An Evaluation of National Highway Network Expansion Policy in India during 1951-2011

Subir Kumar Sen

Abstract
The paper deals with the regional disparity and convergence of availability of national highway network across the states during 1951-2011. The government’s policy of expansion of national highway network is primarily based on two criteria - area and population of the respective state or the region. During this period, government’s policy is successful in combating the problem of regional disparity. The trend of ð convergence value clearly exhibits convergence characteristics. But Theil index reveals that interstate disparity among the states is still a major problem. The major reason behind such interstate disparity is that the policy of expansion of national highway is mainly area centric thereby depriving the states with higher density of population with relatively smaller area share. Based on the findings, the paper suggested state specific policies, particularly for those state(s) which are smaller in size but having high population density.

I Introduction

After independence from British colonial rule in 1947, India followed a mixed economy structure where balanced regional growth has always been a significant objective of its national plans. Starting from the First Plan, to achieve the goal of balanced regional development, the Finance Commission and the Planning Commission always determines the funds devolution to state governments by assigning a significantly high weight on relative backwardness of the states. Needless to mention that in India, different regions with different resource bases and endowments level would have a dissimilar growth path over time. One of the reasons why centralized planning was advocated earlier was based on the expectation that it could restrain the regional disparity. In spite of plan approach, the regional disparity remained a serious problem in India (Varghese, 1998)

The deficiencies of infrastructure have definitely slowed down the growth process. In most of the developing countries including India, the status of actual availability of
infrastructure, particularly in rural sector, is quite low against its actual requirement by the respective countries. The demand for infrastructure is growing at a much faster rate for the last three decades where as the supply is more or less stagnant mostly due to structural reasons. The rapid pace of urbanization and globalization across the world has further aggravated the demand supply gap of infrastructure day by day. Lewis (1955) pointed out that the development of infrastructure in rural sector is anticipated to stimulate economic growth, create jobs, diversify economy and improve the quality of life in the country.

In a nutshell, it has long been assumed that the balanced government investment paved the way for further investment from the private sectors. But, it is a fact that the nature of investment in the infrastructural sector never attained any significantly large investment from the private investors. Even the classical economists, who identified the private sector as the ‘main’ engine of growth of an economy through efficient utilization of resources of any country or region also admitted this particular fact and advocated for larger state intervention. They also believed that the state should take utmost care to provide the required infrastructural facility for proper functioning of the private sector. This particular aspect of market failure in infrastructural sector was raised by Hirschman (1958). Since, infrastructural base is necessary and may not be sufficient for the proper functioning of private sector organizations.

The transportation system, particularly the highways, plays a crucial role in the development of any region in two ways. Firstly, the opportunities of mobility of people and goods are created immediately and secondly, better accessibility in the long run influences the pattern of growth, land use and the level of economic activities in positive direction (Banister, 2002). The literature on the economic effects of highway investment is wide ranging. The earliest works in regional science recognized that both growth and concentration of economic activity at any given location depends largely on access to markets and the location economies arising out of that access (Marshall, 1919). In the same line, later Forkenbrock (1996) viewed investment in highway as a tool to reduce the gap between the rural and metro areas including improved access to services and jobs for rural residents, better access to customers for businesses, and reduced transportation costs. On the other hand, Lamb (1983) explained the development risk out of this investment in highways if that investment is carried out in such a way that the new investment diverts economic activity from an already existing road within the region. Some areas may also be harmed as highway development results in “sprawl” in some previously undeveloped rural areas. In the case of highway impact studies, Allen (1994) argued that investing scarce infrastructure resources will be more efficient in areas exhibiting some degree of prior urbanization. At the same time, the Growth pole theory focuses on centers of economic activity, or growth poles, which are thought to attract investment due to their agglomerative powers (Foster, 1963; Huddleston, 1990; and Forkenbrock, 1996). Again, the location theory proponents (e.g. Alonso, 1964) viewed the reduced transportation costs as one of the key determinants of industrial site choice as highways have the potential to open up underdeveloped regions for economic development. But this view was later challenged by several economists (e.g.
Isserman, 1989 and Rephann, 1994) who pointed out that highways can also lead to negative development effects; they may provide conduits for economic activity to leave underdeveloped regions. So, utmost care should be taken for a balanced regional development through investment in highway system that can cater the need of the economy by considering the present constraints as well as future direction of the economy. It is a fact that many studies found that transportation infrastructure is important in generating local economic development; other factors are often identified as necessary, as well. However, there is currently little consensuses on which factors are most significant in determining growth (e.g. Kraft et al, 1971).

