

Role of Socio-Physical Infrastructure in Regional Economic Growth: A Case Study with Special Reference to Education and Healthcare Sector of Uttar Pradesh



Prachi Agarwal¹, Swami Prasad Saxena², Ph.D.

¹Research Scholar Department of Applied Business Economics Dayalbagh Educational Institute (Deemed to be University) Dayalbagh, Agra 282005 (IN)

²Professor (Macroeconomics & Finance) Department of Applied Business Economics Dayalbagh Educational Institute (Deemed to be University) Dayalbagh, Agra 282005 (IN)

ABSTRACT: Infrastructure facilities, both social and economic, such as healthcare, education, energy, transportation, water supply and communication system play a crucial role in accelerating economic growth of any region. Uttar Pradesh, one of the most populous states of India, is facing many challenges in attaining sustained economic growth. One of the critical factors that plays a prominent role in economic development of the state is social and economic infrastructure. Present study aims to analyze the role of social and economic infrastructure in the economic growth of Uttar Pradesh and reveals that there is a unidirectional causality between physical infrastructure and growth. The findings of the study indicate that both social and economic infrastructure has a significant impact on the economic growth of Uttar Pradesh and there is a need for substantial investment and policy reforms to address the existing gaps and challenges.

KEYWORDS: Economic growth, economic infrastructure, social infrastructure, health, education.

1. INTRODUCTION

India, with a middle-income developing economy, stands at the fifth position in terms of gross domestic product (GDP) and at the third position in terms of purchasing power parity (PPP) in the world. As per the international monetary Funds, India is ranks at 142nd position in terms of per capita GDP, and at 128th rank in terms of per capita PPP. The population of India has been increased at a very fast pace; it is now a second most populous country in the world. According to the analysis by National Sample Survey organization (NSSO), two-third of the people in India live in poverty; about 68.8 percent of the people in the country earn less than 2 dollars a day; and about 30 percent even have less than 1.25 dollars a day. This shows the state of extreme poverty in the country arising from the states which have poor infrastructure. The poverty during a period from 2011-12 to 2017-18 has increased from 17 percent to 50.47 percent in Bihar indicating a hike in poverty (Devulapalli, 2018). Some other states like Rajasthan, Uttar Pradesh, Madhya Pradesh etc. also have a leap up trend in terms of population which directly leads to a decline in the per capita GDP of the state.

According to NSSO, Uttar Pradesh stands at 2nd position in terms of economy. It receives a large part of its revenue from agriculture and the service sector. Three districts of the state, viz., Shrawasti, Bahraich, and Balrampur are multidimensionally poor; they account for about 70 percent of the poverty ratio; whereas, Lucknow, the capital city of the state, has the lowest poverty ratio of about 12.16 percent, showing a fall in urban poverty and a subsequent rise in rural poverty (ENS Economic Bureau, 2021). Although, state government has taken many initiatives to accumulate and arrange funds from central government in form of grants and share in central taxes for some worth economic activities, still it has poor growth in terms of primary education, health and medication, social welfare, and rural development, with low per capita income and high poverty probably due to the macro-economic policies in the state.

2. LITERATURE REVIEW

The role of infrastructure in economic growth is well-established in the literatures, it provides a framework for enhancing the economic activities, such as promoting investment, creating employment opportunities, improving productivity, and facilitating the flow of goods and services. With reference to UP, the development of infrastructure is considered important to address the

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challenges of unemployment and poverty, and promotion of inclusive economic growth. Hence, determining the role of economic and social infrastructure in development is significantly important.

Few studies focused on the importance of economic and social infrastructure in promoting economic growth., they claimed that there exists a positive relationship between economic growth and infrastructure, exhibiting an increased investment and productivity with an improved infrastructure. (Aschauer, 1989; Calderón and Servén, 2004; World Bank, 1994). Keeping the social infrastructure in to consideration Barro, (1991) and Mankiw et al., (1992), estimated social infrastructure is critical for the economic growth and have a positive impact on the human capital formation of the country. Easterly and Serven, 2003, investigated the role of economic infrastructure and claimed that the economic infrastructure factors such as transportation, communication, and energy system, helps to reduce the transaction costs, resulted in a rise in trade and commerce with a greater accessibility to the market.

With reference to UP a few studies tried to explain the role of infrastructure in economic growth such as, a study by Planning Commission (2011), call attention towards the need of infrastructure development, in order to address regional disparities in UP and promoting economic growth. In addition to this, Garg, and Chand (2017), described the role of infrastructure development and investigated that development of infrastructure facilities contributes significantly towards the industrial productivity in UP. Moreover, research by Uttar Pradesh Infrastructure and Industrial Development (2018), investigated a positive role of infrastructure on investment and economic growth in the state.

