ROLE OF INFRASTRUCTURE AVAILABILITY IN INDUSTRIAL DEVELOPMENT OF RESOURCE RICH STATES OF INDIA WITH RESPECT TO JHARKHAND

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ABSTRACT

Growth and diversification of industrial activities in any country or region can take place if there is adequate availability of resources along with financial and social infrastructure in the economy. Furthermore, the lack of integration among physical, financial and social development is also very instrumental in unpleasant economic growth. Interestingly, in the Indian states, the situation is more robust. This study tries to find out the state level disparities in terms of various parameters considered for facilitating the industrialisation process for the selected states. Further, using OLS Regression the study finds out the impact of various infrastructures on the industrial development of the selected mineral rich states formulating different models.

Keywords: Disparity, Economic Growth, Industrial Development, , Infrastructure, Regression, Resource Rich

I INTRODUCTION

It is widely recognized that industrialization, intended as the shift from agriculture to manufacturing, is key to development: hardly any countries have developed without industrializing. This phenomenon has been so striking to induce some economists to hypothesize that the manufacturing sector is the engine of economic growth, the so-called “engine of growth argument” (Kaldor, 1967; Cornwall, 1977). Infrastructure plays a leading role in industrial development. .The causal study by many researchers has established that in long run infrastructure is the leader and the industrial development is the follower.

In Indian context the main characteristic of development has been the wide regional disparity in development levels. Since India is a vast country, the geographical diversity does create some imbalance in resource base. A country with more than 65 years of planned development should have exploited the available resources of the different regions to stimulate some sort of development in every region. No doubt, the efforts have been made in this direction, but wide regional disparity is still a ground reality in India (Gulati, S.C. ,1977; Ghosh, B. and P. De,1998; Dadibhavi, R.V. ,1991).

However, this study focuses on Jharkhand, which is one of the most mineral rich states of India. The study initially reviews the level of industrial development and the availability of the infrastructure facilities of Jharkhand with respect to the other mineral rich states of Maharashtra, Orissa, Tamilnadu and West Bengal. Formulating composite indices for different components of infrastructure, the extent of disparities among the districts is found. Further using the econometric models it is seen as to how far the mineral production, infrastructural availability and the institutional quality for the selected mineral rich states, is influencing their industrial development.

Further investigation reveals that 'Infrastructure' is contributing maximum (out of the components considered - mineral production, infrastructure and institutional quality) as suggested by the highest coefficient values under infrastructure head for all the models. The next contributing component is the institutional quality of the states.

However in all the three models considered, value of mineral production per capita is not found to be contributing significantly if the other infrastructural availability with proper institutional quality is not significant. The paper further tries to find out the contribution/impact (numeral values) of different components of the industrial development models which may find its implication in formulation of the useful policy tools for the urban planners

II IDENTIFICATION OF VARIOUS PARAMETERS CONTRIBUTING TO INDUSTRIAL DEVELOPMENT

Every parameter, on which development index of a region depends, has a correlation amongst each other. The parameter may be positively or negatively correlated i.e. increase in the level of one parameter may increase or decrease the level of other in question, but all the most they have some level of relation.

The correlation obtained from state level data obtained and generated for each state of Jharkhand as well as developed states of Maharashtra, Orissa, Tamilnadu and West Bengal gives vital directions into dependency of one parameter on other, both for Jharkhand as well as developed states. The parameters with which the correlations of level of industrialisation have been derived may be listed below as:

Resource parameters: Mineral Reserves; Per Capita Value of minerals production;

Physical infrastructural parameters: Road length in states per 100 Sq.Km; Railway route length in states per 100 Sq.Km; Electricity availability per 1000 population [total]

Banking Infrastructure parameters: Number of banks; Per capita bank deposits; Per capita bank credits to industry;

Social Infrastructure parameters: Literacy rate; Infant Mortality Rate

Institutional Quality parameters: Case Disposal Ratio per court; C-D Ratio of Banks; Ratio of Surfaced roads to total roads; Number of times President's rule imposed; Number of times CM headed a coalition government

III INTERSTATE DIFFERENCES WITH RESPECT TO VARIOUS PARAMETERS

The parameters for analysing the interstate differences for the considered resource rich states are taken from various development aspects like per capita income which is generally used as a routine economic indicator, percentage of urban population as a demographic parameter, annual average growth rate of the industry sector as an industrial development parameter, road length, railway route length, percent of villages electrified as parameters for physical infrastructure, number of commercial banks and credit deposit ratio as parameters of banking infrastructure and literacy rate and infant mortality rate as parameters of social infrastructure.

