Removing poverty and inequality in India: the role of infrastructure

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THE ROLE OF INFRASTRUCTURE

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REMOVING POVERTY AND INEQUALITY IN INDIA: THE ROLE OF INFRASTRUCTURE

I. INTRODUCTION

Poverty eradication has emerged as a major objective of development planners in recent times. For that purpose it becomes necessary to identify factors that affect poverty and its dynamics. In the literature, there has been substantive discussion and debate on the determinants of poverty. Traditional focus in development thinking has been on how economic growth leads to poverty reduction, as it increases per-capita real income levels to increase incomes of the poor. This is referred to as the 'trickle down' effect of growth, which simply implies a vertical flow of income from the rich to the poor at a given rate. In this process, the benefits of economic growth are reaped first by the rich, and subsequently by the poor, once the rich starts spending their gains. In the recent times, there has been a significant shift in focus in the poverty literature away from the 'trickle down' concept of growth towards the idea of 'pro-poor' growth, defined as "growth that enables the poor to actively participate in, and significantly benefit from, economic activity" (Kakwani and Pernia, 2000). The ideal outcome of such a growth process should be that no person in society is deprived of the basic minimum needs.

Since infrastructure is seen to be a major facilitator of growth, researchers have been trying to link it with poverty reduction recently. In this context, two schools of thought emerged during the 1990s connecting physical infrastructure with poverty reduction. While developing countries attached great importance to physical infrastructure for poverty reduction, many in the international development community viewed assistance for infrastructure with considerable scepticism (DFID, 2002). The critics commented that benefits from infrastructure investment are significantly less than expected, have little *direct* relevance to poverty reduction, and, weak governance and institutions in developing countries leads to corruption, distorted public investment choices, neglected maintenance, etc. thereby lowering infrastructure's contribution to economic growth and diverting benefits intended for the poor. However, there is now a wider recognition that if governance and institutional frameworks are strengthened, the linkage between infrastructure and reduction of poverty can become stronger. In India, eradication of poverty and *inclusive* growth has emerged as one of the main objectives of the government in

recent times and infrastructural bottlenecks are seen as a major obstacle towards that goal. Consequently, recent policy announcements have focused on both infrastructure expansion and pro-poor growth. In this backdrop, it becomes necessary to directly estimate the linkage between infrastructure and poverty in India, both at the national and regional level. Moreover, it would be too simplistic to assume that the association between infrastructure and poverty is uni-dimensional. Rather, the association is expected to be different for different types of infrastructure – physical and social – and also for regions at different levels of development. The present paper seeks to explore this multidimensional association between different types of infrastructural facilities and poverty across India in a regional framework.

II. INFRASTRUCTURE-POVERTY INTERLINKAGE: THEORETICAL PREMISES AND PAST STUDIES

A significant proportion of poverty in poor areas, after controlling for household characteristics, is explained by what is called "geographic capital" (Jalan and Ravallion, 2002). Infrastructure is one of such *geographic capital*, and its deficiency leading to lack of access to product and factor markets may be seen as one of the main causes behind poverty. Infrastructure investments, complemented by policy and institutional reforms, are expected to expand markets and enable the poor to gainfully participate in the growth process. Physical infrastructure like road, transport, and communications provide geographic access and information flow, thereby increasing labour mobility and making it easier for surplus labour to move to places where labour is in short supply. Good infrastructure is also likely to usher in industrial or agro-industrial development. They bring with them outside influences and stimuli and result in profound changes in mentalities, attitudes, opportunities, and socio-economic structure, along with a rise in income levels. Apart from directly productive activities, social infrastructure development is expected to attract better teachers and doctors, expand learning and health-care opportunities, and improve human capital in a region. This will likely increase productivity level and earning capabilities, leading to poverty alleviation. Because of such theoretical arguments, World Development Report(s) (1990 and 2000) talked of infrastructural expansion as an important tool for poverty eradication (World Bank 1990, 2000) [For a well structured theoretical discussion on poverty-infrastructure interlinkage see Pouliquen (2000) and Fan (2004)]. This has been followed by a number of studies exploring the linkage between infrastructure

and poverty including World Bank (1994), Lipton and Ravallion (1995), Jimenez (1995), Markandya et al (2003), Yao (2003), Ali and Pernia (2003), Fan (2004), Estache and Goicoechea (2005). While these have mostly harped on the growth impact of infrastructural expansion and resultant poverty reduction, impact of specific sectors on economic upliftment have been discussed by Howe and Richards (1984), Binswanger et al. (1993), Goldstein (1993), van de Walle (1996), Levy (1996), Bhattarai et al (2002), Songco (2002), Lokshin and Yemtsov (2004, 2005), Jacoby and Minten (2008) among others. Studies on developing countries in general, and East & Southeast Asia in particular, include those by Glewwe et al (2000), Kwon (2000), Balisacan et al (2002), Balisacan and Pernia (2002), Fan et al (2002), Yan and Hua (2004), Torero and Chowdhury (2005), Jones (2006), Sawada et al (2008), ([see Estache (2004) and Jones (2004) for a comprehensive review]. Studies that link poverty with infrastructure on Indian context include those by Rao (1986), Fan et al (1999), Amis and Kumar (2000), Zhang and Fan (2001), Ravallion and Datt (2001), Fan (2003), Radhakrishna and Panda (2006).

While the results from country studies leave scope for debate regarding the role of infrastructure in poverty alleviation, those related to India are mostly micro studies based on a specific infrastructural sector or specific region. But to implement and operationalise infrastructure programmes for poverty reduction in India in a broader framework, we must look at a host of infrastructural sectors – both physical and social – and also try to find out the nature of the relationship across different regions of the nation. In this regard the first important issue is estimation of the impact of different infrastructural facilities in reducing poverty so that proper targeting can be done before investing in large-scale infrastructure across the board. The second issue is that, to the best of our knowledge, most of the existing studies on the link between infrastructure and poverty reduction limit themselves to the static concept of *existing* poverty whereas the role of infrastructure expansion on reduction of poverty is equally important for policy formulation. The present paper attempts to fill in this gap by analysing the relationship between several components of infrastructure on one hand and both levels & dynamics of poverty on other so that proper policies can be formulated for poverty eradication.