The first systematic attempt to build a nationwide integrated road transportation system was recognised by the Nagpur plan in 1943. Since, roads are the arteries and veins of any country in the process of development, the Nagpur plan advocated for a national conception to build road network system in India. Strategic importance coupled with requirements of an integrated road network, a systematic and coordinated approach both at central and state governments’ level is necessary. Besides development should be balanced between different categories of roads and should proceed in a planned sequence, with regard to the requirements of traffic. It is expected that these two levels of government should take a complementary role rather than a substitute role in developing an integrated road network system nationwide. Further, Nagpur plan also emphasized for a balanced development of road network through a planned approach. In India, during British regime, the surface transport network including roads and railways were developed mainly to connect port towns and mineral resource regions which catered to its imperial policy. As a result, the transportation network spread but no balanced approach was taken into consideration.

Taking the area of the country and the population into consideration, the total mileage of roads in existence at the point of time present was admittedly short of requirement. After the advent of the railways, development of roads did not receive adequate attention until the constitution of the Central Road Fund in 1929. Actually, this fund was set up as a part of developing the then road network system which could cater to the needs for movement of defense both manpower and machines during the Second World War. Since then, the achievements have been significant. According to the report of the Motor Vehicle Taxation Enquiry Committee (1950), no fewer than 382 new bridges and causeways had been built and 1250 miles of modern surface roads, 1500 miles of fair weather roads and 2200 miles of road reconditioning were completed up to the time of their enquiry. These were otherwise essential for smooth and speedy transshipment of military personnel and machineries’, particularly in its eastern war front. The assurance of a continuous supply of funds under this scheme had been an important factor contributing to the progress made. Nevertheless, owing to the expansion of motor transport that had taken place during the last 30 years and developments in the field of industry and trade, the road system in existence was not adequate and there was requirement for substantial road development to be undertaken in future years. The modern motor transport requires roads, with easier curves, wider formations, stronger crusts and smoother surfaces, which are not necessary for other community uses of
roads. The number of motor vehicles on the road is steadily increasing and the weight and range of transport vehicles is appreciably greater than it used to be.

In 1943, the Nagpur Plan had set out the target of expansion of hard-surface roads from about 66,400 miles to 122,000 miles of low type roads from about 112,000 to 207,500 miles and the improvement of existing roads, wherever necessary, so that the road system would cater for anticipated traffic needs for the next 20 years. The most notable feature of that plan is that it recognized the whole road transportation system as an integrated network nationwide and recommended that no road surface should be of a higher standard than was required to carry the existing traffic or traffic anticipated in the immediate future.

Hence, the study of interrelationship between growth of transportation sector and regional economic development is a matter of practical as well as theoretical importance which has received considerable attention in both developed and developing countries. It is a fact that the degree of development of the transportation network is a determining factor for socio-political-economic progress of any particular region at different stages of national and regional development planning. However, these studies mainly concentrated on the interface between investment in transport and economic development has broad ramifications that go beyond transport’s basic purpose of moving goods and people from one place to another. Starting from the invention of wheel through the industrial revolution to current times, economic growth of any particular region has always been accompanied by the growth in the transportation sector. That is the effect of investment in transport sector on economic development comes from the role of transportation facilities in enabling movement and interchange of activities between different locations. But, the spatial disparity in availability of national highways (NH) across the state level in India remains unexplored in the existing literature.