Table 1.0: Interstate Differences with respect to various parameters

Infrastructure Measures	**Jharkhand**	**Maharashtra**	**Odisha**	**Tamilnadu**	**West Bengal**	**India**
Per capita income(Rs.)	21734	66729	25708	51117	31673	35993
% of urban population	22.25	42.4	33	43.86	28.03	27.8
Annual average growth rate in industry sector (%)	5.30	9.16	8.04	8.79	5.44	6.87
No. of scheduled commercial banks offices	2118	9053	3196	7253	5796	96059
Road length per 100 Sq.Km	29.99	133.41	166.23	147.89	337.13	115.30
Railway route length per 1000 Sq.Km	24.89	18.20	15.81	31.23	44.36	19.61
% of villages electrified	31.1	88.3	62.6	100	97.3	83.7
Credit deposit (C-D) ratio (%)	33.62	87.08	46.92	116.16	62.87	78.09
Literacy rate (%)	56.21	75.48	64.36	73.86	71.16	65.46
Infant mortality rate (%)	28	17	40	19	26	29
Total major mineral reserves (million tonnes)	82982.98	10799.01	73920.00	33373.92	29956.71	--

Source: Census 2011, Various Data Tables of Planning Commission of India for 2011, GSI & CMPDI 2010

For most of the infrastructure measures shown in Table 1.0,covering the different aspects of socio-economic development, Jharkhand is found to be lagging behind, among the states considered as well as at the national average perspective. A paradox (reflecting a mineral resource conflict) may be noticed that-in the total mineral reserves, Jharkhand is the leading state having maximum value but for all the other developmental parameters considered, Jharkhand is found to be an underperformer among the states considered and it is far below the national average except only one parameter i.e. the railway route length.

IV DATA AND METHODOLOGY

The study is mainly based on the secondary data for the selected mineral rich states of Jharkhand, Maharashtra, Orissa, Tamilnadu and West Bengal, which measures the level of industrialisation and the infrastructural availability for the period 2001-2011. The data of, value of mineral production are referred from various issues of annual reports of Indian Bureau of Mines (IBM) and infrastructure facilities are referred from the statistical abstract from Directorate of Economics and Statistics of the respective states, Planning Commission annual reports, , whereas demographic statistics of individual states are taken from Statistical Abstract, State Census data , are considered for the analysis.

4.1 Research Method

Common problems with such type of analysis are multicollinearity and dimensionality. Principal component analysis (PCA) is used as a statistical tool to remove these problems. Dimension reduction technique of Factor analysis which uses PCA is applied to those variables/proxies which are highly correlated amongst each other Since the units of measurement of correlated variables are different, the rotated component matrix using PCA is used in order to obtain the corresponding weights. Since a variable should not have an artificially higher weight due to its higher variance, the data are standardized with variance one (1) and mean zero (0) before applying PCA. Principal components having Eigen values greater than one (1) are selected. After standardizing the data, it is multiplied with the weight as suggested by PCA to arrive at the corresponding indices or. The obtained weights are multiplied by the corresponding standardized values of the variables to arrive at the composite indices.

V MODELS

For better understanding the impact of various components like Value of Mineral Production Per Capita [VMPC], Infrastructure which covers mainly the Physical Infrastructure [PI], Banking infrastructure [BI] and Social Infrastructure [SI] parameters along with the various parameters of Institutional Quality [IQ], on the industrial development, the following model is formulated -

$$\mathbf{Y_i = \alpha_i + \beta_i\,(VMPC)_i + \lambda_i\,(Infrastructure)_i + \theta_i\,(IQ)_i + \varepsilon_i}$$

Where Y_i represents the level of industrial development of the i^{th} state, VMPC is the value of mineral production per capita, Infrastructure is composite contribution of PI,BI and SI, IQ is the composite contribution of the parameters considered under Institutional Quality. Composite contribution can be assessed by formulating the corresponding composite indices. α is the intercept, β, λ and θ are the corresponding co-efficient of the different parameters of industrial development and ε is the error term.

The level of industrial development may be analysed using- share of industry sector in SGDP, share of manufacturing sector in SGDP and the per capita income of the selected states.

The subsequent models can be rewritten as-

$$\mathbf{Y_{SISi} = \alpha_i + \beta_i\,(VMPC)_i + \lambda_i\,(Infrastructure)_i + \theta_i\,(IQ)_i + \varepsilon_i} \quad \textbf{(I)}$$

$$\mathbf{Y_{SMSi} = \alpha_i + \beta_i\,(VMPC)_i + \lambda_i\,(Infrastructure)_i + \theta_i\,(IQ)_i + \varepsilon_i} \quad \textbf{(II)}$$

$$\mathbf{Y_{PCIi} = \alpha_i + \beta_i\,(VMPC)_i + \lambda_i\,(Infrastructure)_i + \theta_i\,(IQ)_i + \varepsilon_i} \quad \textbf{(III)}$$

Where Y_{SISi} represents the level of industrial development in terms of share of industry sector in SGDP for the i^{th} state, Y_{SMSi} is the level of industrial development in terms of share of manufacturing sector in SGDP for the i^{th} state, and Y_{PCIi} is the per capita income for the i^{th} state, of the selected states.

