Growth and Regional Disparities in Odisha: An analysis in the post-Reform Period

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Abstract

The post-reform period has witnessed a high economic growth in net state domestic product (NSDP) of Odisha. The period achieved a higher growth in the tertiary sector. With a higher growth in the post-reform period, the state witnessed high regional disparities among the districts in terms of Per Capita Income. While some of the districts are growing at a faster rate, most of the districts lag behind. The regional disparities can be looked by looking the convergence divergence of Per Capita Income (PCI) among the districts of Odisha. The state has seen a sigma divergence in income among districts. By regressing the growth of per capita income with the initial per capita income, it shows a divergence among the districts. While regression of PCI growth with the initial per capita income of three sectors shows a mixed result. While primary sector shows a convergence, the tertiary sector shows a divergence and the secondary sector shows an insignificant result.

Key Words: Growth, NSDP, per capita NSDP, Odisha, Convergence, Divergence, Regional Disparities

JEL Classification – O47, N3, P24, P25,

1: Introduction

The post-reform period recorded a faster growth rate in India and among most of the states (Kumar & Subramanian; 2012). While growth has succeeded in reducing poverty in one hand (Dev & Ravi; 2007, Himanshu; 2007), increased inequality (Sakthivel & Kar; 2007) and regional disparities among the states of India (Bhattacharya & Sakthivel; 2004) on the other. Some of the high-income states are growing at a faster rate than the low-income state resulting divergence of income among the states. High growth rate resulted in a change in the sectoral composition of income in the economy. As an economy develops, the share of agricultural sector declines and manufacturing increases, but at a later stage, the share of service sector grows predominantly. While the primary sector witnessed a decline in output share and growth, the tertiary sector recorded a higher growth and an increase in the share of output. It is comparatively easy to analyze the shift in favor of the tertiary sector in the context of developed countries as a standard transition of development theory, but in case of developing countries, the dominance of tertiary sector before the secondary sector's relative size could outweigh that of other sectors, gives rise to several concerns.[1] It is therefore imperative to see the premature nature of the transition at a very low level of per capita income in India before achieving a substantial level of industrialization. From the overall macro perspective, there has been a lot of research done highlighting "Service revolution" (Gordon & Gupta, 2004) and its long-term sustainability (Papola, 2007; Banga, 2005). Very few have been attempted to look into the inter-district inequality within the states (Hatekar & Raju 2003). This study aims to fill up this gap by studying the inter-district disparities in income in Odisha.

The economic reform has a significant effect on growth. The post-reform period in Odisha has witnessed a high economic growth. Some of the recent literature observed that the relative economic position of Odisha has improved. Samantaray, *et al*. (2014) took both the income and non-income indicators (literacy rate, infant mortality rate & maternal mortality rate) to show the improved economic position of Odisha. The period after 2002-03 has seen a revival of agriculture growth (Patanaik, 2010) and a higher decline in poverty (Panda, 2015),

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[1] See details in Choudhury and Chatterjee (2017) paper title "Growth in India's Service Sector: Implications of Structural Breaks."

in comparison to the previous period, which is one of the highest among the Indian states. With a higher growth in the post-reform period, the state witnessed an increase in regional disparities among the districts regarding Per Capita Income. While some of the districts are growing at a faster rate, most of the districts lagging behind. Though Odisha has achieved a high growth rate, it has witnessed a divergence of income among the districts. The growth is concentrated in some compartment of the districts. Odisha as an economy has diverse agro-climatic zones, and socio-economic characteristics. The coastal districts are predominantly dominated by the agricultural activities whereas the mining activities are taken place in the northern districts of Odisha. The southern districts are inhabited by a large scheduled tribe and are hilly regions. The major tertiary sectors are being situated in the twin city of Bhubaneswar & Cuttack. Bhubaneswar city only consists of half of the educational institute of the states. The city recently has been ranked as the number one smart city of the country by the Government of India for the year 2016. The state has 30 districts. Though recently, the state has achieved a high growth rate after 2004-05, there persist huge regional disparities among the districts of Odisha. Anugul which is having PCI Rs 40516 top the list where as Nabrangpur having PCI Rs 14435 is in the lowest among the districts for the year 2011-12. Hence it became important to have a look into which is the sector witnessing a high growth rate in Odisha and is there any convergence or divergence of income among the districts and regions of Odisha?

In this backdrop, this paper tries to re-examine the question, "Is there an increase in regional disparities in Odisha in the post-reform period with higher economic growth?" The paper is organized as follows. Section 2 explains the data and methodology used here. Section 3 explains the sectoral composition of output and sectoral growth in Odisha. Section 4 presents disparities among the districts of Odisha. Section 4 describes the regional disparities in terms of convergence-divergence in Odisha. Section 5 gives concluding remark of the paper.

