

Trends of Economic Growth and Population Change in Rajasthan: A District Level Panel Data Investigation

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Abstract The present paper highlights the trends of economic growth in the economy of Rajasthan and discusses its relative share in the national economy of India. It reviews the trends of year-wise growth rate of per capita net national product in India, per capita net state domestic product for Rajasthan state and per capita net district domestic product for districts of Rajasthan for the period of 2004-05 to 2012-13. It is indicative of the fact that the economy of Rajasthan has registered many ups and downs in the growth trajectory, but the current decade is a period of fair stability and positive growth. Results of Random Effects Model suggest that one percentage point increase in population will be able to increase per capita NDDP by 1.125 percent for twenty nine districts of Rajasthan. District dummies show that higher per capita district domestic product districts like Rajsamand and Jaisalmer have a significant positive association while Jaipur, Alwar, Jodhpur, Barmer, Bharatpur and Sikar have a significant negative association with population. In low fifteen per capita income districts only Nagaur district was observed as negatively and significantly associated with population, while Baran, Bundi and Sirohi have been observed as significantly and positively associated with the population.

Keywords: *economic growth, random effects, districts Rajasthan*

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1. Introduction

The State of Rajasthan is located in the northwestern part of the country. It is bounded on the west and north-west of Pakistan, on the north and northeast by Punjab, Haryana and Uttar Pradesh, on the east and southeast by Uttar Pradesh and Madhya Pradesh and on the south-west by Gujarat. Rajasthan is the largest Indian State in size with an area of 342 thousand sq. Km. According to Census 2011, the population of the state was 686 lakh and density of population was 201 per sq. Km. The state is rich in mineral resources. A vast majority of the population (75.11%) lives in rural areas, where the main occupation is agriculture¹.

Up to early-mid 1980s, Rajasthan exhibited slow progress on almost all economic and social indicators. A mere three percent annual rise in gross state domestic product (GSDP) resulted in almost no growth in per capita income. Since the 1980s, the state has begun to improve upon its economic and social performance. During the last three decades on average, the Rajasthan economy has grown at the rate of 6.05 percent per annum. Long term growth of Rajasthan economy is satisfactory as compared to the national economy. Decadal breakup of the NSDP series shows that, in the decade of 1980s, the state grew at the rate 5.94 percent per annum and then in 1990s at the rate of 6.53 percent per annum and touched the mark of

7.17 percent per annum in the last decade. The growth pattern suggests that economy is consistently on higher growth path trajectory during the last decade.

The Rajasthan economy has shown a healthy growth path during the recent years. GSDP (at current prices) has almost doubled from Rs1, 17,274 crore in FY05 to Rs 3, 03,358 crore in FY11. This has made Rajasthan one of India's fastest growing states with the average growth rate of around 7.43% (real GSDP) during FY05-FY11. Rajasthan stands at the lower side of the per capita income level. Per-capita income in the state is Rs39967 (FY2011) which is much below the national average of Rs54527 (FY2011). Rajasthan stands at 10th in agriculture, 11th in infrastructure, 12th in consumer markets, 14th on macro economy, 15th on investment environment, and 17th in primary education³.

The State has a lot of scope in industries, which contributes around 32 per cent (2007-08 to 2011-12) in State GSDP at constant (2004-05) price. Rajasthan has a strategic advantage of being near of National Capital Region. The RIICO has been working towards facilitating better industrial and investment platform for the State. The State Government has implemented a number of schemes for the improvement of this sector. The industrial policy of the State aims at enhancing the industrial climate and providing quality infrastructure to the entrepreneurs in the State. In recent years, all kinds of infrastructures like; roads, railways, banking, electricity, urban development have been improved in the State. As, this sector is very

important from the employment point of view, the State Government is doing well on the industrial front³.

In the recent past the service sector is being continuously developed by the State and contributing a large part in the GSDP. Its contribution is about 47 per cent (2007-08 to 2011-12) in State GSDP at constant (2004-05) prices. In 11th Five Year Plan, the State Government has taken up a number of initiatives in order to improve the growth momentum of this sector. The service sector contributes around 47% in GSDP followed by the industry and agriculture sectors at 27% and 26% respectively. Over the last ten years period (FY01-10) the share to the GSDP has changed from 27% to 26%, from 28% to 27% and 45% to 47% in the agriculture, industry and services sectors respectively. Agriculture is an important sector of the State due to large dependencies of the population. It contributes around 21 per cent (2007-08 to 2011-12) in State GSDP at constant (2004-05) prices. The State Government has taken up a lot of measures to improve agriculture sector by improving the agriculture infrastructure, to promote agro based business and by making policy for convenient procurement process. The prospects of agriculture in the State largely depend on the timely arrival of monsoon.