The systematic and spatial interaction approach to the study of transportation was first developed by Ullman (1958) who has attempted to measure the significance of complementarities through the application of gravity and potential notions since the expansion of the transportation network is a critical factor in the economic growth of any developing country. In December, 1943 Nagpur plan was formulated which emphasized on a well balanced road system, particularly NH network, for India which can carry the projected quantum of traffic and the developmental needs of the country. After independence in 1947, India adopted a mixed economy structure where government is committed to provide equal opportunity to every segment of the society and every region of the country to grow in terms of availability of infrastructure (Hirschman, 1958). Starting from 1947, the central government took the basic responsibility of building infrastructure base for the country with its limited resources. Accordingly, investments in developing NH network, in particular, are often given high priority because they appear to be unique instruments for fostering economic growth and social progress which is supported by Kuznets (1960). As per the annual report of National highway Authority of India (NHAI), in 2014, the NH network consists of only 1.7 percent of the total road network in India, carries more than 40 percent of total traffic.
Since, the need for economically efficient transport system in the course of economic development is self-explanatory, over the Plan periods; government took special initiative to build this infrastructure base, particularly nationwide in a balanced way considering mainly two criteria-population and area of any region or state. Although, the literature on effect of highway investment is well documented, the issue of interstate disparity of availability of NH network in India has not been discussed yet. Most of the studies find that transportation infrastructure is an important factor in generating local economic development but other factors are sometimes found to be more important. At the same time, evidences are there which shows that benefit is not equally distributed among the different sectors and regions out of such transportation investment in terms of diverse transportation network in general, and national NH network, in particular.

In this paper, an attempt has been made to study a specific aspect of regional disparity across the states in India in terms of availability of NH network across the states over the plan periods during 1951-2011 with respect to population and area criteria. This will help us to evaluate the government’s policy of NH network expansion and to propose effective policy for harmonious expansion of national highway network across the region or state. Hence, an attempt has been made to address the issue of regional disparity in availability of NH network across the states. Accordingly, this study deals with the following research issues which are as follows:

- a. Nature of expansion policy of NH across the states over the plan periods during 1951-2011;
- b. Whether the expansion of NH network across the states shows convergence trend with respect to population and area;
- c. Whether the interstate disparity of availability of NH network has been reducing; and
- d. If disparity in availability of NH network across the state exists, which factor is responsible for such disparity?

To probe into these issues, the present paper has been divided into five sections. Including the present introductory one, the remaining paper is organized as follows: Section 2 deals with methods utilized for understanding the nature and extent of regional disparity of expansion of NH network and the related sources of data. Results are presented in Section 3 and Section 4 discusses the results derived in the previous section. Finally, this paper concludes in Section 5.

II Methodology

Following Koksi and Majumdar (2000), this study has utilized the δ-convergence approach to find the trend of dispersion in availability of NH across the regions in India during 1951-2011. Then, the nature of interstate disparity is measured using Club convergence technique as proposed by Galor (1996). Lastly, the extent of regional disparity of availability of NH across the state is decomposed with respect to area and population criteria using AGC index as reformulated by Spiezia (2002).
ó- Convergence

Following Solow (1956), Swan (1956) and Barro and Sala-i-Martin (1992), Koksi and Majumder (2000) applied the idea of convergence for measuring the trend of regional disparity in availability of telecommunication infrastructure in OECD countries. In the same line, this study uses ó-convergence only to get an idea about the trend of dispersion in availability of NH across the regions in India during 1951-2011 with respect to both area and population parameter. Since, area and population are the major determining factor in construction of NH across the states and ó-convergence is calculated with respect to both the parameters, this study skips the idea of â-convergence1 analysis.

ó- convergence measures the reduction in availability of NH across the states over the time periods. The ó- convergence has been used in this study to see whether the disparities across regions have decreased over time. The value of ó at period t is measured as follows:

\[
\sigma_t = \sqrt{\frac{1}{N-1} \sum_{p=1}^{N} \left( \ln \left( \frac{Y_P}{P} \right) - \frac{1}{N} \sum_{p=1}^{N} \ln \left( \frac{Y_P}{P} \right) \right)^2} ; \text{ and }
\]

\[
\sigma_t = \sqrt{\frac{1}{N-1} \sum_{a=1}^{N} \left( \ln \left( \frac{Y_A}{A} \right) - \frac{1}{N} \sum_{a=1}^{N} \ln \left( \frac{Y_A}{A} \right) \right)^2}
\]

....................................................... (1)

Where \( p \) and \( a \) denote the population and area, respectively.

