CHAPTER 8

CONCLUSION AND POLICY IMPLICATIONS

8.1 Introduction
One of the key challenges in front of Indian government in order to ensure that the demographic dividend for the country gets realized is sustainable infrastructure development. It is critical for the movement of labour and capital across different regions; necessary for basic human capital formation; and instrumental in increasing the speed of doing business. With initiatives like ‘Make in India’ taking the forefront it will be important for the country to not just build upon and improving the existing infrastructure but also, emphasis must be laid on creation of new infrastructure in places that have deficits. And, it is in the nature of infrastructure services that their delivery becomes the responsibility of the State. Hence, despite the wave of privatization and deregulation in infrastructure delivery mechanism, its monopolistic and social dimension demands that the government has a major role in infrastructure provisioning.

Indian economy having witnessed a growth of 6.8 per cent in 2008-09 (the year of the financial crisis) and after registering a growth rate exceeding 9 per cent for three consecutive years is currently passing through a difficult phase. Growth has slowed down and high inflation was a major cause of worry for a while. The overall growth rate for the last two years – 2012-13 and 2013-14 was under 5 per cent with a poorly performing industrial sector (it grew at less than 1 per cent in 2012-13). There are new internal constraints appearing in the economy along with a changing external environment whereby the industrialised countries are growing more slowly. In light of this, a question that becomes important to address is whether India has the potential to grow at 8 to 9 per cent in a sustained way. In this current state of affairs India has unique opportunity for growth by undertaking much needed structural reforms as well as building the infrastructure capacity of the country. The Central Government in India views infrastructure as key driver of the economy propelling development.

The present study was mainly an in depth and rigorous analysis of the role that infrastructure has played in the Indian economy in the last thirty years. It aims to help
strengthen the argument in favour of increased infrastructure development in the country. Being aware of the fact that development is multi-dimensional, this study has attempted to gauge the impact of infrastructure on growth, productivity and inequality. The major findings of this study and the policy implications are identified in the following section.

8.2 Major Findings and Conclusion

In order to understand the nature of relationship between various infrastructure sub sectors and output growth at both the All-India level and at the state-level, an analysis based on descriptive statistics was initially carried out. This also helps provide a background to analyse the various issues. Several interesting insights were gained from the descriptive analysis. Considering that infrastructure has several components to it and is not always satisfactorily encompassed by a single definition, various infrastructure indicators were selected for the purposes of this study and were grouped into physical stock or usage variables. Based upon this, infrastructure indices were constructed using Principal Component Analysis. A study of trend and availability of infrastructure over selected time period at both all-India level and for the 17 major states in India was conducted.

Descriptive Analysis

The time period in hand is a long one and has seen significant changes in infrastructure development priorities. The period was thus divided into three main phases each with a differing political agenda. 1970s and 1980s saw emphasis on rural infrastructure development with huge subsidies for rural electrification, ground water irrigation and massive investment in building rural roads. From the 1990s, the emphasis was on fiscal consolidation and infrastructure investment suffered. However, there were bright points in this period especially with relation to the telecommunication infrastructure development. From late 1990s there was recognition of the vital role played by infrastructure, part due to internal conditions and part due to the initiatives being followed globally which opened the debate on welcoming greater private sector participation in infrastructure provisioning with the state playing the role of a facilitator. The decade of 2000s saw these policy suggestions and initiatives take shape. There was targeted spending on national highways network and build-out of Golden Quadrilateral and related North-South and East-West road
corridors under the Tenth FYP. Policies to create enabling conditions for private sector financing of infrastructural projects were initiated. With the Electricity Act of 2003, the policy framework brought private investment in the sector. Despite the emphasis on PPP by plan documents, the response of the private sector has been lukewarm. Several reasons have been highlighted, such as overlapping of regulatory jurisdiction, improper design, bidding transparency issues, project costs, time overruns etc. Based on the fact that the time period at hand was characterised by different policy focus the ensuing analysis often divided the time period into these three periods.

Also, the 17 major states of India were characterized into different groups based on their income level and growth rate. From the descriptive analysis at State-level it can be inferred that it was the initially rich states that had better infrastructure services and these states managed to not just stay in the high income category but also grew their infrastructure stock. This can also imply that although infrastructure facilities were better developed in these states compared to the poor or middle income states, but in absolute terms there still is a huge scope for development and with an increase in availability of infrastructure these states continue to further increase and grow their PCNSDP.