In addition, we also prepare indices of Agricultural and Industrial development and examine the relation between these and regional wellbeing and poverty levels.

III.   BRIEF NOTE ON METHODOLOGY

1.   Spatial Units

Since we want to study the multidimensional aspect of infrastructure-poverty interlinkage across space and sectors, we must try to alienate the spatial units as far as possible. It is observed that most of the existing studies stop at the state level. But 'state' as a region seems too large a unit to meaningfully reveal the regional dimension of well-being, poverty, infrastructure and development in India. Considerable heterogeneity is present even within each state with several backward and advanced regions coexisting. If we stop at the level of state, then we gloss over such intrastate differences and loose much of the information that could have been gathered. District-level analysis should have been ideal under such situation, but unfortunately robust district level estimates of wellbeing and poverty are available from NSSO only for 2004-05. For other years, districts within a state have been clubbed by NSSO into several groups called *'NSS Regions'* based on geo-economic features of the districts.[1] These *regions* are mostly homogenous in nature and therefore we explore the poverty-infrastructure-development interlinkage at the levels of NSS regions for 1993-94 and 2004-05, and at the district level for 2004-05.

2.   Computation of Variables

Well-being and poverty has been traditionally measured in India by Monthly Per-capita Consumption Expenditure (MPCE) and Proportion of people living below a certain minimum MPCE (the Poverty Line). Both these are estimated from Unit level records of the periodical surveys of National Sample Survey Organisation for the years 1993-94 and 2004-05.

Availability of infrastructural facilities in India has been analysed in a multidimensional framework. There are various facets of Infrastructure, and while a region may lack in one or more of the infrastructural services available, it may possess adequate supply of others. Moreover, poverty and wellbeing would be affected by not only physical infrastructure but presence of financial and social infrastructure (banks, credit institutions, schools, hospitals, etc.) also. Consequently, Infrastructure has been subdivided into *three* constituent components: Physical Infrastructure; Financial Infrastructure; and Social Infrastructure. Further subdivided, the following components of Infrastructure are identified -

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[1] For details of NSS Regions see www.mospi.nic.in

Agro-specific Infrastructure - consisting of irrigation infrastructure and agricultural credit (hereafter AGINF);

Transport & Communication Infrastructure - consisting mainly of Roads and Railways (TRINF);

Power Infrastructure - represented by % of Villages electrified (POWINF);

Financial Infrastructure - consisting mainly of Banking Services (FININF);

Education Infrastructure - consisting mainly of access to schools and colleges (EDUINF);

Health Infrastructure - consisting mainly of access to hospitals, dispensaries and medical personnel (HLTINF).

Each of these six components of infrastructure themselves consist of several variables/indicators and have been constructed using Principal Component Method.[2] Thereafter, the first three indices have been combined to yield the measure of Physical Infrastructure (PHYINF), while the last two were combined to form Social Infrastructure (SOCINF). A Composite Index of Infrastructure (INFRA) has also been constructed combining Physical, Financial, and Social Infrastructural Indices. Similarly, indices of Agricultural Development (AGDEV) and Industrial Development (INDDEV) have been prepared to reflect the levels of sectoral development in the regions.[3] These two were then combined to yield Composite Index of Development (DEVT).

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[2] The constituent indicators of the composite indices are as follows. **Agricultural Infrastructure** – Irrigation Intensity (Net Irrigated Area as percentage of Net Sown Area), Agricultural Credit per Primary Labourer, Number of Primary Agrcultural Credit Societies per lakh population, Power consumed for agricultural purpose per acre of cultivated land; **Transport Infrastructure** – Road Length per thousand sq. km. area, Surfaced road length as percentage of total road length, Percentage of roads as Highways, Railway Length per thousand sq. km. area, Number of Post Offices per thousand sq. km. area, Number of Letter Boxes per thousand sq. km. area, Postal articles carried per capita; **Power Infrastructure** – Percentage of villages electrified, Per capita Power generated, Per capita power sold, Plant Load Factor; **Educational Infrastructure** – Number of Primary & Secondary Schools and Colleges (both per thousand sq. km. area and per thousand population), Teacher-pupil ratio in primary schools, Per capita expenditure on primary education; **Health Infrastructure** – Hospitals and Dispensaries (both per thousand sq. km. area and per thousand population), Number of Beds in hospitals and dispensaries per lakh population. Since Agricultural Credit is a targeted facility, it has been included within agricultural infrastructure and not general Financial Infrastructure.

[3] The constituent indicators of the development indices are: **Agricultural Development** – Per Capita Net State Domestic Product (NSDP) from Agriculture at constant prices, Land productivity measured by NSDP from agriculture per 1000 hectare Gross Cropped Area, Labour productivity measured by NSDP from agriculture per 1000 Agricultural Workers, Cropping intensity, Percentage of Net Sown Area under Commercial Crops; **Industrial Development** – Per Capita NSDP from Secondary sector at constant prices, Non-household Manufacturing workers as percentage of total workers, Registered Factories per 1000 sq. km area, Percentage of NSDP from Manufacturing sector, Value Added by Registered Factories per worker, Value Added-Productive Capital ratio in the registered Factories;

In all cases, the first Principal Component explained more than 70 per cent of the variation and hence only the first was taken. Further analysis is based on those indices.

Since our contention is that causation runs from infrastructure and development to Well-being and Poverty reduction, we have introduced lags between the two sets of variables. While well-being and poverty indices are computed for 1993-94 and 2004-05, infrastructural and developmental indices are prepared for 1991 and 2001 (we have chosen these two years since Population Census data are available for those two time points).