Hence, ó-convergence exists if and only if \( \sigma_{t+1} \leq \sigma_t \) for all \( t=0,1,..T-1 \)

Club Convergence

The interstate disparity in availability of NH network has been measured through Theil Index with respect to population as well as area share of the respective states over the study periods. To find the trend of disparity in availability of NH across the states over the period of study, the Theil Index has been used. We define, \( T_{S_i} \), \( T_R \) and \( T_S \) as the inter-state disparity of state \( i \), inter-regional disparity of regions and inter-state disparity at All India level, which are estimated as follows:

\[
T_s = \sum_{i=1}^{N} \frac{Y}{Y} \ln \left( \frac{Y}{P_{i}} / P \right); \text{ and }
\]

\[
T_R = \sum_{i=1}^{N} \frac{Y}{Y} \ln \left( \frac{Y}{A_{i}} / A \right)
\]

\[
T_s = \sum_{i=1}^{N} \frac{Y}{Y} W_i + T_R
\]

....................................................... (2)

1 Absolute ó-convergence means that the initial availability of NH is the only influencing factor to availability of NH across the states and conditional ó-convergence implies that other explanatory variables affecting convergence are added into the model.
Adjusted Geographic Concentration (AGC) index

Finally, we use the Adjusted Geographic Concentration index (AGC) to throw light on the availability of NH at state level over the plan periods at a five year interval. The AGC index, as reformulated by Spiezia (2002) can be decomposed into two components: geographic concentration of population and territorial disparity. Hence, the AGC index for availability of NH across the states can be expressed as:

\[
AGC = \sum_{i=1}^{n} \frac{(y_i - p_i)}{(y_i - a_i)} |y_i - a_i| + \sum_{i=1}^{n} \frac{(p_i - a_i)}{(y_i - a_i)} |y_i - a_i|
\]

\[
\text{................................. (3)}
\]

The first term on the right-hand measures the effect of territorial disparity in availability of NH (depending on the relative population of the state) and the second term, the effect of geographic concentration of population (depending on the relative area of the state). Obviously, the AGC index lies between 0, indicating no concentration and 1, implying maximum concentration for all states.

Sources of data and division of the Region

In order to investigate the regional disparity of sanction and construction of NH in India, secondary data regarding state wise disbursement figure as on March 31, 2012 have been collected. Then, state wise availability of NH in different Plan periods starting from 1951 to 2011 has been compiled for all the states except the data for the Union Territories. The year wise populations figure are extrapolated from the Census of 1951 to 2011. The data regarding state wise availability of NH are prepared on the basis of various reports of National Highway Authority of India whereas area share of the states are approximated from the various reports published by the Registrar General of India, Government of India, New Delhi. The present study uses the data for infrastructure variables for the period 1951 to 2011 as per the reports of the NHAI and Planning Commission, Government of India while the actual population for that period is approximated by the year end figure for the respective states. In a five year interval, we have simulated the data for populations as well as availability of NH at state level. Further, we have divided the states into two broad categories e.g. States of the North eastern Region (NER) of India and other regions excluding the states of NER of India. For ambiguity in using interpolations and extrapolations methods to calculate year wise population in three newly constituted states, their data are combined with their mother states from where they were bifurcated (the data for Jharkhand, Uttarakhand and Chhattisgarh are combined with the data for Bihar, Uttar Pradesh and Madhya Pradesh, respectively).

III Results

Descriptive analysis

Table 1 represents the availability of NH measured in terms of 10,000 populations and 100 sq km during 1951-2011. The availability of NH with respect to area increased
steadily for the NER, the region excluding the NER as well as for the whole country. During 1951-1971 the area share of NER with respect to area share of NH lagged behind the area share of the region excluding NER as well as from its national standard. After 1971, the area share of NH for the NER improved significantly as compared to the region excluding NER and to its national standards.

Table 1: Availability of NH across the Regions during 1951-2011

<table>
<thead>
<tr>
<th>Year</th>
<th>NE Region</th>
<th>Region excluding NER</th>
<th>All India</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>1.41</td>
<td>0.57</td>
<td>0.62</td>
</tr>
<tr>
<td>1956</td>
<td>1.18</td>
<td>0.54</td>
<td>0.56</td>
</tr>
<tr>
<td>1961</td>
<td>1.02</td>
<td>0.53</td>
<td>0.54</td>
</tr>
<tr>
<td>1966</td>
<td>0.97</td>
<td>0.47</td>
<td>0.49</td>
</tr>
<tr>
<td>1971</td>
<td>1.06</td>
<td>0.47</td>
<td>0.54</td>
</tr>
<tr>
<td>1976</td>
<td>1.05</td>
<td>0.45</td>
<td>0.49</td>
</tr>
<tr>
<td>1981</td>
<td>1.22</td>
<td>0.41</td>
<td>0.47</td>
</tr>
<tr>
<td>1986</td>
<td>1.55</td>
<td>0.38</td>
<td>0.44</td>
</tr>
<tr>
<td>1991</td>
<td>1.39</td>
<td>0.36</td>
<td>0.43</td>
</tr>
<tr>
<td>1996</td>
<td>1.26</td>
<td>0.33</td>
<td>0.40</td>
</tr>
<tr>
<td>2001</td>
<td>1.60</td>
<td>0.46</td>
<td>0.37</td>
</tr>
<tr>
<td>2006</td>
<td>1.92</td>
<td>0.57</td>
<td>0.50</td>
</tr>
<tr>
<td>2011</td>
<td>2.04</td>
<td>0.58</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Note: The figure in italics and in bolds represents the availability of NH per 10,000 populations and per 100 square kilometer, respectively across the region. Source: Authors’ Calculation Based on Various data compiled from different Planning Commission Report.