The lower income states have seen an improvement in their growth performance as well as in infrastructure development in recent years, however, relatively, they still lag far behind the high income states. Availability and status of infrastructure is considered as an important pre-condition for a region to develop and grow and it thus serves as a mechanism by which differences in cross-regional per capita incomes can be reduced within the national economy. The fact that there is such a dearth of infrastructure availability in states that have low income has important policy implications.

The study also acknowledges the importance of ‘quality’ of infrastructure and engages in descriptive analysis on quality of infrastructure at All-India level based on the available data. Both quantitavie and qualitative measures were utilized to gauge the quality of infrastructure in India in recent years. It was concluded that for India to utilize infrastructure in a manner that it propels growth it is not just enough to build more infrastructure without keeping the quality aspect in mind else we may not see
desired impact of infrastructure on the economy. The quality of main infrastructure sectors like Roads and Electricity were found to be quite bad when compared internationally or ranked by firms within India. Even in terms of the quantitative indicators available from official sources it was concluded that the quality of infrastructure left much to be desired. Electricity was seen as the biggest infrastructure challenge facing India with transmission and distribution losses standing at 24% of the total electricity generated. This had naturally resulted in a tremendous supply-demand imbalance. Similarly, the roads infrastructure presented a disappointing trend. There is no data available on the condition and quality of existing surfaced roads. Indian roads are also congested with there being more than 32 thousand registered motor vehicles per 1000 square km in 2011-12. The registered motor vehicle density has nearly doubled in less than a decade – in 2003 it was 18000 per 1000 sq km and it stood at 33000 in 2011-12. However, there were some infrastructure sub sectors in India which were doing well in terms of quality such as civil aviation. It must also be mentioned that although telecommunication sector has seen a revolution and in terms of tele-density India is performing well, but ICT technology diffusion still has much scope for expansion.

**Infrastructure-Output Nexus: All-India level**

As there exists a wide debate on the influence of infrastructure on output levels and growth it led to attempts to quantify this effect and estimate the contribution of infrastructure as a factor of production to aggregate output. This study does not treat public capital synonymously for public infrastructure but instead has made use of infrastructure indicators from different sectors. Also, it accounts for the time series and panel data properties of the data before engaging in econometric analysis.

Upon considering the impact of growth rate of various infrastructure indicators as independent variables (all series are I(0) in growth rate), it is found that electricity and telecommunication growth rate has had significant and positive impact on output growth. The coefficient for electricity generation is 0.35 and is significant at 5% level. And that of tele-density growth rate is 0.15 and is significant at 1% level. However, impact of growth rate of surfaced road density on output growth rate was not significant. The claim of importance of roads infrastructure cannot be refuted based on this result its impact is not as direct input into production but via its impact on
capital and productivity (especially in manufacturing sector). The channel through which roads infrastructure impacts output is more indirect, via it can impact the usage and productivity of other factors of production - capital and labour. When infrastructure indices were used as explanatory variables, we were able to confirm the importance of infrastructure for India, with a 1% increase in infrastructure index, output increased by 0.23. This justifies investing in building more infrastructure in the country as the output elasticity is positive and significant.

In India’s development path the role and significance of different sectors – agriculture, industry and services – has evolved over time. It was a natural transition then to examine whether the relative importance of infrastructure sub sectors in influencing the growth of these sectors has also changed. This was found to be the case, for example, telecommunication played a relatively more important role in the growth of services sector in India. With a one percentage increase in teledensity, growth rate of services sector increased by 0.15%, and that of industrial sector increased by 0.10%. However, a one percentage increase in electricity generation resulted in a 0.5% increase in Industrial output growth, and a 0.3% growth in services sector. Hence, it can be seen that even though both the infrastructure sectors were important for the growth of each sector, the importance varied for each.

To examine the dynamic relationship between output and infrastructure indices, a VAR model was employed in which stationary variables have been taken. We find that there is a one directional causality running from infrastructure indices to output (all variables in first differences) and the results are highly significant. However, we find no evidence that output granger causes infrastructure index. Based on VAR estimation, the impulse response functions were obtained and it was found that introducing a positive shock to the infrastructure index, resulted in a positive response from output growth which dies out after 4 years. A one unit shock to d_II (first difference of composite index of infrastructure) leads to an increase in output growth of 0.012 in the first period which gradually dies out after 4 periods. Interestingly, variation in infrastructure explains 20% of variability in output and 7% variation in labour and capital both indicating towards the indirect effect of infrastructure.
Infrastructure-Output Nexus: State-level

