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A NON-PARAMETRIC APPROACH TO FINANCIAL INCLUSION ANALYSIS THROUGH POSTAL NETWORK IN INDIA

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ABSTRACT

The postal department has emerged as a key institution with immense potential towards the ongoing financial inclusion drive in an emerging economy, such as, India. With its vast network of offices and array of financial services it enjoys familiarity of rural residents. In this context, it becomes useful to gauge the spatial and temporal distribution of financial inclusion efforts of the postal department and contemplate steps for further improvements of improving access and usage of finance, especially for the backward and disadvantaged fraction of the society. The results reveal that although there has been improvement, significant progress has not been observed in postal savings penetration and its usage as reflected by accounts per capita and savings per capita trend, respectively, in the study spanning over a period from 1990 to 2008 across eighteen major states of India. Across the states, low preference for postal services seems to be the norm by the more advanced states. The phenomenon could be due to superior avenues, better socio-economic factors and other demographic aspects available to inhabitants of more prosperous regions. The Data Envelopment Analysis reveals a more or less continuous enhancement of the inclusion intensity (measured as the level of financial inclusion of a region compared to the optimal frontier), notably 1999 onwards. The inclusion growth has also registered positive and beneficial changes. Among the constituents of inclusion growth, both intensity change and technology change effects are turning out to be positive for most of the years. The results indicate that both usage of postal services and inherent macro economic conditions of the regions are contributing towards improved inclusion.

KEYWORDS
Financial Inclusion, Panel data, Data Envelopment Analysis.

JEL CLASSIFICATION
G21, C33, C61.

INTRODUCTION

Strong and robust financial institutions are the pillars of economic growth, development and prosperity of modern economies. A financial system, which is inherently strong, functionally diverse and displays efficiency and flexibility, is critical to our national objectives of creating a market-driven, productive and competitive economy. A mature system supports higher levels of investment and promotes equitable growth in the economy with its depth and coverage. A considerable empirical literature using various sophisticated techniques has been employed across nations that seem to validate the point effectively (Levine, 1997; Levine, 2002; Beck et al., 2000; Christopoulos and Tsionas, 2004). The availability of efficient financial intermediaries and their strong network are the major facilitators of developmental and expansionary activities. In turn the economic agents facilitate in growth, development, investment, employment generation, infrastructure improvement, which are now well established in the literature (Feldstein and Horioka, 1980; Brunetti et al., 1998; Ford and Poret, 1991; Hartog and Oosterbeek, 1993).

With the objective of delivering banking services in India at an affordable cost to the vast sections of disadvantaged and low income groups, was constituted the Rangarajan Committee report (2008) recommending unrestrained access to public goods and services as the *sine qua non* of an open and efficient society. It defined Financial Inclusion, '*as the process of ensuring access to financial services and timely and adequate credit where needed by vulnerable groups such as the weaker sections and low income groups at an affordable cost'*. As banking services are in the nature of public good, it is essential that availability of banking and payment services to the entire population without discrimination is the prime objective of the public policy.

Out of 600,000 habitation centres in India, only about 30,000 centres are covered by commercial banks. Further, the proportion of people having any kind of life insurance cover is as low as 10 per cent. People having debit cards comprise only 13 per cent and those having credit cards are only at a marginal 2 per cent (Subbarao, 2009). The observations are glaring testimony to the severity of the financial exclusion situation existing in the Indian economy. In this respect the financial inclusion process has been undertaken in a mission mode by the Reserve Bank of India. Among the major measures implemented are: relaxation of branch licensing policy to enable branch opening especially in rural conglomerations, availability of basic 'No-Frills' account for low income group, simplification of general credit card (GCC) schemes to bank customers in rural areas and so on. The schemes are showing results with improvement of participation of rural inhabitants in the formal financial system (Thorat, 2007).