Some of the researchers have investigated the root causes of poor economic growth while some discussed slow growth and the issues related with allocation of funds received by the states. Their findings indicate that states like Maharashtra, West Bengal, Tamil Nadu indicate good growth and some states like Uttar Pradesh, Madhya Pradesh, Rajasthan, and Bihar although receive a huge revenue, they lack in the developmental criterion. A brief review of some of the relevant empirical studies related to the same is presented below. Agarwal (2005) examined the budgetary constraint and growth scenario in Uttar Pradesh by focusing on the implementation of the economic reforms at state level. He mentioned that due to non-initiation of reforms in the states, there was a deterioration in the fiscal position in the late nineties. The revenue and fiscal deficit as percentage of GDP of the states which was 1 to 2 percent in mid-nineties increased to 3 to 4 percent in late nineties. To overcome the situation of fiscal crises, the author stressed on policy reforms in the state. Narain et al. (2007) examined the state of socioeconomic development in selected states of India taking net area irrigated, yield rate of food grains, per capita milk production, annual death and birth rate, road length, per capita expenditure on the medical and public health etc. as major indicators. As per results, states like Punjab, Maharashtra, and Tamil Nadu were ranked first while Bihar, Orrisa, and Jammu and Kashmir were ranked last in terms of socio-economic development. At the overall level, socioeconomic development is found to be positively associated with the development in agriculture and industry.

Mukherji (2009) in his work on the states' economic growth and development in India discussed the trajectory of economic policies in India from 1947 to 1975, 1975 to 1991 and 1991 afterwards. He mentioned that the major challenge for the development in states of the country is inclusive growth which can be achieved by changes in the democratic policies. Rasul and Sharma (2014) attempted to understand the reasons for the poor economic performance of Bihar and Uttar Pradesh. They observed that poor performance in these states is caused by many factors ranging from social, economic to political and historical factors. They mentioned that the poor economic condition in these states is primarily caused by British colonial policy in agriculture, low human capital formation, poor infrastructure, and weak institutions. Gupta et al. (2020) observed that Bihar and Uttar Pradesh have a much higher share in spendings on primary healthcare as compared to secondary and tertiary healthcare. They also noted that Himachal Pradesh spends the most per capita on healthcare after Tamil Nadu. The per capita spendings on primary health care is also much higher in these states as compared to other states. However, this has been changed and in the last three years (from 2014-15 to 2016-17) when a decline in the expenditures on primary healthcare was observed in West Bengal and Tamil Nadu, and a significant increase was noted in the spendings on secondary and tertiary healthcare in Himachal Pradesh, Tamil Nadu and somewhat in Uttar Pradesh. The study indicated lack of uniformity in spending on healthcare across the selected states.

However, despite of the present literatures, there still exists a gap in understanding of the specific challenges, thus, the present study tends to focus on investigating the role of social and physical infrastructure in economic growth of Uttar Pradesh, and will address to answer the questions like: Is there any surplus from the expenditure and receipts of the state? If yes, then whether it has been used for some productive activities or not? How much funds of the state are used for social welfare? And what is the impact of social and physical infrastructure on economic growth? The study is organized as: the relevant literature has been reviewed in section 2. Section 3 presents the trend in the total expenditures and receipts in the state. It also includes the status of health and education in the state. Section 4 depicts data and methodology, and section 5 presents analysis of the impact of social factors on GSDP growth of the state. Section 6 consists of the findings and the conclusion.

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3. PRESENT STATUS OF ECONOMIC GROWTH OF UTTAR PRADESH

UP is the fourth largest contributor to the India's GDP, i.e., almost 8.9 percent of GDP, the economic activities in UP is primarily driven by the agriculture, industry, and service sectors. The Gross State Domestic Product (GSDP) of UP depicts an upward trend, i.e., a growth of sixty thousand crores over past 10 years, while, due to high population, the per capita GSDP reveals a slow pace increasing trend, i.e., a rise of only two crores in past years. From the year 2011 to 2014, UP registered an annual average GSDP growth of 6.7% approximately, in sense till 2015, there was a decelerated growth in UP, but after the establishment of NITI AAYOG, there is a visible change in the pattern of growth. The GSDP of the state in 2016-17 was 11.37 percent (MOSPI), was the highest during past ten years, but, due to the pandemic in the country, the economic growth of the state had fall significantly to -6.36 percent in the year 2020-21, and the overall CAGR of the growth rate of GSDP is 11 percent.