VI RESULTS AND DISCUSSIONS

The results are analysed using the different composite indices formulated, which is used in studying the interstate disparities, as well as the solutions to the different models. The three alternative equations have been solved for all selected states as a group and for parallely for the individual states. As the result of Model I did not give significant results, in the second section, the study discusses the results of the Model II and Model III only.

6.1 Results of OLS regression between level of industrial development, VMPC, Infrastructure and IQ [For all the states as a group]

Values of Table 2.0 suggest that Model-I is not explaining the variances in the data, but the rest models i.e. Model-II and Model-III are contributing to the level of industrial development of the resource rich states, which are shown by the highly significant values of F-Statistics.

Further investigation reveals that 'Infrastructure' is contributing maximum (out of the components considered - mineral production, infrastructure and institutional quality) as suggested by the highest coefficient values under infrastructure head for all the models. The next contributing component is the institutional quality of the states.

However in all the three models considered, value of mineral production per capita is not found to be contributing significantly which may be an indication that mineral production without any value addition is not contributing in its maximum extent.

Table 2.0: Regression values for the resource rich states under consideration for Model-I, Model II and Model III [Contribution of different components to industrial development]

	Intercept	VMPC	Infrastructure	IQ
Model I	3.614	0.0104	0.0769	0.0212
AR^2	0.8046			
F-Statistics	1.682			
Model II	4.135	-0.0167	2.461***	0.072**
AR^2	0.594			
F-Statistics	22.502***			
Model III	6.589	-6.535	2.589***	0.340***
AR^2	0.854			
F-Statistics	140.322***			

Abbreviations: VMPC-Value of mineral production per capita, IQ- Institutional Quality.

**** Significant at 1% significance level* *** Significant at 5% significance level*

Further it would be better if Model-II and Model-III are further analysed at individual state level. The next section takes a look into the interstate differences for the various components contributing to the industrial development, at individual state level.

6.2 Results of OLS regression between level of industrial development, VMPC, Infrastructure and IQ [For individual state]

It is clear from the value of Table 2.0 that only Model-II and Model-III are contributing models, hence for these models, the level of industrial development is analysed, for the individual state under consideration.

Table 3.0: Regression values for the resource rich states under consideration for Model- II and Model-III

States	**Model-II**				**Model-III**			
	Intercept	AR^2	t-Stat.	F-Stat.	Intercept	AR^2	t-Stat.	F-Stat.
Jharkhand	-21.06	0.491	0.4573	0.2092	60.94	.6032	6.1436***	37.74***
Maharashtra	37.34	0.753	3.041**	5.166**	-244.29	0.8293	6.6880***	44.72***
Orissa	33.02	0.584	1.701	2.894	-756.6	0.617	3.9388***	15.51***
Tamilnadu	-21.77	0.723	2.317**	10.638***	372.82	0.845	14.923***	32.70***
West Bengal	37.20	0.595	2.89**	8.375**	734.91	0.767	5.533***	30.68***

**** Significant at 1% significance level*

*** Significant at 5% significance level*

Table 3.0 shows that, Model-III which measures the industrial development with respect to per capita income is found to be highly significant for all the states. Model -II, which measures the industrial development with respect to share of manufacturing sector, is significant only for Maharashtra, Tamilnadu and West Bengal. This may be explained as these states are the better performing states in terms of industrial development, while the states of Jharkhand and Orissa, are not contributing, reflecting the low level of industrial development in these states.

Further, the comparative analysis of the states, suggests the lowest value of Adjusted R^2 in Model-II is 0.491 which corresponds to Jharkhand. Similarly in Model-III, Jharkhand has the lowest Adjusted R^2 value of 0.6032. The lowest Adjusted R^2 values suggest that (for both the models), Jharkhand is not performing satisfactorily and is lagging behind amongst the other resource rich states.

VII CONCLUSION

The above study thus leads us to believe that the Industrial Development level of a region is substantially determined by the level of Infrastructure available therein. Different types of infrastructure affect different facets of development and the interactions between them are such that infrastructure is the leader and development is the follower in most cases. Moreover, specific developmental stage of a region is also a crucial factor that determines the nature and magnitude of the association between different components of infrastructure and development level. The outcome of the study seems to highlight the immediate need for infrastructural expansion and development in Jharkhand.

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