IV. POVERTY TRENDS IN RECENT YEARS

Poverty has generally been measured in India using the concept of Poverty Line and estimating the proportion of people having monthly expenditure below such levels. It is thus linked with Monthly Per-capita Consumption Expenditure (MPCE), State and Sector-specific Poverty lines, and regular updating of the latter as prices change. Trends in incidence of Poverty in India over the last few decades reveal that percentage of the population living below the poverty line fluctuated between 50-65 per cent prior to the mid-1960s, but had then declined steadily to about one-third of the population by the early 1990s. Since then, consumption levels have increased by about 3 per cent per annum in the rural areas and by about 6 per cent p.a. in the urban areas (Table 1). This has been accompanied by a drop in Poverty levels from about 36 per cent in 1993-94 to about 27 per cent in 2004-05.

The Poverty Lines used by Planning Commission in its official estimation of poverty came under criticism and the Expert Group under chairmanship of Suresh Tendulkar revised the Poverty Lines upward in its report (GOI, 2009). This has resulted in higher estimates of poverty for the country – 41.8 per cent in rural areas, 25.7 per cent in urban areas, and 37.2 per cent in aggregate for the year 2004-05. This is still a decline from the revised 1993-94 figures of 50.1 per cent and 31.8 per cent in rural and urban areas respectively.

While such trends are commendable, there is substantial regional variation in both consumption and poverty levels, both across rural-urban space and among states even in 2004-05. While consumption levels (at constant 1980-81 prices) vary from ₹ 56 in rural Madhya Pradesh to ₹ 263 in urban Maharashtra, incidence of poverty varies from about 3 per cent in urban Himachal Pradesh to more than 46 per cent in rural

Orissa. At the NSS Region level, poverty is highest in Southern Orissa, followed by Northern Orissa, Central and Southern Madhya Pradesh, Inland Maharashtra, and Vindhya region. Incidence of poverty is least in Northern Punjab, followed by Southern Gujarat, Saurashtra region, and Southern Kerala.

This spatial variation in well-being and poverty prompts us to explore their reasons and the foremost that comes to mind is regional economic performance. It is generally expected that high income regions will have higher consumption levels and lower incidences of poverty. But that is not been the experience in India with high income states like Maharashtra having more than 30 per cent of people living below poverty line while poverty figures are relatively lower in low income states like Andhra Pradesh and Rajasthan. Thus average income level and growth performance of the state do not seem to have a strict correspondence with well-being and equity within the state. Since income level and growth figures are available at the state level, it is hard to explore whether heterogeneity within a state is leading to such observations. Considering this, we try to examine whether infrastructural facilities have any bearing on regional well-being and poverty in India.

V.   TRENDS IN INFRASTRUCTURAL FACILITIES

India, on attaining independence, accorded highest importance to the development of infrastructural facilities. The successive plans were formulated on such lines that the infrastructural sectors claimed the lion's share of the plan outlays and actual expenditures. This emphasis continued and was reinforced in the post-SAP period (since 1990s). As a result, we find that all the sub-sectoral components of infrastructure – AGINF, TRINF, POWINF, EDUINF, and HLTINF – have exhibited a sustained and continuous rise during 1991-2001 period (Table 2 and 3). The relative position of the states regarding different infrastructure indices show that the hierarchy has remained fairly similar over time – with the same states retaining the top and bottom positions.   Excellent infrastructure has been in place in Delhi, Punjab, Maharashtra, and Tamil Nadu, while infrastructural facilities has been lacking in Bihar, Madhya Pradesh, Orissa and Rajasthan. While the relative positions have remained sticky, inter-state variations are observed to be substantial, highest for Financial infrastructure and lowest for Power infrastructure. We are also experiencing diverging tendencies in physical and financial infrastructural indices and convergence only in social infrastructure. Considering that the first two are more directly linked to

economic activities, wellbeing and poverty, such a diverging trend speaks of increasing regional inequality in recent times.

VI. TRENDS IN DEVELOPMENT LEVELS

All the three indices of development – AGDEV, INDDEV and DEVT have increased during 1991-2001, more for AGDEV compared to INDDEV, indicating industrial slowdown after the Structural Adjustment Process (Table 4). More or less similar trends were observed for the major states also. Here too, the hierarchy has remained fairly similar over time – with the same states retaining the top and bottom positions. In case of AGDEV, the North-western and Southern states are doing well while for INDDEV, the Western and North-western states doing better than others. The North-western and Western states are consistently doing better in terms of composite measure of development. This clearly reflects a regional pattern with the Eastern, Northern and Central regions performing poorly from where only West Bengal is reaching close to the national average level of development. This regional disparity is of grave concern.

We have briefly positioned the fact that there is substantial regional variation in India in terms of Well-being, Poverty, Infrastructural availability, and Developmental levels. We would now explore the nature of interlinkages between these indicators, and also whether the interlinkages are uniform or dissimilar across time and space.

VII. POVERTY-INFRASTRUCTURE-DEVELOPMENT INTELINKAGE

1. Infrastructure-Poverty Linkage across Regions and Districts

The association between infrastructure, poverty and well-being is examined using Correlation, Cross-tabulation and Multivariate Regression. The results are discussed below.

a)   Association between Infrastructure and Consumption Levels

There appears a noteworthy association between regional well-being and infrastructural availabilities as observed from the significantly positive correlation coefficient between Rural and Urban MPCE and Infrastructural indices for the 1991-94 period (Table 5). As expected, Agricultural infrastructure is most important in rural areas, while impact of Power, Health, and Financial infrastructure seems to be relatively higher in both rural and urban areas. At the composite level, Physical infrastructure appears to have stronger influence than Social infrastructure in raising

the average MPCE level. In 2001-05 period, similar association between infrastructure and well-being is observed, though the strength of association has seems to have weakened over time (Table 6).

b) *Association between Infrastructure and Poverty*

This is mirrored in the opposite relation between infrastructure and poverty as well, with significant negative correlation observed between regional infrastructural indices and incidence of poverty in both the time points. Power and Health infrastructure emerges as most crucial elements in tackling both rural and urban poverty. This is quite revealing since better health facilities seems to be tackling poverty through its impact on productivity level of the workers. On the other hand, electricity is now a pre-condition of almost all productive activities and therefore its availability seems to be leading to entrepreneurship, economic expansion & diversification and higher income level for the people. In this regard it is sad to note that even in 2009 more than 10 per cent of Indian villages and 35 per cent of Indian households do not have electricity. Among the components, though Physical infrastructure appears to be more important in tackling poverty in rural areas, in urban areas impact of Social infrastructure appears to be stronger. This may be linked with the fact that moderate levels of physical infrastructural facilities are available in almost all urban areas and the difference between areas lies in availability of social infrastructure. On the other hand, even physical infrastructure is quite inadequate in many rural areas and therefore those with better facilities have lower poverty level.

c) *Association between Infrastructure and Inequality*

We have estimated consumption inequality within the regions/districts by Gini Coefficient of MPCE, and it is observed that regions with better infrastructure are also those with higher inequality on an average, as reflected by positive association between infrastructure indices and inequality in both 1991-94 and 2001-05 periods.