Apart from the banking system, the Department of Post, which functions as an organ of the Government of India, also has a huge potential to cater to the rural population and contribute towards further inclusion. India Post is a reliable establishment having decent reach nationwide with wide array of financial instruments. The present study is an attempt to analyze the spatial and temporal distribution of financial inclusion and contemplate steps for further improvements of improving access of finance. The results indicate low preference for postal services among the more prosperous states. The DEA analysis reveals a more or less continuous enhancement of the inclusion efforts, particularly during the last decade.

The rest of the article is structured as follows. Section 2 provides a backdrop about the structure of India Post and its emerging role as an effective medium of financial inclusion through vital statistics. Discussion about the data and variables utilized is performed in section 3 followed by econometric methodology in section 4. The empirical results are presented in section 5. The synopses of the study along with the broad findings are summarized in section 6.

BRIEF BACKGROUND

The Department of Post functions under the jurisdiction of Central Government commonly known as 'India Post'. The Indian Postal department is one of the largest postal institutions catering especially to the rural and middle class households. With more than 155,000 offices it can boast of a more dense distribution than that of all commercial banks put together. The postal department provides not only postal solutions but also a host of savings and financial services to far-flung and remote sections of the societies. The apex body of the department is the Postal Service Board. The board consists of a chairman and three members. The three members hold the portfolios of Operations and Marketing, Infrastructure and Financial Services, and Personnel.

Postal savings are a vital constituent of the formal financial system especially catering to the middle class and rural population. Although the core activity of postal department is collection and delivery of mails, over the years the department has diversified by initiating services in the field of basic banking, finance, financial remittances, social security schemes such as old age pension scheme, National Rural Employment Guarantee Scheme (NREGS). It has also started schemes pertaining to insurance, mutual funds, bill payment and so on. Postal Life Insurance was started in 1884 as a welfare measure for the employees of Posts and Telegraphs Department is now open for nearly all government employees.

As per the Report of the expert committee on Harnessing the India Post Network for Financial Inclusion (Shah, 2010) the India Post network with over 155,000 branches is twice as large as the outreach of all commercial banks in India put together. Over the years, the Post Office Savings Bank (POSB) has emerged as significant component of India Post operations and its revenues from financial services as a share of its total revenue have steadily increased over time. Nearly 16 crore people use India Post to save Rs 3,23,781 crore as on March 31, 2007. Out of this, deposits in savings bank account alone are Rs 16,789 crore.

Some preliminary evidence regarding accessibility of postal network suggests that India has a reasonable coverage of post offices across its territory (Table 1). Both in terms of spread and individuals covered, it is superior to nations like China and United States. In fact, India Post seems to be the chief medium of formal financial access and usage by the rural India. Nearly 90 per cent of the post offices in India are located in rural areas. Post office branches in India are in the closest proximity (2 km on average) to rural clients compared to branches of commercial banks, regional rural banks and cooperatives (5 km on average) (Priyadarshee, 2010).

DATA AND RELEVANT VARIABLES

The present study utilizes information on state-wise characteristics, which primarily reflect not only the level of financial activity and awareness but also the factors that contribute towards higher financial aspirations and requirements. The analysis spans across eighteen major states of India over a period from 1990 to 2008 (Henceforth, geometric mean has been utilized to arrive at all the average values, unless specified otherwise).

The parameters are essentially categorized separately as a set of output and input variables. The primary data source for the postal information is the Statistical Tables Relating to Banks in India published by Reserve Bank of India. It provides region-wise annual information on number of accounts and balances available in post office savings bank deposit. The state-wise population and per capita income have been collated from Office of the Registrar General, Census Commissioner of India and Handbook of Statistics respectively.

The present study focuses on the postal department treating it as a vital medium of financial inclusion, where individuals can obtain wide array of financial services commencing from opening of a basic savings account to long term savings products. It provides more sophisticated financial services, such as, pension schemes, insurance products, micro credit etc.