The revenue account of Uttar Pradesh lays down a snapshot of its economic performance, which highlights the revenue, expenditure sources and revenue deficit. The major source of revenue includes, central and state tax, grants, and non-tax revenue, while the state government spends its revenue on various infrastructure sectors, including health and education, agriculture, etc., it also incurs expenses on salaries and pensions, subsidies, social welfare, and debt servicing. According to the data provided in the state budget of Uttar Pradesh, the state received huge revenues and has certain categories of expenditures. The total expenditure of the state was Rs. 550271 crores in 2021-22, and the total receipts during the year was Rs. 506182 crores, estimated to record a growth of 7 percent over GSDP, delineates a revenue deficit of 44089 crores, i.e., 2.8 percent of GSDP of the state. On the other hand, the fiscal account of UP depicted a fiscal surplus of Rs. 62490 crores during 2019-20 due to a significant rise in the non-tax revenue, and a deficit balance of 14.2 and 44.1 thousand crores during 2020-21 and 2021-22 (Table – 1) which illustrates 4 percent of GSDP, i.e., 1 percent higher than the limit set by Fiscal Responsibility and Budget Management Act (FRBM) 2003.

Table – 2 represents major expenses of the state on education, health, rural and urban development. It shows that although government expenditure on these heads has increased in absolute terms, the change in expenditure over previous financial year has remained approximately same except in year 2021-22. In the state budget (2021-22), the government allocated Rs. 5395 crores to National Rural Health Mission (NRHM), and Rs. 1300 crores to Ayushman Bharat Yojna. The allocation to the education sector also indicates a sharp rise in 2021-22. The government, to provide better education opportunities allocated Rs. 18172 crores to Samagra Shiksha Abhiyan Rs. 3406 crores for Mid-Day Meal Program. The data as per the State Budget of Uttar Pradesh (2022-23) indicates that the state issued 13 percent of GSDP for expenditures on education, which is only 2 percent less than the average of the sum of funds allotted to the rest of the states. Additionally, the funds issued for healthcare are only 7.1 percent of GSDP, which is 1 percent more than the average funds allotted to all the states although it received huge amount from central government in the form of grant in aid.

Few states with good economic structure achieve the highest growth; indeed, there exist certain factors that affect its economic and social development. The factors that hinder the growth comprise of the lack of skills in the population, poor infrastructure, inflation, industrial policy etc., Uttar Pradesh is the most populous state in the nation having some of the factors which hinder its growth. Despite the size and potential, Uttar Pradesh is facing many challenges in attaining sustained economic growth. One of the critical factors that play a prominent role in economic development is social and economic infrastructure. Social infrastructure includes education, health, and other services that are aimed to improve the lifestyle and well-being of the population, and economic or physical infrastructure includes transportation, communication system, energy and other provisions that facilitates the economic activities. Although, recent years data communicate progress in urban areas, still there exists a significant gap. To cite, although state has a good roads network, the quality is often poor; it lacks in providing affordable electricity to its citizens, inadequate accessibility to safe drinking water and sanitation facilities, limited availability of healthcare provisions, low educational attainment etc. All this affects human capital development and hinders economic growth. It is assumed that more expenditure on the social infrastructure leads to better health of the people, development of human capital and skilled labor, and higher literacy leads to growth and higher productivity.

4. MATERIAL AND METHODS

Present paper focuses on examining the effect of infrastructure stocks on the economic growth in Uttar Pradesh. The variables used for analysis include infrastructure index and social expenditures (independent variable), and real state gross domestic product (dependent variable). In equation form:

$$Y_t = f(I_t, EX_t)$$

Where, Y_t is the gross state domestic product (GSDP), I_t represents supporting infrastructure, and EX_t is social expenditures (amount spent by government on health and education).

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Although a variety of indicators are specified to elucidate the infrastructure index, the researchers used Principal Component Analysis (PCA) to make a composite index. Major indicators included in this index are power requirement, per capita availability of power, installed capacity of power, length of roads, railway route, and telephones per 100 population.

The relevant data on selected variables for a period spanning from 2004-05 to 2020-21 is taken from annual budgets of Uttar Pradesh (published by RBI), final accounts of Uttar Pradesh (published by Comptroller and Auditor General of India), and handbook of statistics on Indian economy (published by RBI).

5. ANALYSIS AND FINDINGS

To interpret the infrastructure index, researchers have used Principal Component Analysis (PCA). The eigenvalues, variance and factor loading of the variables are presented in table 3. The results indicate eigenvalue of the first factor greater than one (> 1) and explains about two third of the total variance. Further, there is a huge difference between the eigenvalue of first and next factor. Hence, the first factor (PC), which represents the variance of all the six components of infrastructure, is considered for making index.