This implies that while infrastructural expansion is related to higher living standards and lower aggregate poverty, the benefits have not been equally shared and an unbalanced growth pattern seems to be working. While this is expected in initial stages of growth, this should not be allowed to rip off the fabric of social equality and how to tackle this situation should be carefully analysed.

One notable departure to this is the negative association between Inequality and Social infrastructure, more particularly Education infrastructure. Regions with

improved social infrastructure, in particular educational facilities, are also those with lower inequality levels. The role of social infrastructure like educational facilities in enhancing human capital and creating an egalitarian atmosphere is thus emphasized.

d) Cross Tabulation

The regions were also divided into three groups (High, Moderate and Low) along each of the indicators – Composite Infrastructure, Average MPCE, Poverty levels, and Inequality levels. The districts were then cross-tabulated according to Infrastructure group on one hand and MPCE group, Poverty group and Inequality group successively. The Chi-Square coefficients and Gamma Ratios associated with these Cross-tabulations were examined to understand the interlinkage between infrastructure, well-being, and poverty (Table 7). As observed earlier, for 1991-94 period the relationship between infrastructure and MPCE is positive while that with Poverty levels is negative, the association being stronger for rural areas. For the 2001-05 period, the association maintains the earlier nature, and has become even stronger. However, the relation between infrastructural group and inequality group appears to be positive, especially for the rural areas, indicating higher inequality in regions with better infrastructure.

e) Differential Impacts across Groups of Regions

As mentioned earlier, we have grouped the regions into Good, Moderate, and Poor Infrastructure regions. It is observed that the nature of infrastructure–well-being–poverty linkages is different for the three types of regions. The association seems to be strongest for the moderate infrastructure regions in both rural and urban areas, supporting the Hansen thesis (Hansen, 1965) that social overhead capital has strongest impact in intermediate regions (Table 8).

Moreover, the components of infrastructure that are crucial are also dissimilar across regions. While in Poor Infrastructure regions Electricity is more important, in regions where overall infrastructure situation is good, Financial infrastructure and Social infrastructure (like schools and hospitals) emerge as more vital. This indicates the primacy of physical infrastructure in improving well-being of the people and reducing poverty. Only when such elementary facilities like transport, irrigation, and communication are available that the role of education and health comes into play.

If we look at the association between infrastructure and poverty separately for regions at different Development levels (grouped according to the composite index of

agricultural and industrial development), we find that impact of infrastructure on poverty and well-being is highest for the regions that are lagging in development. The case for using infrastructure as a tool for amelioration of poverty in the backward regions is thus emphasised.

2. Development Indices, Poverty and Well-being

While infrastructure aids poverty eradication, more direct association should be perceived between development levels and well-being. It is observed that developmental indices are positively associated with MPCE and negatively with Poverty levels (Table 9 & 10). At aggregate level, industrial development appears to be more important in improving well-being and reducing poverty though most of the people are still dependent on agriculture as their primary means of livelihood, both directly and indirectly. It is thus evident that rapid industrialisation and transformation from agricultural to industrial economy is necessary to improve the living condition of the people and reduce poverty. As with the infrastructural groups, in this case too, the associations are stronger for intermediate regions, supporting broadly the Hansen thesis (Hansen, 1965).

3. A Multivariate Regression Approach

So far we have discussed the association between poverty, well-being, infrastructure, and development indices using simple bivariate techniques. While this is a simple indicator of the role played by lack of infrastructural facilities in concentration of poverty, a multivariate approach will bring out the relative importance of the different facets of infrastructure identified in our study. For that, we have used Multiple Regression whereby MPCE levels, Poverty Level, and Inequality Index are expressed as functions of sectoral infrastructural indices. The results are provided in Table 11.

It is observed that even in a multivariate framework, several of the infrastructural facilities are important explanatory variables in determining regional well-being, poverty, and inequality. Better transport, power, and financial infrastructure is leading to higher MPCE levels both in 1993-94 and 2001-04 periods. More importantly, their role, especially those of Transport and Power, in explaining regional differences in MPCE level has increased substantially.

Availability of better transport and power infrastructure is also observed to have substantial negative impact on regional poverty levels, though in 1991-94 period the most important factor appeared to be Health facilities.

The relation between Inequality and Infrastructure appears to be relatively weak at the aggregate and further declining over time. However, it appears that improvement in Physical infrastructure, specifically Power facilities, lead to higher regional inequality. On the other hand, improvements in educational and health facilities seems to have a decreasing effect on inequality, as seen from their negative regression coefficients, though the coefficients are not significant.

VIII. DYNAMIC RELATIONSHIP

So far we have explored the association between infrastructure, well-being and poverty in a static framework. However, to examine the role of infrastructural expansion in improving consumption levels and alleviating poverty in a more meaningful way, one must also look at the dynamic relationship between them. This has been attempted by looking at the association between *improvement rates* in infrastructural indices on one hand and rate of growth in MPCE and rate of decline in number of poor people on the other (Table 12).

It is observed that the relation between improvement in infrastructure and growth of consumption is positive throughout. Though the association is not very strong overall, the influences of expansion of Financial, Health, and Educational infrastructural facilities are relatively greater, especially in the urban areas.