Establishing the nexus between per capita NSDP in India and infrastructure availability in 17 major Indian states brought forth interesting results. Three main infrastructure indicators – electricity, Roadways and telecommunications were included in the analysis as most directly productive activities in industry and services make use of these three sectors as intermediate inputs. Along with these, two social sector infrastructure indicators – index for education and index for health facilities were included in the study. The main conclusions that can be drawn are: considerable regional disparities exist in terms of per capita net state domestic product (PCNSDP) and these disparities have increased over the years even though the initially poor states have been growing at a faster rate. After grouping the states into three categories important observations were that the poor states were also the ones with least amount of infrastructure development, whereas, the rich states had relatively much better infrastructure provision but there is evidence of an increase in infrastructure growth in poor states after the reforms of 1991 even though their level still remained considerably below that of the rich states.

The analysis was first done for aggregate PCNSDP, followed by a sectoral impact of infrastructure on secondary and tertiary sector PCNSDP. It was gathered from panel cointegration results that there exists a long term relationship between infrastructure variables and output, however, this relationship is not clear in the short run. After undertaking panel data estimation it was found physical infrastructure variables did not have a uniform influence on output. The relationship not just differed for aggregate output, secondary and tertiary sector output; there was also distinct difference in the impact infrastructure had on the same sector for different time periods.

For aggregate output, there was a significant and positive impact of electricity consumption which was highest in 1990s. However, when looking at 2000s this impact was insignificant indicating the electricity bottlenecks that were appearing in the economy in the face of poor infrastructure quality (huge transmission and distribution losses to the tune of 26% in 2010) and cost of huge subsidies in the sector which was passed on to consumers and agriculture sector (which had resulted in poor

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13 We did not include too many infrastructure variables into the study to avoid multicollinearity and in order not to lose too many degrees of freedom.
performance by state electricity boards). Under these circumstances there is an underinvestment in the sector and supply has not kept pace with demand. Output elasticity of telecommunication was highest in 1990s but declined in 2000s and this holds true even for services sector. Reasons put forward for this are declining marginal returns in the sector and scope for increased ICT diffusion in the country. Contribution of roads infrastructure was found to be insignificant in the face of political agendas (building roads closer to election year) and poor quality of existing roads.

The impact of infrastructure varied not just on the specific sector of the economy but also depending upon the time dimension or the time period under investigation, as overtime, the drivers of growth change and hence, the relative importance of infrastructure sub sectors will also evolve. Elasticity of electricity was highest during the 1990s. Electricity had the highest elasticity for the secondary sector output in the 1990s and teledensity had highest elasticity for services sector during the same period. The impact of social infrastructure – education and health - also showed similar pattern. Education infrastructure had a significant contribution to secondary sector output only in the 1990s. For tertiary sector, it had positive elasticities in 1980s and 1990s.

However, these results do not point to any uniform relationship between infrastructure availability and output. This possibly entails to the fact that infrastructure development in the country has not been uniform and has seen cycles of infrastructure build-up corresponding to maybe a different political-economy era in each decade. The focus of the corresponding five year plans was shaped in large parts by the changing political priorities of government.

**Infrastructure – Total Factor Productivity Growth**

Amongst the sources of economic growth, TFP growth is accorded special importance. Infrastructure affects productivity and aggregate output through direct and indirect channels: Directly - by entering the production function as an additional input, and indirectly - by reducing transaction and operating costs and allowing efficient use of other productive inputs. In this study, thus, an attempt was made to study the impact of different types of infrastructure on total factor productivity for the time period 1970-2011 at an all-India level. Infrastructure indices were used as
dependent variables and the series were found to be cointegrated. The results from FM OLS estimation indicate that the relation was positive and significant at 1% level. The elasticity of TFP growth with infrastructure index is around 0.20, i.e. a one unit increase in the index of infrastructure, increases TFP by 0.20 percentage. In addition, it was also found that upon estimating the impact of infrastructure on sectoral TFP growth, Basic Metals & Fabricated Metal products; Chemicals & Chemical products; Machinery; Other Non-Metallic Mineral products; Wood & products of wood and financial services experienced a significant and positive impact from specific infrastructure sectors’ growth rate.