The paper is organized as follows: section II provides a literature review referring to previous studies dealing with identifying and associating different nature and determinants with economic growth in states of India and abroad. Section III introduces data and methods employed in this study. Section IV provides the empirical results and discussions and the last part is dedicated to conclusions and policy suggestions.

2. Review of Literature

There is a vast amount of literature available on a growth pattern among Indian states. Nair's (1982) analysis for the years 1950-51, 1955-56, 1960-61 to 1975-76 showed that interstate disparities in per capita NSDP had declined over the period 1950-51 to 1964-65 and increased thereafter up to 1975-76 [13].

Roy Choudhary (1993-94) analysis concluded that coefficient of variation of per capita NSDP in constant prices increased during the study period 1967-68 to 1985-86 [15]. Das and Barua (1995) concluded that the interstate inequality widened during the study period 1970-1992 [8].

Mathur (2001) study since 1950 with specific focus on their periods 1980's and 1990's revealed that there is a steep acceleration in the coefficient of variation of per capita income over the reform period up to 1996 [11].

Kurian (2000) was of the view that the increase in the role of private sector after 1980's aggravated the interstate disparities [10]. Krishna (2004) was of the view that the interstate disparities revealed through the coefficient of variation widened steadily over time and the relative position of the states have not undergone major changes [9]. Yet there is no study about Rajasthan based on district level data to understand the growth pattern after independence.

3. Objective, Data Source and Research Methodology

The present paper highlights the trends of economic growth in the economy of Rajasthan and discusses its relative share in the national economy of India. It reviews the trends of year-wise growth rate of per capita net national product in India, per capita net state domestic product for Rajasthan state and per capita net district domestic product for districts of Rajasthan for the period of 2004-05 to 2012-13. The paper is an attempt to discuss various aspects of economic growth in the last decade and to understand the impact of population growth on per capita net district domestic product in Rajasthan.

For the purpose of the present paper, primarily we have used quantitative secondary data collected from the Central Statistical Organization, Data book for DCH; 18 October 2013. Year wise data on population at district level is so far not published anywhere. We have calculated population data by dividing NDDP from per Capita NDDP.

As statistical method we tried to fulfill our objectives through charts and graphs and then we used Ordinary Least Square model, per capita net district product at constant prices of 2004-05 as dependant variable and population size as independent variable. For the purpose of better understanding, we converted both dependent and independent variables in to a logarithm, so as to find out elasticity effect. But it was found spurious because the Durbin Watson value was very low. And hence we tried to use another alternative as panel over pooled model. Further, Chow test was used to select between Pooled OLS and panel estimation techniques. If the Chow Test suggested using panel over pooled model, a Hausman test will be used to select between Fixed Effects and Random Effects estimation. If the Hausman test suggests employing Random Effects estimation, then this is confirmed against Pooled OLS using a Breusch and Pagan Lagrangian multiplier test. Further district dummies have also been used for an in-depth analysis. Further, districts were classified in two categories as high & low per capita net district domestic products as used in many previous studies. Bhattacharya and Sakthivel (2004) have observed an inverse relationship between per capita SDP growth and population growth [2,3,4]. Ahluwalia (2002) also highlighted the trend of increasing inequality among states by using per capita state domestic product data for the period 1980-81 to 1998-99 [1]. Following to Chenery, Robinson, and Syrquin (1986) model, recently Nobuya Haraguchi & Gorazd Rezonja (2010) determine the dependent variable real output per capita (*ROPC*) and gross domestic product (GDP) per capita, which is endogenously determined within the model [5,6,14]. Both the dependent and explanatory variables are expressed in logarithmic terms to measure the elasticity of each coefficient. David E Bloom & Richard B. Freeman (1986) in his working paper no 1837, National Bureau of Economic Research, Cambridge, Population Growth, Labour Supply and Employment in Developing Countries, classified developing countries as lower income, lower Middle income and Upper middle income developing countries [7].