In this regard, the motivation of the study is to gauge the spatial and temporal distribution of financial inclusion. The output variables consist of number of savings account and balances kept in such accounts. Among the input variables effort has been made to include economic and demographic indicators that have an influence on the public needs, awareness, interests and demand side of financial services (Dev, 2006; Kamath et al., 2010; Kumar, 2011; Shetty, 2004). The income per capita and population constitute our input variables. With this we move to the next section explaining the quantitative methodology applied in the present context.

ECONOMETRIC METHODOLOGY

The study employs the Data Envelopment Analysis (DEA) approach to examine the inclusion intensity and inclusion growth across the states. The DEA is a non-parametric, non-linear programming method in operations research and economics for the estimation of production frontiers. The estimated frontier represents the best practices boundary corresponding to the optimal utilization of resources. The earliest exposition of the methodology was performed in a seminal article by Farrell (1957) and extended by Charnes, Cooper and Rhodes (1978). The term 'Decision Making Unit' (DMU) was used for the first time in the CCR model proposed by Charnes, Cooper and Rhodes (1978), employing a mathematical programming model to determine the efficient frontier based on the concept of the Pareto optimality when more than one measure is used. If a DMU lies on the frontier, it is referred to as an efficient unit; otherwise it is labeled as inefficient. The data are enveloped in such a way that radial distances to the frontier are minimized. The DEA is carried out by assuming either constant returns to scale (CRS) or variable returns to scale (VRS). The estimation with these two assumptions allows the overall technical efficiency (TE) to be decomposed into two collectively exhaustive components, viz., pure technical efficiency (PTE) and scale efficiency (SE) i.e., TE=PTE*SE. The former relates to the capability of managers to utilize firms' given resources, whereas the latter refers to exploiting scale economies by operating at a point where the production frontier exhibits constant returns to scale. A major advantage of the non-parametric approach is no prior assumptions are required about the functional form of the relationship. Hence, it guards against spurious results obtained due to application of faulty functional form.

The various approaches to efficiency and productivity analysis have been profusely utilized in the production economics (Banker et al., 1984; Coelli et al., 2005; Ray, 2004). As per the production theory parlance efficiency is defined as the gap between the best practices frontier and the actual level of performance of a DMU. Although, efficiency is a useful measure to assess the performance across the state space, a firm may be enjoying the gains due to improvements in technology of operations. Productivity indicates the extent to which the benchmark production frontier shifts of each firm over time with respect to the observed input mix. The same concept has been applied to measure inclusion intensity and growth respectively.

With this background, financial intensity in the present context is defined as the level of financial inclusion of a region compared to the optimal frontier, estimated using the piecewise linear combination of the actual input–output correspondence set that envelops the data of all the states in the sample.

The productivity can be interpreted as behavior of financial inclusion due to combined effect of region specific changes/improvements and changes in comparison to optimal behaviour. Productivity can be broken into technical change and technical efficiency change. Inclusion growth is defined as the growth or deterioration of financial inclusion status of a region. It is a combination of inclusion intensity change effects and technological change factors. The factors responsible for technological change could be due to demographic (literacy, income), infrastructure and other socio economic factors.

The study utilizes the BCC (Banker et al., 1984) methodology, which allows for variables returns to scale. The efficiency for each DMU is obtained as maximum of the ratio of weighted outputs to weighted inputs. The problem is formally formulated as follows,

Maximize $$E_k = \sum_m W_m Z_{km}$$

$$\sum_m W_m Z_{jm} \le 1$$

$$W_m \ge 0 \qquad \text{. . . (1)}$$

Z_{jm} denote the m^{th} measure of the j^{th} DMU. W_m is the corresponding weight for the m^{th} measure. The weights are selected, such that, each firm obtains the highest possible score. The restriction imposed on the weights is that the resulting score cannot exceed unity.