ó- Convergence analysis

During the period 1951-1966, the ó value with respect to area shows a decreasing trend both at all India level as well as for the NER. After a marginal increase in 1971 ó value shows a decline up to 2011. The trend is more or less similar for the NER and at all India level. The trends are presented in the following figure.

Figure 1: Trend of ó Value with reference to Area during 1951-2011

Source: Based on Author’s Calculation.

The ó value, for the NER and for the all India level more or less shows a similar decreasing trend excluding the region without NER. Further, the absolute value of ó is much higher for the NER and for the all India level as compared to the region excluding NER. With a marginal upward shift in 1971, ó value decreases till 2011 which shows the convergence of ó- value at all India level.
The estimated value of \( \delta \) with respect to area decreased significantly for the NER and also for the country. Although the region other than NER also experienced reduction in the \( \delta \) value the decrease is much lower as compared to the NER or the country as a whole. This clearly shows that the expansion of NH network had led to a faster reduction in disparities over time across NER compared to areas excluding NER. The \( \delta \)-value with respect to populations also showed a similar trend as that with respect to area, but the spread is found to be much lower with respect to populations as compared to area. This is presented in the following figure.

**Figure 2: Trend of \( \delta \) Value with reference to Population during 1951-2011**

![Chart showing trend of \( \delta \) value with reference to population]

Source: Based on Author’s Calculation

It is therefore evident that the Five Year Plans have given emphasis on area criteria rather than population criteria in formulating expansion of NH network across the states. A reading of the two diagrams would show that in formulating the expansion policy of NH across the states, the trend in reduction in the disparity of availability of NH among the states with respect to area clearly shows a decreasing trend where as the disparity among the states in availability of NH with respect to population criterion does not show any prominent decreasing trend. As a result, the states with larger population but with a small area, for example, Tripura have been affected directly and have relatively lower share of NH as compared to the other states of NER.

**Club Convergence Analysis**

The Theil index indicates that \( T_s \) has an increasing trend over the plan periods, indicating that the disparity among the states in terms of availability of NH had become wider in India. The \( T_s \) values for the NER are more pronounced than that for the states excluding NER. \( T_s \) for NER take an upward rising ‘W’ shaped implying that the interstate disparity in NER has a fluctuating upward trend.
On the other hand $T_S$ for the other states excluding NER is more or less steady implying little change in the interstate disparity of availability of NH across the states. The value of $T_S$ value also shows an increasing trend since the eighties thereby implying that inter-regional disparity has also increased between the NER and the other parts of the country.

**Table 2: Result of Theil Index over the period 1951-2011**

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</tr>
</thead>
<tbody>
<tr>
<td>$T_S$(NER)</td>
<td>0.21</td>
<td>0.22</td>
<td>0.22</td>
<td>0.19</td>
<td>0.12</td>
<td>0.12</td>
<td>0.09</td>
<td>0.21</td>
<td>0.21</td>
<td>0.20</td>
<td>0.25</td>
<td>0.46</td>
<td>0.51</td>
</tr>
<tr>
<td>$T_S$(ENER)</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>0.09</td>
<td>0.08</td>
<td>0.08</td>
<td>0.10</td>
<td>0.09</td>
<td>0.11</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>$T_R$</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>0.04</td>
<td>0.08</td>
<td>0.08</td>
<td>0.07</td>
<td>0.06</td>
<td>0.06</td>
<td>0.07</td>
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<tr>
<td>$T_S$</td>
<td>0.10</td>
<td>0.10</td>
<td>0.09</td>
<td>0.09</td>
<td>0.10</td>
<td>0.11</td>
<td>0.13</td>
<td>0.18</td>
<td>0.19</td>
<td>0.18</td>
<td>0.19</td>
<td>0.18</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Source: Based on Author’s Calculation; Note: ENER denotes the region excluding NER