4. Results and Discussion

4.1. Gross State Domestic Product

The Gross State Domestic Product (GSDP) is the total monetary value of all the final goods and services produced by an economy during a given period of time (generally a year) accounted without duplication. The Rajasthan economy has shown a healthy growth path during the recent years. GSDP (at constant prices) has almost doubled (1.89) from Rs 127746 crore in 2004-05 to Rs 239913 crore in 2012-13². The year-wise estimates of Gross State Domestic Product at constant prices and growth rates for India and Rajasthan are provided in Table 1. As per the advance estimates, Gross State Domestic Product at constant (2004-05) prices, in the year 2012-13

is likely to attain a level of 2, 39,913 crore, as against the estimates of GSDP for the year 2011-12 (quick estimates) of 2, 27,824 crore, registering an increase of 5.31 per cent over the preceding year. A substantial increase in the percentage share of Rajasthan state in the national has been observed; it has been increased from 4.3% in 2004-05 to 4.36% in 2012-13. The percentage growth rate of GSDP shows many ups and downs during 2004-2013; the highest growth rate 15.28% recorded in 2010-11, while the lowest growth rate was registered 5.14% in the financial year 2007-08 due to weak monsoon.

Table 1. Trends of GSDP and its Growth Rate in India and Rajasthan

GDP factor cost at constant prices 2004-05 (Rs Crores)			% Growth Rate	
Year	India	Rajasthan (% share)	India	Rajasthan
2004-05	2971465	127746 (4.30)	-	-
2005-06	3253073	136285 (4.19)	9.48	6.68
2006-07	3564364	152189 (4.27)	9.57	11.67
2007-08	3896636	160017 (4.11)	9.32	5.14
2008-09	4158676	174556 (4.20)	6.72	9.09
2009-10	4516071	186245 (4.12)	8.59	6.70
2010-11	4937006	214698 (4.35)	9.32	15.28
2011-12	5243582	227824 (4.34)	6.21	6.11
2012-13*	5505437	239913 (4.36)	4.99	5.31

Source: Central Statistical Organization, Data book for DCH; 18 October 2013.

4.2. Net National Product / Net State Domestic Product

The growth pattern of Net State Domestic Product (NSDP) of Rajasthan for the period 2004-05 to 2012-13 is given in Table 2. Year-wise growth rate is indicative of the fact that the economy has registered many ups and downs in the growth trajectory, but the current decade is a period of fair stability and positive growth. The all India net national product at constant price has increased from 2651573 crore in 2004-05 to 4823087 crore in 2012-13,

while net state domestic product at the constant prices for the same period was grown from 112636 crore to 207980 crore. Percentage growth of NSDP was higher than the national average in the year of 2006-07, 2008-09, 2010-11 and 2012-13, while in all other years it was witnessed lower growth rate than national average. It clearly highlights that still the economy of Rajasthan depends on agriculture and mercy of nature ultimately, if the rain is quite satisfactory growth rate is also satisfactory or vice versa.

Table 2. NNP / NSDP at Constant Prices (2004-05)

Year	NNP / NSDP (Rs in Crores)		% Growth over previous year	
	India	Rajasthan	India	Rajasthan
2004-05	2651573	112636	-	-
2005-06	2908180	120202	9.45	6.72
2006-07	3178664	134350	9.53	11.77
2007-08	3469008	140471	9.13	4.56
2008-09	3689772	152284	6.36	8.41
2009-10	3994165	161159	8.06	5.23
2010-11	4364952	186193	8.38	15.53
2011-12	4618809	197537	6.88	6.09
2012-13*	4823087	207980	4.42	5.29

Source: Central Statistical Organization, Data book for DCH; 18 October 2013.

As per the calculated percentage growth of previous years in India shows declining trend, but there is no clear trend of increasing growth rate during the last decade in Rajasthan. As per the advance estimates, the Net State Domestic Product at constant (2004-05) prices, in the year 2012-13 has been estimated at 2, 07,980 crore as against 1, 97,537 crore in the year 2011-12 (quick estimates) showing an increase of 5.29 per cent over the previous year.