EMPIRICAL RESULTS

Before proceeding to the DEA results the distributional aspects of the dataset are presented herewith. Table 2 presents the summary of variables utilized for the analysis for selected time points. The table displays a continuous rise in both population and number of postal savings accounts. The population estimate for 2008 stood at 1066 million, whereas the individuals having postal savings account for the same period marked a figure of 67 million. The savings balance has also swelled in nominal terms over the years. However, on normalizing the savings amount the trend shows a downward movement during the period 1990 to 1995 before improving to Rs 15176 crore in 2008. The average values of the parameters across the states are provided in Table 3. On average the highest population, savings accounts and balance is held by the state of Uttar Pradesh at 158 million, 11 million and Rs 1332 crore respectively. Delhi enjoys the highest per capita income among the group at Rs 37,000 approx. The least population is exhibited by Himachal Pradesh at slightly less than 6 million. Jammu and Kashmir portrays the minimum number of savings accounts and amount both as observed from the summary table.

To understand the performance of postal network in India as a medium of financial intermediary in general and operation of basic savings accounts specifically, Figure 1 displays both, the trend of savings accounts per capita and savings balance per capita depicted during the study period. First, focusing on savings accounts per capita, it is observed that the figure improved slightly to 6.26 per cent in 2008 compared to previous period. It implies that there exist only 6 savings account holders in a group of 100 individuals. The savings account per capita has more or less been a stable series hovering in the range of 4.5 to 8 per cent. On turning our attention to savings balance per capita, it is noticed that the sequence has been more volatile, especially pre 2000. The variable in fact registered a dip in 2008 to Rs 142 per capita compared to 149 in 2006. However, the series continuously improved from a low of around Rs 100 per capita in 2000 till 2006.

A cross regional graphical display of accounts per capita is available in Figure 2 for comparative purpose. The All-India average for the entire horizon stood at 5.9 per cent. The regions exhibiting a better ratio than the All-India average are West Bengal, Orissa, Himachal Pradesh at 13.4, 11.6 and 10.1 per cent respectively. Among the poor performers are the states of Punjab, Delhi, Maharashtra at 5.2, 4.0 and 2.9 respectively. It is surprising to note that more affluent zones have a low penetration of postal savings accounts. This may partly be explained due to low preference for postal services by the more developed states due to more avenues, better socio-economic factors and other demographic aspects enjoyed by their inhabitants.

As discussed in Section 3, DEA has been implemented and inclusion intensity has been estimated for all the states over the study period. The inclusion intensity varies from zero to unity. A score of zero implies perfect exclusion, whereas unity pertains to perfect inclusion. The temporal variation of the inclusion intensity is displayed in Figure 3. It may be observed that the inclusion intensity registered a sharp fall from 0.67 in 1990 to 0.34 in 1991. However, post 1991 it has been generally stable and moving in the band 0.4 to 0.6 till 1999. There after, a jump in inclusion intensity has been observed in 2000, where it has moved to 0.69. Afterwards there has been a continuous and slight improvement of inclusion intensity except to 2008, where it has fell slightly to 0.75.

The average inclusion intensity[1] measured across the states is displayed in Table 4. The All-India average inclusion intensity computed is around 0.61. The regions, such as, Kerala, Rajasthan, Karnataka yielded low inclusion intensity at 0.27, 0.33 and 0.34 respectively compared to All-India average. Whereas, some states like Jammu and Kashmir, Himachal Pradesh and Bihar have recorded a perfect inclusion. The phenomenon has occurred due to DEA methodology, which carries out piecewise linear combination utilizing the available variables. Other zones, like Uttar Pradesh and Orissa have also produced high inclusion intensity figures of 0.97 and 0.98 respectively. The findings again point to the inference of high usage of postal services in emerging regions.