Based on the available data, the regional impact of infrastructure on productivity growth could be computed only for organized manufacturing sector. We have a panel of 14 states for the time period 1981-82 to 2003-04, electricity generation, Road density, and financial infrastructure (indicator for which is bank credit deposit ratio) was significant for TFP growth rate of organized manufacturing sector. It is also true that in the 1980’s, trend rate in TFP growth of the organized manufacturing sector was positive and substantially higher for all states (except West Bengal) when compared with that for the post reform period (after 1991). However, when looking at the impact of infrastructure from 1990-91 onwards) we observe that the results for impact of infrastructure growth rate are not so robust on TFP growth rate statewise. In fact, it is only road density growth rate and bank credit deposit ratio growth that turn out to be significant in explaining TFP growth rate for manufacturing sector statewise in India. In light of this, one can say with confidence that lack of infrastructure can affect economic growth of India by affecting productivity growth and in order to compete globally, infrastructure deficiencies will have to be taken into consideration.

**Infrastructure – Consumption Inequality: State-Level Analysis**

The role of infrastructure is not limited to its impact on output growth but there are several components to it. Economic growth accrued to infrastructure development does not necessarily lead to a reduction of interpersonal or inter-regional inequalities. However, via its impact on human capital development it is possible to observe a reduction in inequality. Literature does not offer a definite answer to this question and in this thesis the nature of relationship between not just growth and infrastructure but
also between inequality and infrastructure has been explored to answer whether there is any link between physical infrastructure and consumption inequality and the nature of the relation between the same for major Indian states.

This study has also tried to look at the impact of infrastructure on inequality across states in India because, despite the high levels of growth observed in India in the previous decade, the national level of inequality has remained high and has been an important dampener on whether the benefits of growth are being shared in an equitable manner. The nature of relationship between growth, inequality and infrastructure is not clearly defined. Infrastructure has a positive influence on economic growth and is seen as a pre-requisite for development, however, it may be wrong to believe that economic growth, that may be attributable to infrastructure development, should necessarily lead to a reduction in inequality.

This study tried to assess the impact infrastructure development has had on inequality as measured by the Gini coefficient computed statewise using the data on Monthly Per Capita Consumption Expenditure (MPCE) which have been estimated from Unit level records of the periodical Household Consumer Expenditure surveys of National Sample Survey Organisation for the years 1983, 1987-88, 1993-94 and 2004-05 and 2009-10 (Rounds 38th, 43rd, 50th, 61st and 66th round respectively). Three separate estimations were made: for all the 17 states, for the high income states (states which had PCNSDP higher than the all-India PCNSDP in 2009-10) and for the low income states (states which had PCNSDP lower than the all-India PCNSDP in 2009-10).

Amongst the infrastructure variables, indicator for power infrastructure (per capita electricity consumption) and road density show a positive relation with Gini coefficient. The relation with road infrastructure is found to be significant at 1 per cent level and this is a surprising result as it indicates that with an increased road density, inequality has increased. This study puts forward another explanation for observing such a result. The dependent variable - gini coefficient obtained from consumption expenditure data is calculated from the survey conducted by NSSO and has details on expenditure on durable and non-durable goods. So it may happen that with an increased access to markets, via better roads network, people with more resources/incomes are able to incur higher expenditure on luxury goods or products
that were earlier not available in the markets around them (such as expenditure on expensive cars, Television sets, refrigerators, building of houses, expenditure on social functions). With a better roads network, productive opportunities may have been made available to those who did not have access earlier, but the benefits from these may have accrued more to the already rich in terms of better investment opportunities which led to ever higher returns that translated into more consumption inequality.

There are three fold explanations put forward for a positive relation between electricity infrastructure and inequality. First, electricity supplied for agriculture consumption purposes is highly subsidized and often provided free of cost before elections. This should actually have resulted in lower inequality, but the supply of electricity in rural areas remains limited and most agriculture electricity supply is riddled with time restrictions and poor quality. Second, most of agriculture electricity consumption is for pumping water where most pumps are unmetered and all farmers are charged a flat rate for electricity. This flat rate pricing is regressive as it assists the large land owners more than the small farmers. Politicians cater to large landowners as they are key in swinging votes and are often the patriarchs in their community. This results in excessive power loads and lowered voltage levels. System managers control loads by cutting the supply to certain areas and mostly serve for few off peak hours. Third, even in terms of consumption of electricity, it is higher in urban areas than in rural areas. And inequality in urban areas is much higher than in rural sector.

Thus, the main conclusion from this study is that impact of infrastructure at all India level has been positive when looking at an aggregate index of infrastructure. However, upon looking at individual infrastructure components, the impact differs from sector to sector, and even varies for different time periods. At state-level, there is much to be desired in infrastructure development in low income states.