4.3. Per Capita Net National Product / Per Capita Net State Domestic Product

The per capita income at constant (2004-05) prices during 2012-13, is likely to be 29,917 as compared to 28,851 in the year 2011-12, registering an increase of 3.7 per cent over the previous year. Table 3, show that Rajasthan is continuously witnessing lower per capita

growth than the national average, excluding the years 2006-07 and 2010-11. It also highlights that there is no clear trend of growth in per capita income in spite of satisfactory growth in NSDP during the last decade and it

is largely due to high population growth rate and inappropriate availability of employment generation in the state.

Table 3. Per capita NNP / NSDP at Constant Prices

Year	India	Rajasthan	India	Rajasthan
2004-05	24143	18565	-	-
2005-06	26015	19445	7.75	4.74
2006-07	28067	21342	7.89	9.76
2007-08	30332	21922	8.07	2.72
2008-09	31754	23356	4.69	6.54
2009-10	33901	24304	6.76	4.06
2010-11	36342	27625	7.2	13.66
2011-12	38037	28851	4.66	4.44
2012-13 *	39168	29917	2.97	3.70

Source: CSO, Data book for DCH; 18 October 2013.
Author's Calculation.

4.4. Inter District Growth Rates

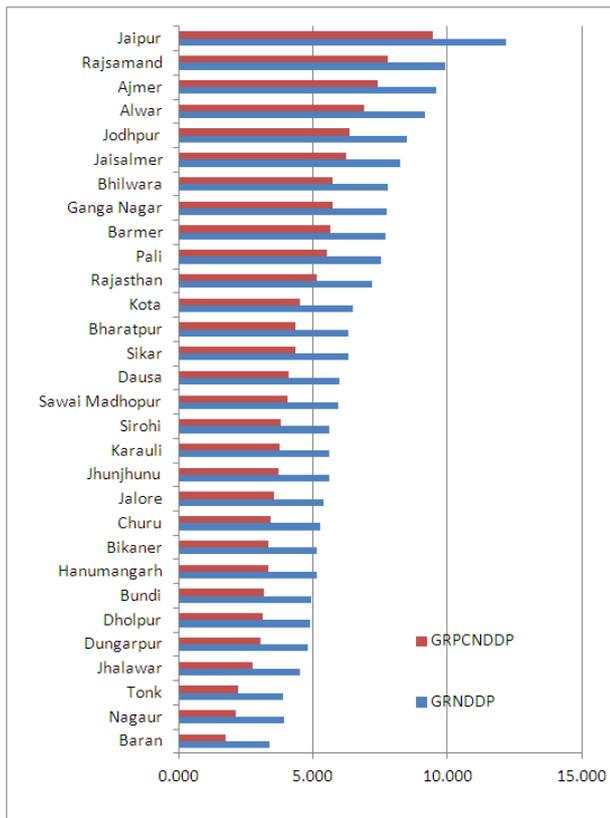


Figure 1. Trends of Growth rate in the districts of Rajasthan during 2004-2010

GPCNDDP- Average Annual Growth Rate of Per Capita Net District Domestic Product

AAGNDDP- Average Annual Growth Rate of Net District Domestic Product

- Growth rates: The best performing districts in terms of growth (measured as net district domestic product at constant prices) during 2004-10 were Jaipur (12.17

per cent) Rajsamand (9.94) and Ajmer (9.59) (Figure 1).

- The districts with the slower growth rates included Baran (3.38per cent), Nagaur (3.9%) and Tonk (3.89%).
- Jaipur also had the highest per capita growth rate in terms of per capita income, at 9.44 percent. On the other hand, per capita income growth was remained lowest in Baran (1.73%) the only district where per capita growth has been measured less than 2% during 2004-10.
- Ten districts among twenty nine included districts have been registered higher per capita growth than average growth rate of Rajasthan State (5.15%) and nineteen districts have recorded lower per capita growth rate than the state average during 2004-10.
- Four districts namely Pratapgrah, Udaipur, Banswara and Chittorgarh have not been included due to non availability of data for this period because the formation of the Pratapgrah district from these three districts.