Although, inclusion intensity is a useful measure to assess the performance across geography, it does not enable us to conclude about the temporal behaviour of inclusion process. The DEA methodology permits us to compute productivity gains and its break up due to improvements in inclusion intensity or technological changes. Technological progress in our context may be due to various inherent improvements of demographic (literacy, income), infrastructure and other socio economic factors. A glance at the temporal trend of financial inclusion growth depicts beneficial and positive inclusion growth over the study period (Table 5) except for some negative growth in intermittent years in 1993, 1999 and 2000. The inclusion growth observed for 2008 stood at 8.7 per cent compared to the previous period. Among the constituents of inclusion growth, both intensity change and technology change effects are turning out to be positive for most of the years. The result indicates that both usage of postal department and inherent macro economic conditions of the regions are contributing towards improvement of the overall inclusion drive. The state wise inclusion growth shows an average All India figure of 1.0602 (Table 6). The calculation implies a positive inclusion growth of average 6.02 per cent over the period. Except for Orissa, which depicts a fall of around 4 per cent for financial inclusion, all other states register a positive growth. Maharashtra, Uttar Pradesh and Punjab depict a less than average growth at 1.015, 1.04 and 1.04 respectively. On the other side, Kerala and Tamil Nadu have displayed rich inclusion improvements at 1.11 and 1.12 respectively.

CONCLUSION

The postal department is a vital organization contributing towards the ongoing financial inclusion drive. With its vast network of offices and array of financial services it has a tremendous potential to serve the people. In this regard, the motivation of the study is to gauge the spatial and temporal distribution of financial inclusion and contemplate steps for further improvements of improving access of finance, especially for the rural and disadvantaged fraction of the society.

The exploratory results reveal that although there has been improvement, significant progress has not been observed in postal savings penetration and its usage as reflected by accounts per capita and savings per capita trend over the study period spanning over a period from 1990 to 2008 across eighteen major states of India. Across the states, low preference for postal services seems to be the norm by the more developed states. The phenomenon could be due to more avenues, better socio-economic factors and other demographic aspects enjoyed by the inhabitants of more developed regions. The DEA analysis reveals a more or less continuous enhancement of the inclusion intensity, notably 1999 onwards. The inclusion growth has also registered positive and beneficial changes. Among the constituents of inclusion growth, both intensity change and technology change effects are turning out to be positive for most of the years. The result indicates that both usage of postal department and inherent macro economic conditions of the regions are contributing towards improvement of the overall inclusion drive.

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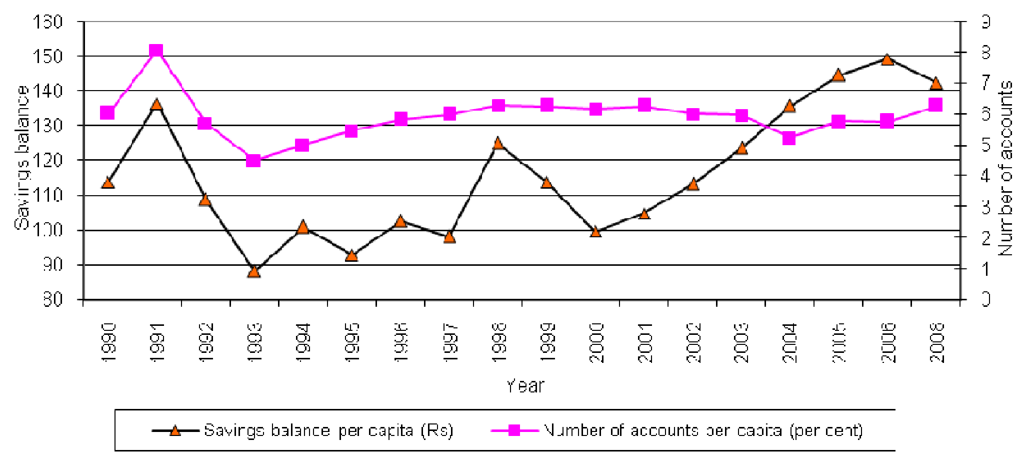
DISCLAIMER

The author is Research Officer at the Reserve Bank of India, Mumbai, India. The views expressed in the paper are those of author and not of the organisation to which he belongs.