Impact of improvement in infrastructural facilities, especially social infrastructure, on rate of poverty reduction is more pronounced. Expansion of transport facilities also seems to be facilitating reduction in incidence of poverty.

Thus the dynamic linkage supports the view that infrastructural expansion is an important tool for improving consumption level and reducing incidence of poverty across regions / districts in India.

IX. SUMMARY

We have observed that infrastructural availability at the regional/district level has impacts on both average living standards as well as the income distribution in terms of lowering the proportion of people living below the poverty line. At the same time, some components of infrastructure – the physical sectors – tend to increase inter-personal inequality at the regional level. Dynamic relationship reveals positive association between expansion rates of infrastructural facilities and growth of consumption and reduction in incidence of poverty.

It can therefore be inferred from the study that expansion of regional infrastructural facilities enhances average consumption level of the people and reduces the proportion of people living below poverty line. At the same time, these impacts are not uniform across the populace, and is accompanied by increased inequality within the region/district. Availability of education and health facilities however leads to both lowering of poverty and convergence through reduced interpersonal inequality.

This differential role played by different sub-components of infrastructure in rural & urban areas, as also in different types of regions is an important finding of this study. Policy formulations should try to focus on such differentiated roles while drawing up developmental and poverty eradication programmes. Obviously, not everyone among the poor can be pulled up by their bootstraps to join in the infrastructure-mediated growth process so described. There are those who are truly dispossessed and thus unable to be gainful producers of goods and suppliers of labour. There may also be other instances in which the poor may be socially constrained or excluded, and thus are not in a position to immediately join in the growth process. Improvement in regional infrastructural facilities leading to economic growth, more often than not, bypasses this section and widens socio-economic inequality. In fact, results from our study points out to such increasing inequality along with physical infrastructural progress. Poverty and exclusion of this nature will require different types of intervention – capability formation through social infrastructure and redistribution at the margin may be some of them. The study emphasises the importance of focussed and regionally segregated infrastructural development for raising living standards and alleviation of poverty in India, along with adequate attention to social infrastructure to prevent increased inequality.

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Table 1

MPCE and Poverty Trends across Major States in India

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States	MPCE 1993		MPCE 2004		Poverty Rates 1993			Poverty Rates 2004		
	Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Agg**	**Rural**	**Urban**	**Agg**
Andhra Pr	73	103	79	137	15.9	38.3	22.2	11.2	28.0	15.8
Bihar	59	96	69	137	58.2	34.5	55.0	43.0	28.7	41.1
Delhi	na	na	162	233	1.9	16.0	14.7	6.9	15.2	14.7
Gujarat	87	131	81	151	22.2	27.9	24.2	19.1	13.0	16.8
Haryana	124	152	138	182	28.0	16.4	25.1	13.6	15.1	14.0
Himachal Pr	na	na	110	192	30.3	9.2	28.4	10.7	3.4	10.0
Karnataka	82	129	81	164	29.9	40.1	33.2	20.8	32.6	25.0
Kerala	106	135	130	166	25.8	24.6	25.4	13.2	20.2	15.0
Madhya Pr	66	107	56	123	40.6	48.4	42.5	37.9	41.9	39.0
Maharashtra	91	178	130	263	37.9	35.2	36.9	29.6	32.2	30.7
Orissa	71	130	68	128	49.7	41.6	48.6	46.8	44.3	46.4
Punjab	137	162	154	241	12.0	11.4	11.8	9.1	7.1	8.4
Rajasthan	92	121	89	145	26.5	30.5	27.4	18.7	32.9	22.1
Tamil Nadu	83	124	96	172	32.5	39.8	35.0	22.8	22.2	22.5
Uttar Pr	84	119	97	151	42.3	35.4	40.9	33.7	31.0	33.1
West Bengal	99	169	110	220	40.8	22.4	35.7	28.6	14.8	24.7
ALL INDIA	103	168	137	215	37.2	31.6	35.9	28.3	25.7	27.5

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: MPCE is in Rs per capita per month at 1980-81 prices; Poverty Rates are percentages of total population living below official poverty line.

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Table 2

Infrastructure Trends across Major States in India 1991

</div>

States	AGINF	TRINF	POWINF	FININF	EDUINF	HLTINF	PHYINF	SOCINF	INFRA
Andhra Pr	0.10	0.14	0.82	0.12	0.34	0.13	0.19	0.20	0.61
Bihar	0.09	0.11	0.00	0.03	0.32	0.07	0.05	0.15	0.00
Delhi	0.23	1.00	0.97	1.00	0.22	0.27	1.00	0.27	1.00
Gujarat	0.03	0.10	0.97	0.07	0.41	0.13	0.15	0.22	0.70
Haryana	0.13	0.20	1.00	0.09	0.31	0.06	0.27	0.14	0.73
Himachal Pr	0.03	0.00	0.81	0.00	0.00	0.00	0.04	0.00	0.54
Karnataka	0.05	0.11	0.95	0.06	0.45	0.07	0.16	0.19	0.68
Kerala	0.04	0.17	1.00	0.10	0.26	0.13	0.21	0.17	0.73
Madhya Pr	0.03	0.05	0.70	0.04	0.41	0.06	0.06	0.16	0.49
Maharashtra	0.00	0.12	0.88	0.10	0.40	0.10	0.14	0.19	0.64
Orissa	0.05	0.04	0.21	0.03	0.57	0.07	0.00	0.22	0.15
Punjab	0.24	0.17	1.00	0.13	0.39	0.16	0.28	0.24	0.75
Rajasthan	0.04	0.05	0.26	0.02	0.32	0.11	0.01	0.18	0.17
Tamil Nadu	0.11	0.55	0.91	0.24	0.30	0.10	0.56	0.16	0.74
Uttar Pr	0.14	0.11	0.51	0.06	0.32	0.08	0.13	0.15	0.37
West Bengal	0.05	0.29	0.13	0.32	0.32	0.09	0.21	0.16	0.17
ALL INDIA	0.27	0.27	0.75	0.07	0.58	0.12	0.43	0.14	0.19

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: Indices have been standardised across 1991 and 2001 to lie between 0 and 1.