**Decomposition through AGC Index**

The Five Year Plans set two criteria for expansion of NH across the states namely population and area of any state. However, the analysis of sigma convergence and analysis of club convergence is not sufficient to find the factor(s) responsible for such disparity. The AGC index has been estimated to find the extent of such disparity in availability in NH network across the two broad categories viz. States of the NER of India and Other states excluding the states of NER. Hence, the decomposition has been done at three levels.

For the NER, the AGC Index clearly shows a decrease in concentration index over the plan periods thereby implying that regional disparity in availability at state level has decreased. The estimates of effect of territorial disparity of availability of NH per capita shows convergence of the sectoral structure of national highways within the
northeast region or in other words disparity in national highways across the states of the region compared to its population share has decreased faster over the plan periods. However, intra regional variation with respect to its size has decreased at a lesser rate and has wide variations. On the other hand the estimates of the effect of territorial disparity have been faster for the non NER region.

**Table 3**: Trend of AGC Index for the NER Over the Plan Periods: 1951-2011

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</tr>
</thead>
<tbody>
<tr>
<td>Territorial disparity effect- NH per capita</td>
<td>0.22</td>
<td>0.24</td>
<td>0.25</td>
<td>0.25</td>
<td>0.05</td>
<td>0.05</td>
<td>-0.12</td>
<td>-0.08</td>
<td>-0.07</td>
<td>-0.05</td>
<td>-0.06</td>
<td>-0.37</td>
<td>-0.27</td>
</tr>
<tr>
<td>Effect of GC of population</td>
<td>0.70</td>
<td>0.69</td>
<td>0.67</td>
<td>0.67</td>
<td>0.83</td>
<td>0.81</td>
<td>0.80</td>
<td>0.67</td>
<td>0.66</td>
<td>0.65</td>
<td>0.63</td>
<td>0.64</td>
<td>0.54</td>
</tr>
<tr>
<td>AGC (NER)</td>
<td>0.93</td>
<td>0.93</td>
<td>0.93</td>
<td>0.93</td>
<td>0.87</td>
<td>0.86</td>
<td>0.68</td>
<td>0.59</td>
<td>0.59</td>
<td>0.59</td>
<td>0.58</td>
<td>0.27</td>
<td>0.26</td>
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</tbody>
</table>

Note: Authors’ Calculation Based on Various data compiled from different Planning Commission Report

**Table 4**: Trend of AGC Index for the Region Excluding NER Over the Plan Periods: 1951-2011

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</tr>
</thead>
<tbody>
<tr>
<td>Territorial disparity effect- NH per capita</td>
<td>-.07</td>
<td>-.07</td>
<td>-.14</td>
<td>-.13</td>
<td>.02</td>
<td>.02</td>
<td>.02</td>
<td>.00</td>
<td>-.02</td>
<td>-.02</td>
<td>-.09</td>
<td>-.09</td>
<td></td>
</tr>
<tr>
<td>Effect of GC of Population</td>
<td>.46</td>
<td>.45</td>
<td>.45</td>
<td>.44</td>
<td>.28</td>
<td>.29</td>
<td>.28</td>
<td>.27</td>
<td>.28</td>
<td>.24</td>
<td>.31</td>
<td>.42</td>
<td>.42</td>
</tr>
<tr>
<td>AGC (Region Excluding NER)</td>
<td>.39</td>
<td>.39</td>
<td>.31</td>
<td>.31</td>
<td>.30</td>
<td>.30</td>
<td>.28</td>
<td>.26</td>
<td>.26</td>
<td>.29</td>
<td>.33</td>
<td>.33</td>
<td></td>
</tr>
</tbody>
</table>

Note: Authors’ Calculation Based on Various data compiled from different Planning Commission Report