APPENDIX

Figure 1: Trend of postal savings indicators



Note: Savings balance has been normalized by GDP deflator

Figure 2: Number of accounts per capita

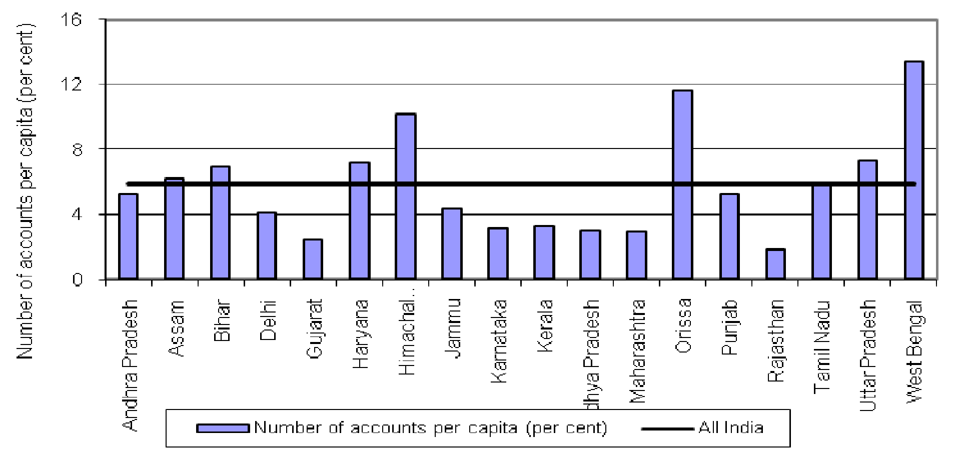


Figure 3: Behaviour of Inclusion Intensity over the period

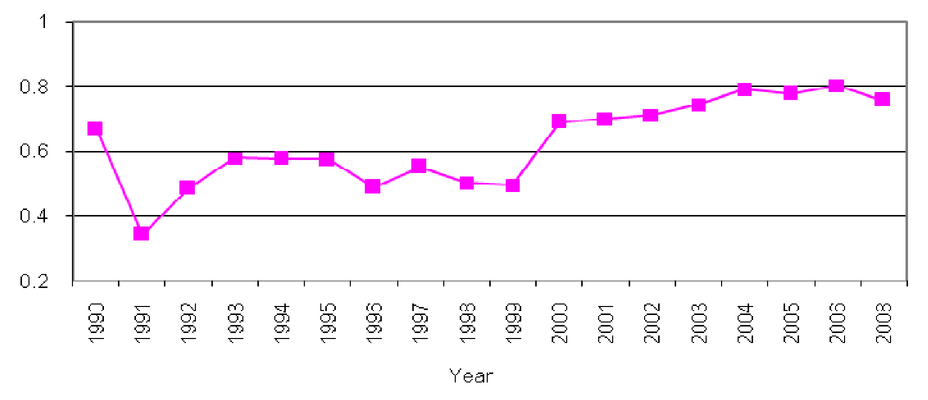


TABLE 1: CROSS COUNTRY POSTAL ACCESSIBILITY

Nation	Postal network density (per sq km)	Average population per post office
China	145.59	19962
India	21.21	7174
Pakistan	64.49	13719
USA	259.25	8029

Source: Priyadarshee (2010); Hassan (2008)

TABLE 2: PARAMETER TOTALS OVER SELECTED TIME POINTS

Year	Population (thousand)	Number of postal savings accounts (thousand)	Savings balance (Rs crore)	Savings balance (Rs crore) *
1990	780312	46980	3168.56	8885.26
1995	862606	47067	4720.20	8002.29
2000	943072	58007	7796.00	9391.68
2005	1019386	58771	14734.27	14734.27
2008	1066195	66759	17700.67	15176.61

* Savings balance normalized by GDP deflator

TABLE 3: SNAPSHOT OF VARIABLES (STATE-WISE AVERAGE)