Table 3
Infrastructure Trends across Major States in India 2001

States	AGINF	TRINF	POWINF	FININF	EDUINF	HLTINF	PHYINF	SOCINF	INFRA
Andhra Pr	0.31	0.25	0.83	0.21	0.82	1.00	0.35	1.00	0.75
Bihar	0.19	0.33	0.02	0.04	0.33	0.43	0.28	0.42	0.08
Delhi	0.34	0.92	0.98	0.06	0.22	0.18	0.97	0.20	0.82
Gujarat	0.09	0.09	0.98	0.39	1.00	0.13	0.16	0.39	0.78
Haryana	0.20	0.38	1.00	0.22	0.59	0.15	0.45	0.29	0.80
Himachal Pr	0.40	0.00	0.82	0.20	0.00	0.00	0.16	0.00	0.60
Karnataka	0.07	0.23	0.96	0.23	0.78	0.81	0.27	0.84	0.81
Kerala	0.15	0.22	1.00	0.34	0.66	0.09	0.30	0.26	0.79
Madhya Pr	0.14	0.05	0.72	0.05	0.41	0.06	0.11	0.17	0.51
Maharashtra	0.05	0.14	0.89	0.41	0.53	0.10	0.18	0.23	0.72
Orissa	0.20	0.04	0.23	0.05	0.60	0.29	0.05	0.40	0.19
Punjab	0.31	0.20	1.00	0.33	0.56	0.27	0.33	0.37	0.81
Rajasthan	0.11	0.06	0.27	0.16	0.41	0.22	0.05	0.29	0.23
Tamil Nadu	1.00	0.55	0.92	0.33	0.36	0.15	0.86	0.22	0.81
Uttar Pr	0.18	0.19	0.53	0.20	0.44	0.30	0.22	0.36	0.45
West Bengal	0.15	0.75	0.15	0.35	0.29	0.08	0.64	0.15	0.24
ALL INDIA	0.38	0.43	0.83	0.07	0.69	0.11	0.78	0.25	0.39

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: Indices have been standardised across 1991 and 2001 to lie between 0 and 1.

Table 4
Development Trends across Major States in India

States	1991			2001		
	AGDEV	INDDEV	DEVT	AGDEV	INDDEV	DEVT
Andhra Pr	0.12	0.05	0.07	0.20	0.06	0.18
Bihar	0.14	0.04	0.07	0.21	0.02	0.08
Delhi	0.11	0.81	0.53	1.00	1.00	1.00
Gujarat	0.13	0.03	0.06	0.22	0.03	0.10
Haryana	0.21	0.05	0.09	0.48	0.05	0.21
Himachal Pr	0.00	0.02	0.00	0.00	0.02	0.01
Karnataka	0.12	0.03	0.05	0.22	0.05	0.12
Kerala	0.17	0.10	0.13	0.37	0.10	0.20
Madhya Pr	0.10	0.01	0.02	0.17	0.03	0.07
Maharashtra	0.11	0.14	0.12	0.16	0.13	0.15
Orissa	0.08	0.01	0.02	0.12	0.02	0.04
Punjab	0.15	0.07	0.09	0.26	0.13	0.17
Rajasthan	0.09	0.00	0.02	0.13	0.01	0.05
Tamil Nadu	0.12	0.08	0.09	0.12	0.09	0.10
Uttar Pr	0.09	0.01	0.04	0.14	0.03	0.13
West Bengal	0.10	0.05	0.07	0.14	0.04	0.14
ALL INDIA	0.15	0.09	0.83	0.19	0.10	1.00

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: Indices have been standardised across 1991 and 2001 to lie between 0 and 1.

Table 5
Association between Regional Wellbeing/Poverty/Inequality and Infrastructure – 1991-93

Causal Variables	**Rural MPCE**	**Rural Poverty**	**Rural Inequality**	**Urban MPCE**	**Urban Poverty**	**Urban Inequality**	**Agg MPCE**	**Agg Poverty**	**Agg Inequality**
Agricultural Infrastructure	0.53** (0.00)	-0.34** (0.01)	0.28** (0.03)	0.11 (0.40)	-0.12 (0.39)	-0.16 (0.25)	0.33** (0.01)	-0.29** (0.03)	0.27** (0.04)
Transport Infrastructure	0.36** (0.01)	-0.15 (0.26)	0.30** (0.02)	0.28** (0.04)	-0.13 (0.32)	0.13 (0.34)	0.45** (0.00)	-0.16 (0.23)	0.41** (0.00)
Power Infrastructure	0.48** (0.00)	-0.50** (0.00)	0.49** (0.00)	0.32** (0.02)	-0.34** (0.01)		0.45** (0.00)	-0.50** (0.00)	0.49** (0.00)
Financial Infrastructure	0.45** (0.00)	-0.23* (0.09)	0.18 (0.17)	0.47** (0.00)	-0.19 (0.16)		0.61** (0.00)	-0.24* (0.07)	0.34** (0.01)
Educational Infrastructure	-	-	-0.22 (0.11)	-	-	-0.36** (0.01)	-	-	-0.29** (0.03)
Health Infrastructure	0.48** (0.00)	-0.40** (0.00)	-	0.33** (0.01)	-0.39** (0.00)	-0.16 (0.23)	0.52** (0.00)	-0.40** (0.00)	-
Physical Infrastructure	0.49** (0.00)	-0.28** (0.03)	0.41** (0.00)	0.34** (0.01)	-0.21 (0.12)	0.11 (0.22)	0.54** (0.00)	-0.29** (0.03)	0.51** (0.00)
Social Infrastructure	0.18 (0.17)	-0.15 (0.26)	-0.13 (0.33)	0.11 (0.40)	-0.31** (0.02)	-0.36** (0.01)	0.25* (0.06)	-0.18 (0.19)	-0.17* (0.10)
Composite Infrastructure	0.58** (0.00)	-0.54** (0.00)	0.52** (0.00)	0.41** (0.00)	-0.38** (0.00)	-	0.58** (0.00)	-0.54** (0.00)	0.56** (0.00)

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: Figures in parenthesis are Significance levels. ** and * denotes significance at 5 per cent and 10 per cent levels respectively. Coefficients with significance level above 40 per cent are not reported.