**Table 5**: Trend of AGC Index for the All India Level Over the Plan Periods: 1951-2001

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</thead>
<tbody>
<tr>
<td>Territorial disparity effect- NH per capita</td>
<td>-0.05</td>
<td>-0.04</td>
<td>-0.11</td>
<td>-0.11</td>
<td>0.04</td>
<td>0.06</td>
<td>0.05</td>
<td>0.07</td>
<td>0.07</td>
<td>0.08</td>
<td>0.05</td>
<td>-0.06</td>
<td>-0.03</td>
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<td>Effect of GC of Population</td>
<td>0.48</td>
<td>0.47</td>
<td>0.47</td>
<td>0.46</td>
<td>0.30</td>
<td>0.30</td>
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<td>0.27</td>
<td>0.24</td>
<td>0.30</td>
<td>0.41</td>
<td>0.37</td>
</tr>
<tr>
<td>AGC (All India)</td>
<td>0.43</td>
<td>0.43</td>
<td>0.35</td>
<td>0.35</td>
<td>0.34</td>
<td>0.36</td>
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<td>0.33</td>
<td>0.33</td>
<td>0.35</td>
<td>0.34</td>
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</tr>
</tbody>
</table>

Note: Authors’ Calculation Based on Various data compiled from different Planning Commission Report
IV Discussion

It is a fact that the availability of NH in terms of per 10,000 populations and 100 sq. km. increased steadily for the NER during 1951-2011. In absolute figure, the increase in availability of NH per 10,000 populations is about 45 percent where as the region excluding the NER shows a very small decline of about 1.70 percentages during the same period. The country as a whole shows a small increase in share by 1.61 percentages. At the same time, up to 1966, NER was lagging behind the all India average with respect to availability of NH across the states per 100 sq. km. But since the mid sixties especially after 1971, there has been major thrust in development of NH in NER. This region has made remarkable progress since 1966 compared to earlier years in terms of availability of NH per 100 square kilometers. During the period under study (1951-2011) the increase in NH in the region has increased almost five times where as the region other than NER and the NH network at all India level experienced half of that growth rate of NH network. Two factors are perhaps responsible for such increase in NH networks in the region. One, the topography of NER is not suitable for massive expansion of other mode of surface transport i.e. railways and thereby NH network was expanded by the government to substitute the railway. Secondly, after 1971, NH network in NER expanded due to strategic reasons.

The ó-value with respect to area significantly reduced for the NER compared to the non NER region. This shows that the expansion of NH network with respect to area of the state could address the issue of disparity in availability of NH network. Although the ó-value with respect to population also shows a similar trend as that with respect to area, the extent of reduction in disparity is much lower which is obvious.

This is also supported by the estimates obtained for $T_s(NER)$, $T_a$ and $T_c$. $T_s(ENER)$ show no change in the level of interstate disparity among the states excluding NER. At the same time, $T_s(NER)$ shows complete divergence thereby implying that the interstate disparity among the states in the NER has been increasing during 1951-2011. Obviously, $T_a$ value is also very high implying interregional disparity of availability of NH across the region.

The analysis of ó-convergence clearly shows that regional disparity of availability of NH for the country has been reducing. But the trends of Theil indices show that there exists significant regional disparity across the states within the country as well as between the regions in terms of availability of NH across the states are concerned. The trend of AGC index for the NER clearly exhibits a convergence. However decomposition of the index shows that highly populous states with smaller areas had lower share of NH. Similar phenomena can be observed for regions excluding NER or for the country as a whole.

During 1951-2011, government’s policy of expansion of NH has been area centric and less emphasis was put on population of any region or state. This adversely
affects those states which have small area but the density of population is relatively high viz. Tripura in NER. In NER, Tripura is the smallest state after Sikkim in terms of area but ranked second in terms of populations, after Assam. The government’s policy of area centric distribution of NH across the states left Tripura with only 400 kms. of NH which is much lower as compared to the other states of the country, in general and to the other states of NER, in particular.

V Conclusion

Overall, during the period 1951-2011, the availability of NH for the NER, the regions other than NER and of the whole country increased significantly. The availability of NH across the states shows convergence trends across the regions and also the country as a whole implying that the policy of expansion of NH across the states at least able to reduce the regional disparity. However, area thrust in expansion of NH also adversely affects states which are populous but have lower area shares. Therefore a uniform criterion across the country keeping its geographical and topographical variation calls for accommodating regional/state specificity so as to expand the coverage taking both population and area into consideration.

References

Huddleston J R (1990) Regional and Local Economic Impacts of Transportation Investments, Quarterly Transportation, Vol.44, No. 4, pp.579-594


