0.70)	(0.74)	(0.82)	(0.66)	(0.70)
Number of obs	330	330	330	330	330	330
Groups	15	15	15	15	15	15

Notes: ***, ** and * indicate statistical significance at the 1 percent, 5 percent and 10 percent level, respectively. For all regressions, the t-statistics values are presented in the parenthesis.

Table 10. *RelationshipBetween Financial Development and Productivity in India over the Period of 1980-81–2003-04*: Results of GMM Estimation-Dependent Variable= ? log(tech_index)

Variable	Traditional	Basic	Hi-Tech	Traditional	Basic	Hi-Tech
? log(tech index)				Variable Market_Cap included		
	Model 13	Model 14	Model 15	Model 16	Model 17	Model 18
Bank_density	0.518	3.787***	-0.292***	-0.038	9.827***	-0.161***
	(0.66)	(4.62)	(0.62)	(0.56)	(5.74)	(0.72)
Bank_comp	0.020**	0.005	0.010	0.013**	-0.018	0.008
	(0.01)	(0.02)	(0.01)	(0.01)	(0.05)	(0.01)
Bank_credit	-0.123	0.008	-0.037*	-0.125	0.167	-0.041**
	(0.04)	(0.08)	(0.01)	(0.04)	(0.11)	(0.01)
Market_Cap				-0.025*	0.044*	-0.029
				(0.06)	(0.06)	(0.02)
SDP_percapita	0.408***	0.099**	0.298***	0.245***	-0.011**	0.309***
	(0.11)	(0.28)	(0.08)	(0.14)	(0.26)	(0.09)
Time	0.006***	0.024***	-0.003***	0.004***	0.029**	-0.003***
	(0.00)	(0.02)	(0.00)	(0.00)	(0.02)	(0.00)
Reform	-0.115***	-0.092	0.043***	-0.131	0.083	0.037***
	(0.01)	(0.05)	(0.01)	(0.02)	(0.11)	(0.02)
Const	-0.033	-0.280*	0.028**	0.030	-0.491	0.017**
	(0.05)	(0.32)	(0.04)	(0.05)	(0.37)	(0.05)
AR(1)	-0.116	0.119***	-0.097	-0.379	0.066***	-0.087
	(0.07)	(0.31)	(0.02)	(0.20)	(0.37)	(0.04)
AR(2)		-0.306***			-0.394***	
		(0.47)			(0.64)	
AR(3)		0.790***			0.483***	
		(0.62)			(0.46)	
AR(4)					0.014	
					(0.19)	
Wald test	1781.06	1003.43	479.58	1575.12	5260.25	373.14
Sargan test	14.08	11.44	13.73	11.89	9.64	13.50
	(1.00)	(1.00)	(0.88)	(1.00)	(1.00)	(0.89)
Auto-correlation2/3/4	0.17	0.90	1.17	-1.56	-0.54	1.11
	(0.86)	(0.37)	(0.24)	(0.12)	(0.59)	(0.27)
Number of obs.	330	300	330	330	285	330

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