Table 6
Association between Regional Wellbeing/Poverty/Inequality and Infrastructure – 2001-04

Causal Variables	**Rural MPCE**	**Rural Poverty**	**Rural Inequality**	**Urban MPCE**	**Urban Poverty**	**Urban Inequality**	**Agg MPCE**	**Agg Poverty**	**Agg Inequality**
Agricultural Infrastructure			0.22 (0.10)	0.26 (0.05)	-0.21 (0.12)	0.20 (0.15)	0.24 (0.07)	-0.14 (0.29)	0.28* (0.04)
Transport Infrastructure				0.30* (0.02)	-0.34** (0.01)	0.18 (0.20)	0.32* (0.02)	-0.17 (0.20)	0.21 (0.12)
Power Infrastructure	0.42** (0.00)	-0.53** (0.00)	0.28* (0.03)	0.26 (0.05)		-0.11 (0.44)	0.43** (0.00)	-0.45** (0.00)	0.29* (0.03)
Financial Infrastructure							0.10 (0.47)		0.10 (0.44)
Educational Infrastructure	0.15 (0.28)	-0.22 (0.11)		0.12 (0.36)	-0.10 (0.49)	-0.24 (0.07)	0.17 (0.23)	-0.21 (0.12)	
Health Infrastructure		-0.11 (0.42)	-0.11 (0.42)	0.13 (0.35)	-0.14 (0.32)			-0.12 (0.37)	
Physical Infrastructure	0.16 (0.23)	-0.15 (0.26)	0.19 (0.15)	0.37** (0.01)	-0.35** (0.01)	0.19 (0.16)	0.39** (0.00)	-0.25 (0.06)	0.31* (0.02)
Social Infrastructure		-0.16 (0.23)		0.16 (0.25)	-0.15 (0.26)			-0.17 (0.20)	
Composite Infrastructure	0.41** (0.00)	-0.52** (0.00)	0.29* (0.03)	0.33* (0.01)	-0.15 (0.27)		0.47** (0.00)	-0.47** (0.00)	0.32* (0.02)

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: Figures in parenthesis are Significance levels. ** and * denotes significance at 5 per cent and 10 per cent levels respectively. Coefficients with significance level above 40 per cent are not reported.

Table 7
**Association between Wellbeing/Poverty/Inequality Group and Infrastructure Group –
Results from Cross Tabulation**

Variables	1991-94				2001-2004			
	Chi Square	Signif level	Gamma Ratio	Signif level	Chi Square	Signif level	Gamma Ratio	Signif level
Rural MPCE	12.31**	0.00	0.55**	0.00	56.9**	.00	0.58**	.00
Urban MPCE	5.47	0.24	0.32**	0.05	28.3**	.00	0.40**	.00
Agg MPCE	20.13**	0.00	0.68**	0.00	60.9**	.00	0.60**	.00
Rural Poverty	5.90	0.21	-0.42**	0.00	56.2**	.00	-0.61**	.00
Urban Poverty	2.75	0.60	-0.27	0.13	14.3**	.01	-0.20**	.02
Agg Poverty	5.80	0.21	-0.41**	0.00	43.4**	.00	-0.53**	.00
Rural Inequality	21.79**	0.00	0.70**	0.00	31.4**	.00	0.43**	.00
Urban Inequality	6.16	0.19	0.08	0.70	1.8	.77	0.10	.26
Agg Inequality	20.41**	0.00	0.57**	0.00	23.4**	.00	0.36**	.00

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: ** and * denotes significance at 5 per cent and 10 per cent levels respectively.

Table 8
**Association between Poverty and Infrastructure for Different Groups of Districts –
2001-04**

Causal Variables	Districts with			Districts with Development level		
	Good Infrastr	Moderate Infrastr	Poor Infrastr	High	Intermediate	Lagging
Agricultural Infrastructure	-0.15 (0.31)	-0.03 (0.63)	0.07 (0.55)	-0.14 (0.26)	-0.11 (0.07)	-0.14 (0.28)
Transport Infrastructure	-0.06 (0.67)	-0.07 (0.3)	-0.05 (0.63)		-0.12 (0.06)	-0.16 (0.20)
Power Infrastructure	-0.12 (0.42)	-0.29** (0.00)	-0.18* (0.08)	-0.26* (0.04)	-0.22** (0.00)	-0.53** (0.00)
Financial Infrastructure	-0.24* (0.10)	-0.10 (0.11)	-0.16 (0.14)	-0.15 (0.22)		-0.20 (0.11)
Educational Infrastructure	-0.10 (0.15)	-0.08 (0.20)	-0.02 (0.20)	-0.18 (0.14)	-0.18** (0.00)	-0.10 (0.20)
Health Infrastructure	-0.27* (0.06)	-0.03 (0.63)	0.03 (0.77)		-0.13* (0.06)	-0.03 (0.10)
Physical Infrastructure	-0.12 (0.43)	-0.11 (0.07)	-0.04 (0.72)	-0.13 (0.31)	-0.18** (0.01)	-0.19* (0.07)
Social Infrastructure	-0.26* (0.07)	-0.07 (0.25)	-0.15 (0.16)		-0.10* (0.10)	-0.15 (0.15)
Composite Infrastructure	-0.24* (0.09)	-0.40** (0.00)	-0.10 (0.37)	-0.30* (0.01)	-0.19** (0.00)	-0.52** (0.00)

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: Coefficients measure Correlation between Poverty Rates and various Infrastructure
levels; Figures in parenthesis are Significance levels. ** and * denotes significance
at 5 per cent and 10 per cent levels respectively. Coefficients with significance
level above 50 per cent are not reported.