8.3 Policy Suggestions
Redefining the role of the state does not translate into ‘less Government’ but maybe ‘different government’ and this is most obvious in the provisioning of infrastructure facilities. Infrastructure provisions of looked as an industrial activity is monopolistic in nature, involves high sunk cost and has public goods characteristics, necessitates the involvement of Government. Public Private Partnerships have come up in the face
of limited public funds but have not been very successful in India. There are critical areas like innovative financing mechanism that will have to be revisited. Meanwhile, considering the importance of infrastructure for India, it is imperative for the central government to then have the states as partners in infrastructure development. They better understand the needs and requirements of the region and can form and more importantly, implement appropriate policies. For example, the golden quadrilateral helped bridge the rural-urban divide, however, the national and state highways constitute less than 5 per cent of total roads in India. Hence, it is important to involve the local stakeholders in development process.

India is witnessing a unique structural transformation which goes against the traditional Lewisian model. The economy has seen a shift from agriculture to services led growth leapfrogging the important role played by the industrial sector. Services sector with its tremendous contribution to GDP has not been able to generate commensurate employment opportunities. There is disconnect with share of service sector in employment standing at only 25% and industrial sector accounting for 12% of labour force. In order for the much discussed “demographic dividend” of India to be a reality, there is a need to ensure that the growth path of India generates sufficient employment opportunities for all and at a higher rate. It is in this regard that the industrial sector (manufacturing in particular) needs to step in to ensure an inclusive growth model is followed in the country.

Thus, the two sectors – Services and industrial - are very important for India’s growth potential and have varying infrastructure needs. The infrastructure requirements for furthering the growth of services sector may differ from those of industrial sector. It has been found from this study that tele-density played an important role in explaining services growth at an All-India level as well as for the states. It has had a significantly important role to play not just as an input in production but also in explaining the productivity growth of one of the fastest growing service sector- financial services. Thus, there is clear evidence on the importance of tele-communication infrastructure for the service sector in India. Even though India has seen tremendous growth of this sector with compound growth rate of 65% between 1998 and 2010, but there is still much more that can be done. As has been shown, the ICT diffusion – internet users per 100 population and broadband
access to the internet – is still considerably low. Hence, more investment in telecommunication sector especially in rural areas, will go a long way in supporting services sector growth rate and help improve accessibility.

Moreover, the industrial sector which is expected to play an important role in India in generating employment for the vast working age population has an important relation with electricity/power infrastructure. When electricity generation increased by 1 percent, growth rate of industrial output was found to increase by 0.5 percentage. It also played an important role in explaining the productivity growth of those Industries which have actually seen an increase on their productivity growth in the post reform period - Basic Metal and metal products, Machinery nec. This is despite the fact that in India there are large transmission and distribution losses and the supply of electricity is erratic resulting in usage of diesel generators by a large number of firms. Hence, the impact on output growth of industrial sector will rise many folds if power generation, distribution, transmission are improved.

Interestingly, the lack of significant relationship with railways infrastructure in India is an indirect indicator of the condition of railways infrastructure in India. Indian Railways network is the fourth largest in the World; however, the growth of the network is not commensurate with the growth in traffic. Freight loading grew by 1344% and passenger kilometre by 1642%, and route kilometres having grown by only 23% in the last 65 years. The system is running on over-capacity and the indicator for railways infrastructure – rail density – may not be able to fully capture the role played by this sector.

Similarly, we fail to obtain significant relationship with roads infrastructure in India which is surprising considering the importance given to it in literature and economic theory. This result could be for many reasons as have been mentioned repeatedly in this study. However, we stress on two of the probable causes - First, impact of road is more indirect and not as a direct input to production. Thus, its impact is more indirect and can be observed via increased on private capital or labour productivity. Second, it could be that the quality of the roads that are built is poor and does not result in expected gains with firms incurring huge costs in wear and tear and

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14 This result is not shown in the main text but when railways was included in regression estimates, it always turned out to be insignificant.
depreciation, transaction costs, delays etc. Roads are constructed in electorally more visible areas and are not necessarily built based on an efficiency criteria. The government can have an independent regulatory body to assess the quality of roads in the country and to ensure that maintenance of roads is an important priority. It will also be important to ensure that construction of roads is not solely in urban areas but also reaches hinterland.