Johansen test of cointegration used to check cointegration between the variables (table 4) indicate that all the three variables i.e., the infrastructure index, social expenditures and GDP are stationary at first difference, in sense they are integrated in the same order one (I(1)). Results also show that there exists one cointegration equation, confirming that Vector Error Correction Model (VECM) can be used for further analysis.

The results of VECM used to analyze the causality between the input and output variables (table 5) indicate that there exists a cointegrating relation amongst the variables. VECM distinguishes between the short-run and long-run associations also. A significant t-stat. of the regressor indicates short-run causal relationship; conversely, significant t-stat. the error correction term implied long-run causal relationship among the variables. The results presented in table 5 show that t-stat. of both regressors and error correction term are significant, meaning that there exists strong causal relationship among the variables in short as well as in long-run. To know the direction of the causation Granger causality test is used. The results (table 6) indicate a unidirectional causality running from infrastructure index (economic infrastructure) to GDP growth.

With a view to examine the impact of infrastructure index and social expenditures on economic growth. For this purpose, data series of all the variables are converted in to log form. The results contained in table 7 show positive coefficient (0.119458) of infrastructure index, and a negative coefficient (-0.500548) for social expenditures meaning that infrastructure has a positive impact on GDP growth, and social expenditures has a negative impact on GDP growth. It also implies that a 1 percent increase in the infrastructure will increase GDP by 11 percent; conversely, a 1 percent increase in the social expenditures will decrease the GDP by 5 percent.

6. CONCLUSION

Infrastructure stock and human capital play a prominent role in the economic growth of any region. The results of the study show a positive and significant role of infrastructure on GDP growth of Uttar Pradesh. The results also indicate unidirectional causality between physical infrastructure and economic growth, which implies that government should focus on development of infrastructure and its related components to ensure sustained high GDP growth rate. This will help the state government in poverty eradication and improving living standards of the people of the state. The overall study investigates that the expenditures by the government on both the social factors have a significant impact on the economic growth of the state. The social perspective delineates that there should be some measures to control the social issues and expenditures, as it does not lead to economic growth rather, just an expenditure for the government.

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Appendix

Table 1: Trend of Total Receipts and Total Expenditure of Uttar Pradesh

Year	GSDP in crores INR (Constant 2011)	Per Capita GSDP INR (Constant 2011)	Population in crores	Total Receipts in crores INR	Total Expenditure in crores INR	Surplus/ Deficit in crores INR
2015-16	908241	42397	21.4	302315	303949	-1634
2016-17	1011501	46504	21.76	324819	333425	-8606
2017-18	1057747	47897	22.11	326428	321823	4605
2018-19	1123982	50129	22.46	386886	391211	-4325
2019-20	1166817	51255	22.81	445842	383352	62490
2020-21	1092624	47271	23.15	400504	414751	-14247
2021-22	1537628	65431	23.5	506182	550271	-44089

Source: GSDP and Per Capita GSDP has been collected from MOSPI, the Population of state from NSSO and the Receipts and expenditures from State Budget Uttar Pradesh (Various issues)

Table 2: Expenditures on Social Sector in Uttar Pradesh (In crores INR)

Year	Education	Health	Rural Dev.	Urban Dev.
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		Exp.	% Change	Exp.	% Change	Exp.	% Change	Exp.	% Change
2014-15	Amount	37689	-	12209	-	7280	-	6648	-
	% of Total	13.71	-	4.44	-	2.65	-	2.42	-
2015-16	Amount	40112	6.42	12104	-0.86	10177	39.79	5250	-21.02
	% of Total	13.19	-	3.98	-	3.34	-	1.72	-
2016-17	Amount	49000	22.15	14304	18.47	10436	2.54	6238	18.81
	% of Total	14.69	-	4.30	-	3.12	-	1.87	-
2017-18	Amount	47079	-3.9	16904	17.88	19399	85.88	14080	125.71
	% of Total	14.62	-	5.25	-	6.02	-	4.37	-
2018-19	Amount	48650	3.33	18102	7.08	29315	51.11	11206	-20.41
	% of Total	12.43	-	4.62	-	7.49	-	2.86	-
2019-20	Amount	55778	14.65	19957	10.24	23156	-21.09	9836	-12.225
	% of Total	14.55	-	5.20	-	6.04	-	2.56	-
2020-21	Amount	53043	-4.90	20582	3.13	26431	14.14	15180	54.33
	% of Total	12.78	-	4.96	-	6.37	-	3.66	-
2021-22	Amount	67683	27.60	32009	55.51	27455	3.87	23980	57.97
	% of Total	12.29	-	5.81	-	4.98	-	4.35	-