Table 9
Association between Regional Wellbeing/Poverty/Inequality and Development – 1991-93

Causal Variables	Rural MPCE	Rural Poverty	Rural Inequality	Urban MPCE	Urban Poverty	Urban Inequality	Agg MPCE	Agg Poverty	Agg Inequality
Agricultural Development	0.28* (0.03)	-0.21 (0.11)	0.25* (0.06)	-0.26* (0.05)		-0.31** (0.02)	0.11 (0.42)	-0.18 (0.19)	0.18 (0.19)
Industrial Development	0.57** (0.00)	-0.33* (0.01)		0.61** (0.00)	-0.38** (0.00)		0.77** (0.00)	-0.35** (0.01)	0.29** (0.03)
Composite Development	0.63** (0.00)	-0.39** (0.00)	0.17 (0.20)	0.56** (0.00)	-0.36** (0.01)		0.79** (0.00)	-0.39** (0.00)	0.34** (0.01)

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: Figures in parenthesis are Significance levels. ** and * denotes significance at 5 per cent and 10 per cent levels respectively.

Table 10
Association between Regional Wellbeing/Poverty/Inequality and Development – 2001-04

Causal Variables	Rural MPCE	Rural Poverty	Rural Inequality	Urban MPCE	Urban Poverty	Urban Inequality	Agg MPCE	Agg Poverty	Agg Inequality
Agricultural Development	0.44** (0.00)	-0.40** (0.00)		0.17 (0.21)	-0.21 (0.12)		0.33* (0.01)	-0.38** (0.00)	
Industrial Development	0.23 (0.09)	-0.15 (0.29)	0.31* (0.02)	0.51** (0.00)	-0.28* (0.04)	0.21 (0.12)	0.61** (0.00)	-0.25 (0.06)	0.42** (0.00)
Composite Development	0.42** (0.00)	-0.38** (0.00)	0.33* (0.01)	0.41** (0.00)	-0.35** (0.01)		0.61** (0.00)	-0.44** (0.00)	0.39** (0.00)

Source: Authors' Calculations based on Data Sources mentioned in appendix.
Notes: Figures in parenthesis are Significance levels. ** and * denotes significance at 5 per cent and 10 per cent levels respectively. Coefficients with significance level above 50 per cent are not reported.

Table 11
Multivariate Analysis – Regression Results

Expl Variables		MPCE		Poverty Level		Inequality Index	
		1991-94	2001-04	1991-94	2001-04	1991-94	2001-04
MODEL – I	Constant	149.43** (0.00)	264.96** (0.00)	67.20** (0.00)	57.58** (0.00)	0.23** (0.00)	0.22** (0.00)
	AGINF	47.38 (0.22)	7.43 (0.68)	-8.48 (0.23)	-0.28 (0.84)	0.01 (0.57)	0.01 (0.27)
	TRINF	24.60** (0.00)	28.18** (0.01)	-2.78* (0.06)	-3.26* (0.10)	0.01 (0.13)	0.01 (0.22)
	POWINF	2.13** (0.00)	3.74** (0.00)	-0.31** (0.00)	-0.32** (0.00)	0.01** (0.00)	0.01** (0.04)
	FININF	31.41** (0.00)	2.12 (0.52)	-1.63 (0.14)	-0.03 (0.91)	0.01 (0.60)	0.01 (0.51)
	EDUINF	26.18 (0.54)	18.97 (0.26)	-8.89 (0.26)	-3.34 (0.32)	-0.02 (0.52)	-0.01 (0.95)
	HLTINF	54.74* (0.07)	3.87 (0.57)	-13.84** (0.01)	-0.21 (0.70)	-0.02 (0.12)	-0.01 (0.37)
	Adjusted R²	**0.62**	**0.47**	**0.36**	**0.29**	**0.19**	**0.10**
MODEL – II	Constant	300.92** (0.01)	562.00** (0.01)	49.26** (0.00)	34.95** (0.00)	0.27** (0.00)	0.25** (0.00)
	PHYINF	20.21 (0.53)	80.84** (0.00)	-7.25 (0.20)	-3.61* (0.08)	0.04* (0.00)	0.03** (0.02)
	FININF	16.57** (0.02)	2.91 (0.41)	-0.26 (0.83)	-0.10 (0.71)	-0.01 (0.31)	0.01 (0.40)
	SOCINF	45.11* (0.07)	4.43 (0.78)	-8.68* (0.07)	-1.28 (0.29)	-0.03 (0.13)	-0.02 (0.47)
	Adjusted R²	**0.35**	**0.32**	**0.20**	**0.14**	**0.28**	**0.20**

Source: Same as Table 1.
Note: ** and * denotes significance at 5 per cent and 10 per cent levels
respectively; Figures in parenthesis are Significance levels

Table 12
Dynamic Analysis – Association between Improvement Rates – Correlation Coefficients

Variables (Improvement Rates in)	Growth in MPCE			Decline in Number of Poor People		
	Rural	*Urban*	*Aggregate*	*Rural*	*Urban*	*Aggregate*
Agricultural Infrastructure			0.152 (0.26)			
Transport Infrastructure		0.097 (0.47)		0.177 (0.19)	0.145 (0.29)	
Power Infrastructure			0.144 (0.28)			
Financial Infrastructure	0.091 (0.50)	0.121 (0.37)	0.095 (0.48)			
Educational Infrastructure	0.116 (0.39)	0.320 (0.18)	0.136 (0.32)	0.197 (0.14)		0.162 (0.23)
Health Infrastructure		0.216 (0.19)		0.189 (0.16)	0.106 (0.43)	0.187 (0.17)
Physical Infrastructure				0.104 (0.44)	0.166 (0.21)	0.170 (0.14)
Social Infrastructure		0.253 (0.26)		0.235* (0.08)	0.106 (0.43)	0.214* (0.10)
Composite Infrastructure	0.197 (0.14)	0.221* (0.10)	0.166 (0.22)		0.150 (0.26)	0.124 (0.36)

Source: Same as Table 1.

Note: ** and * denotes significance at 5 per cent and 10 per cent levels respectively; Coefficients with significance level above 50 per cent are not reported. Figures in parenthesis are Significance levels