State	Population (thousand)	Number of postal savings accounts (thousand)	Savings balance (Rs crore) *	Per capita income (Constant)
Andhra Pradesh	74286.49	3914.18	1292.47	15453.03
Assam	25873.88	1602.90	207.10	12698.80
Bihar	78271.38	5433.75	949.98	6097.07
Delhi	12841.24	523.24	372.07	36962.17
Gujarat	48357.42	1198.20	551.03	18434.68
Haryana	19963.38	1437.69	278.78	24061.42
Himachal Pradesh	5864.47	597.23	377.59	19788.06
Jammu	9672.57	424.89	104.06	13542.88
Karnataka	51008.40	1612.47	366.71	15980.40
Kerala	31414.29	1033.01	244.15	19052.50
Madhya Pradesh	58009.64	1764.26	371.29	10821.67
Maharashtra	92683.24	2708.00	866.92	21422.36
Orissa	35668.60	4149.20	493.55	10618.96
Punjab	23341.06	1225.74	571.76	24494.78
Rajasthan	53600.97	1000.12	394.16	12844.81
Tamil Nadu	60926.67	3575.94	869.12	18211.08
Uttar Pradesh	158744.28	11636.82	1332.24	9566.66
West Bengal	77831.17	10454.06	1125.65	14963.74

* Savings balance normalized by GDP deflator

TABLE 4: AVERAGE INCLUSION INTENSITY ACROSS STATES

State	Inclusion intensity
Kerala	0.2763
Rajasthan	0.3322
Karnataka	0.3371
Madhya Pradesh	0.3619
Gujarat	0.4184
Maharashtra	0.5311
Haryana	0.5675
Assam	0.5904
All India	0.6099
Tamil Nadu	0.6231
Andhra Pradesh	0.6281
Delhi	0.6669
Punjab	0.7484
West Bengal	0.8723
Uttar Pradesh	0.9796
Orissa	0.9803
Bihar	1
Himachal Pradesh	1
Jammu	1

TABLE 5: TEMPORAL TREND OF INCLUSION GROWTH AND ITS DECOMPOSITION

Year	Intensity change effects (CRS)	Technology change	Intensity change effects (VRS)	Scale effect	Inclusion growth
1991	0.4648	2.35971	0.50977	0.91151	1.09661
1992	1.54124	0.65502	1.42079	1.0848	1.00954
1993	1.21975	0.72975	1.19297	1.0224	0.89003
1994	1.00774	1.15233	0.99458	1.01328	1.16124
1995	0.9941	1.06616	0.99978	0.99444	1.05995
1996	0.83461	1.32134	0.84748	0.98471	1.10276
1997	1.12108	0.89675	1.12941	0.99265	1.00532
1998	0.79865	1.49155	0.90879	0.87878	1.1914
1999	1.02084	0.94505	0.98867	1.03244	0.96484
2000	1.52769	0.62054	1.39405	1.09583	0.94794
2001	1.00796	1.06934	1.01364	0.99436	1.07805
2002	1.03469	1.06281	1.01586	1.01841	1.09966
2003	1.03307	1.10935	1.0441	0.98943	1.14612
2004	1.09031	0.99369	1.06486	1.02398	1.08343
2005	0.99073	1.11687	0.98428	1.00655	1.10665
2006	1.02784	1.01228	1.02926	0.99851	1.04013
2008	0.89992	1.20854	0.94325	0.95392	1.08764

Table 6: Average Inclusion growth variations across states

Year	Inclusion growth
Orissa	0.9608
Maharashtra	1.0149
Uttar Pradesh	1.0359
Punjab	1.0377
Haryana	1.0386
Jammu	1.0485
West Bengal	1.0501
Assam	1.0516
All India	**1.0602**
Himachal Pradesh	1.0606
Karnataka	1.0677
Andhra Pradesh	1.0696
Gujarat	1.0743
Bihar	1.0790
Madhya Pradesh	1.0844
Delhi	1.0845
Rajasthan	1.0996
Kerala	1.1122
Tamil Nadu	1.1246

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