Source: State Budget of Uttar Pradesh (Various issues)

Table 3: Principal Component Analysis

Eigenvalues: (Sum = 6, Average = 1)

Number	Eigenvalue	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	5.130704	4.555839	0.8551	5.130704	0.8551
2	0.574865	0.332899	0.0958	5.705568	0.9509
3	0.241966	0.219036	0.0403	5.947534	0.9913
4	0.022931	0.005273	0.0038	5.970465	0.9951
5	0.071657	0.005779	0.0029	5.988122	0.9980
6	0.011878	----	0.0020	6.000000	1.0000
Factor Loadings					
Variable					PC – 1
LTELE					0.414627
LROADS					0.421157
LRAIL					0.313766
L POWER					0.436383
LPCPOWER					0.430533
LINSTPOWER					0.420088

Source: Author's calculation using EViews.

Table 4: Johansen Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalues	Trace Statistics	Critical Value	Prob.**
None*	0.945749	56.71578	29.79707	0.0000
At most 1	0.414135	13.00383	15.49471	0.1147
At most 2*	0.282696	4.983835	3.841465	0.0256
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
*denotes rejection of the hypothesis at the 0.05 level				
** MacKinnon-Haug-Michelis (1999) p-value				

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Unrestricted Cointegration Rank Test (Maximum Eigenvalues)				
Hypothesized No. of EC(s)	Eigenvalues	Max-Eigen Stat.	Critical Value	Prob.**
None*	0.945749	43.71195	21.13162	0.0000
At most 1	0.414135	8.019997	14.26460	0.3767
At most 2*	0.282696	4.983835	3.841465	0.0256

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
 *denotes rejection of the hypothesis at the 0.05 level
 ** MacKinnon-Haug-Michelis (1999) p-value

Source: Author's calculation using Eviews.

Table 5: VECM Test Results

Cointegrating Eq.	CointEq 1		
LGDP (-1)	1.000000		
INDEX (-1)	-0.142552 (0.00207) [-68.9144]		
LSOCEX (-1)	1.040471 (0.04756) [21.8354]		
C	-6.837614		
Error Correction:	D(LGDP)	D(INDEX)	D(LSOCEX)
Cointeq1	0.312610 (0.49580) [0.63052]	11.05444 (1.22109) [9.05293]	-0.659987 (0.53321) [-1.23776]
D (LGDP (-1))	-0.743785 (0.71694) [-1.03744]	-8.941780 (1.76574) [-5.06404]	1.021830 (0.77104) [1.32526]
D (INDEX (-1))	0.040728 (0.05034) [0.80901]	0.559717 (0.12399) [4.51432]	-0.051329 (0.05414) [-0.94806]
D (LSOCEX (-1))	-0.727295 (0.69485) [-1.04669]	-10.96986 (1.71134) [-6.41011]	1.127916 (0.74728) [1.50935]
C	0.071744 (0.04969) [1.44381]	0.820557 (0.12238) [6.70492]	-0.023284 (0.05344) [0.43570]

Source: Author's calculation using Eviews.

Table 6: Granger Causality Test Results

Null Hypothesis:	Obs.	F-Statistic	Prob.
LSOCEX does not Granger Cause LGDP	16	2.15066	0.1663
LGDP does not Granger Cause LSOCEX		1.40750	0.2567
INDEX does not Granger Cause LGDP	16	5.08743	0.0420
LGDP does not Granger Cause INDEX		0.33007	0.5754
INDEX does not Granger Cause LSOCEX	16	0.92612	0.3534
LSOCEX does not Granger Cause INDEX		0.78880	0.3906

Source: Authors' calculation using Eviews.

Table 7: OLS Results

Variable	Coefficient	Std. Error	T-Statistics	Prob.
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Index	0.119458	0.008214	14.54324	0.0000
LSOCEX	-0.500548	0.168151	-2.976778	0.0100
C	6.292154	0.172615	36.45190	0.0000
R-squared	0.959773	Mean dependent variable.		5.779725
Adjusted R-squared.	0.954026	S.D. dependent variable		0.245602
S.E. of Regression	0.052661	Akaike info Criterion		-2.891109
Sums squared residual.	0.038824	Hannan- Quinn Criter		-2.876493
Log Likelihood	27.57443	Durbin-Watson Stats		1.579566
F-statistics	167.0131			
Prob (F-Statistic)	0.000000			

Source: Authors' calculation using Eviews.



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