4.5. Econometric Investigation

Using panel data for twenty nine districts of Rajasthan for the period of 2004-05 to 2011-12, paper highlights on the basis of pooled OLS model that one percentage point increase in population would have an incremental impact on the per capita income by 0.11%, remaining other things constant (Table 4). It was interesting to know if the model parameters changed over the years, which was done using a Chow test for structural change. F statistics suggest the preference of a fixed Effects model over pooled OLS regression. A Hausman test on Fixed Effects and Random Effects suggested that fixed effects are causing biases in estimating the coefficients and hence they need to be eliminated. To ensure that Random Effects were a better technique over OLS for the present data set, a Breusch and Pagan Lagrangian Multiplier Test was carried out. This

confirms at a highly significant level that Random Effects Estimations are the best technique for this data set.

Table 4. Estimation of Per capita net district domestic product for the districts of Rajasthan, 2004-05 to 2011-12

Variables	Pooled OLS, using 174 observations			Random-effects (GLS), using 174 observations		
	Coefficient	std. error	t-ratio / p-value	coefficient	std. error	t-ratio / p-value
const	9.07218	0.311877	29.09***	1.49772	0.941362	1.591
l_POP	0.111055	0.041677	2.665***	1.12521	0.125649	8.955***
R-squared	0.039645					
Adj R-squared	0.034061					
Durbin-Watson	0.081417					
Hausman test	-	-	-	289.238***		

Results of Random Effects model suggest that one percentage point increase in population will be able to increase per capita NDDP by 1.125 percent for twenty nine districts of Rajasthan (Table 4). This result is significant at the 1% level. In fourteen districts of high per capita district domestic product, population has a high positive effect on per capita district domestic productivity. A 1% increase in the population increases dependant variable by 1.69% & 1.45% respectively in fourteen high and fifteen low per capita district domestic product

districts. District dummies show that district like Rajsamand and Jaisalmer have a significant positive association while Jaipur, Alwar, Jodhpur, Barmer, Bharatpur and Sikar have significant negative association population and per capita income (Table 5). In low fifteen per capita income districts only Nagaur district was observed as negatively and significantly associated with population, while Baran, Bundi and Sirohi have been observed as significantly and positively associated with population (Table 5).

Table 5. Random-effects (GLS), using 174 observations Included 29 cross-sectional units Time-series length = 6

Dependent variable	l_PCNDP, (for high income districts)			l_PCNDP, (for low income districts)		
	coefficient	std. error	t-ratio / p-value	coefficient	std. error	t-ratio / p-value
const	-2.52150	1.11633	-2.259 **	-1.10586	1.05830	-1.045
l_POP	1.68860	0.382348	-4.560	1.45245	0.137707	10.55***
D_Jaipur	-1.74334	0.382348	-4.560 ***			
D_Rajsamand	0.728954	0.320716	2.273**			
D_Alwar	-1.11603	0.341514	-3.268***			
D_Jodhpur	-1.11121	0.339183	-3.276 ***			
D_Jaisalmer	1.83773	0.349645	5.256 ***			
D_Barmer	-0.835243	0.323319	-2.583**			
D_Bharatpur	-0.897378	0.325403	-2.758***			
D_Sikar	-0.956927	0.328559	-2.912 **			
D_Baran				0.957308	0.405881	2.359**
D_Bundi				1.00075	0.407724	2.454**
D_Nagaur				-0.933272	0.401002	-2.327**
D_Sirohi				1.25234	0.411864	3.041***
Breusch-Pagan test	145.588***			215.547***		
Hausman test	234.599***			251.946***		

5. Conclusion & Suggestions

It clearly highlights that still the economy of Rajasthan depends on agriculture and mercy of nature ultimately, if the rain is quite satisfactory growth rate is also satisfactory or vice a versa. As per the calculated percentage growth of previous years in India shows declining trend, but there is no clear trend of increasing growth rate during the last decade in Rajasthan. The best performing districts in terms of growth (measured as net district domestic product at constant prices) during 2004-10 were Jaipur (12.17 per cent) Rajsamand (9.94) and Ajmer (9.59). The districts with the slowest growth rates included Baran (3.38per cent), Nagaur (3.9%) and Tonk (3.89%). Ten districts among twenty nine included districts have been registered higher per capita growth than average growth rate of Rajasthan State (5.15%) and nineteen districts have recorded lower per capita growth rate than the state average during 2004-10.

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Notes

1. as per Census 2011.
2. Economic Review 2012-133.
3. PHD Research Bureau, April 2011.

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