While there is an agreement on the importance of infrastructure, it is equally important to understand which infrastructure sub sector matters the most and under what circumstances. In this case the stage of development of the state/region will dictate its need of infrastructure. One can propose here that the less developed a state, the higher the returns to infrastructure development. Whereas, for states which are more developed, there may be other dimensions of infrastructure like bottlenecks, diseconomies of scale, network effects that will tend to matter more. Thus, one major policy implication as suggested by Hulten and Isaakson (2007) which is applicable for India when deciding which infrastructure sector to invest in is to analyse the stage of development, and the type of infrastructure that will help achieve growth and productivity at levels which allow for catch-up with regions with highest growth rates. Also, certain infrastructure sectors like roads are slow to show payoffs as they are often built keeping in mind future needs. Even so, in case of Indian states, power infrastructure should be developed especially in the more industrialised states to ensure regular supply of electricity for industry. In this endeavour, governments will have to pay special attention to build power infrastructure in the country and consistent efforts be made to reduce the tremendous transmission and distribution losses that occur after generation of electricity. States or regions with higher share of services sector output should further build upon and strengthen the telecommunication infrastructure. This is a sector in which government can encourage more private investment and play the role of a facilitator.

Lastly, the impact of infrastructure variables on consumption inequality measure indicates that some components of infrastructure –power and road – tend to increase interpersonal inequality at the regional level. This is especially true for lower income states. From policy perspective the results of this study do not prescribe abandoning transportation projects or infrastructure development but instead
emphasise also on investments in complementary policies. Infrastructure can help open up opportunities but the benefits accrue to those who are able to take advantage of these. Instead of making the gains available purely based on good luck (being in the right sector or place), efforts should be made such that infrastructure facilities are effectively utilized by all and this can occur if infrastructure is built in more informed way and alongside complementary policies that help the less well-off take advantage of the facilities.

One important policy recommendation that comes not directly from the study, but an issue that the researcher often faced in the progress of this study was lack of good quality data availability for infrastructure sectors. There are discrepancies even in the official Infrastructure Statistics published by CSO. Roads statistics is riddled with inconsistencies. Even if a reliable, sufficiently long time series cannot be brought about, attempts should be made to put in place data collection procedures that will ensure consistent data series on infrastructure henceforth. There are issues with social infrastructure statistics as there occur definitional changes in what comprises a particular infrastructure stock, for example definitions of a hospital or a community health centre changed in the 1990s. This brings about changes and the data series before the definitional change and the one after is rendered incomparable. Additionally, for a developing country like India, data on just the quantity of infrastructure stock is not enough as quality plays a very important role and can have repercussions on output growth. Serious thought has to be given on data collection for the quality aspect of infrastructure.

8.4 Limitations and Scope for Further Research

This study has not dealt with the impact of quality of infrastructure in India in a more rigorous manner. This is mainly due to lack of sufficient data on the quality aspect of infrastructure. An attempt was made to look at the quality of infrastructure at all-India level in a descriptive manner and it did point towards some interesting facts. These will have to be backed by data that allows for more detailed analysis and an extensive qualitative field work which is beyond the scope of this thesis.

In the study, use has been made of credit disbursed by scheduled commercial banks as proxy for state level private capital. This is just a proxy for private capital and may underestimate the role of private investment at state level. Also, in order to
measure the state level impact on productivity, we have ignored the services sector and only looked at organised manufacturing sector. We cannot rule out the impact of infrastructure on productivity growth across states in the post reform period in India based on the results obtained. In fact, as has been shown, infrastructure growth played a significant role as determinants of productivity growth for many of the services sector. There is thus a need for estimating industry-wise/sector-wise productivity growth at state-level to understand the impact of infrastructure in more detail. This will provide us with a clear picture of the state level differences in productivity, however, computation of state-level service sector TFP growth and unorganised manufacturing sector TFP growth was found to be beyond the scope of this study.

Furthermore, the unit of analysis in this study stops at state-level, but in order to gain more insights, a district level study will be beneficial. This will help better understand the regional impact of infrastructure and can explain how decisions to invest in infrastructure can make real impact in a society. The hypothesis that infrastructure yields a higher return in richer areas that are already relatively abundant in private capital and that could be due to the complementary relation between infrastructure and private capital and human capital and will result in increasing income inequality may ring true but this warrants a further analysis at district level and is beyond the scope of this study.

The present study is based on Macro-level data using infrastructure statistics over the last thirty years or so. This data has at times presented itself riddled with inconsistencies and figures had to be normalised. For some years, there exist issues with even the official data sources of infrastructure with same source reporting different figures for roads statistics over time. The lack of significant impact from roads infrastructure could thus be due to this reason. Additionally, econometric methods cannot easily capture the gains from redesigning of transport networks; or the gains that occur via increased competition or better integration. This warrants micro level studies especially at the firm or industry level.