2: Data and Methodology

The data on per capita NSDP from 1993-94 to 2011-12 and NSDP from 1970-71 to 2012-13 has been taken from EPW Research Foundation. The PCI data are available from 1970-71 onwards for the state Odisha for the 13 districts. The districts of Odisha has been sub divided in the year 1993 from 13 districts to 30 districts, and hence our convergence analysis starts from the period 1993-94 to include all the thirty districts. The data are of different base years

as 1970-71, 1980-81, 1993-94 and 2004-05 at constant prices. The splicing method has been used to make the whole series at a common base of 2004-05. The three-year moving average method is used to make the data series trend line smooth. To find out the number of regimes in a time series data, we need to find out the major structural breaks in that series by using appropriate methods. The breaks may occur due to change in policy regimes such as the introduction of the neo-liberal regime in India, Policy intervention by the states as the introduction of the green revolution, or due to external shocks like oil price crisis. In this paper, the break dates have to determine to take into consideration the economic reform. Hence the whole period has been classified into two phases as pre-reform (1972-73 to 1991-92) and the post-reform period (1992-93 to 2011-12).

2.1: Growth rate Analysis

Boyce (1983) kinked exponential growth model has been used for the calculation of the growth rate. The distinctive feature of the kinked, as opposed to discontinuous exponential growth models, is that they make use of information regarding levels of output throughout the time series for estimating the growth rate in a given sub-period. To derive a generalized kinked exponential model for m sub-periods having m-1 kinks, the unrestricted model for joint estimation of sub-period growth rate with no continuity is: The generalized K-E model for m sub-periods and m-1 kinks, let the kink points be $K_1,\ldots k_{m-1}$, and the sub-period dummy variables as $D_{1,\ldots},D_m$. Then the unrestricted model for joint estimation of the sub-period with no continuity requirement is :

$Ln\ Q_t = a_1D_1 + a_2D_2 + \ldots + a_mD_m + (b_1D_1 + b_2D_2 + \ldots + b_mD_m)t + u_t$. Applying the appropriate m-1 linear restriction, $a_i + b_ik_i = a_{i+1} + b_{i+1}k_i$, for all i = 1,…, m-1, we obtain the generalized K-E model as:

$$lnQ_t = a_1 + b_1\left(D_1t + \sum_{j=2}^{m} D_jk_1\right) + b_2\left(D_2t - \sum_{j=2}^{m} D_jk_1 + \sum_{j=3}^{m} D_jk_2\right) + \cdots$$
$$+ b_i\left(D_it - \sum_{j=i}^{m} D_jk_{i-1} + \sum_{j=i+1}^{m} D_jk_i\right) + \cdots + b_m(D_mt - D_mk_{m-1}) + u_t$$

2.2: Regional Disparities in Odisha

The district wise data of Net District Domestic Product (NDDP) of Odisha for Primary, Secondary and Tertiary sector has been collected from the Directorate of Economics and Statistics (DES) Odisha. The period of analysis is from 1993-94 to 2011-12 for which the

data has been available. The data on per capita Net State Domestic Product (NSDP) of Odisha from 1993-94 to 2011-12 has been taken from Economic Political Weekly Research Foundation which originally brought from Central Statistical Organisation (CSO). The regional disparities in the post-reform era can be evaluated by looking into the convergence-divergence of Per Capita Income (PCI) among the districts of Odisha. The districts of Odisha have been subdivided in the year 1993 from thirteen to thirty districts, and hence our convergence analysis starts from the period 1993-94 to include all the thirty districts. The data are of different base years as 1993-94 and 2004-05 at constant prices. The splicing method has been used to make the whole series at a common base of 2004-05. The growth rate of per capita income (PCI) and NDDP have been estimated using the semi-log equation.

Barro & Martin (1995) explains two types of convergence, β (beta) & σ (sigma) convergence. The β convergence explains the poorer region will grow faster than the rich region enabling the former to catch the later at the steady state growth rate. The β convergence, however, depends on several parameters as technology, saving, population, etc. which varies from region to region. The absolute or unconditional convergence assumes that all these parameters remain same over the region implying all economy will converge to same steady state, which is hardly true. Whereas the conditional convergence proposed by Solow assumes that each country will converge to a steady state, which is determined by the parameters specific to that economy. The σ convergence deals with a cross-sectional dispersion of income over time. The σ convergence occurs when the dispersion of income across regions has declined over time. The unconditional β convergence and σ convergence has been calculated to know the convergence of per capita income among the districts of Odisha. The growth of PCI, obtained has been regressed with the log of the initial income to get the regression coefficient. If the sign of the coefficient is negative and significant, then it implies that there is a convergence in PCI among the districts. An ordinary least squares cross-section regression is fitted:

$g_{GSDP} = a + \beta(\log \text{ initial GSDP}) + \varepsilon_r$ (1) ………………….. (3)

Where g_{GSDP} is the growth of per capita State gross domestic product; log initial GSDP is the level of GSDP in the base year 1993-94 and ε_r are the error term. For unconditional convergence, β must be significantly negative.
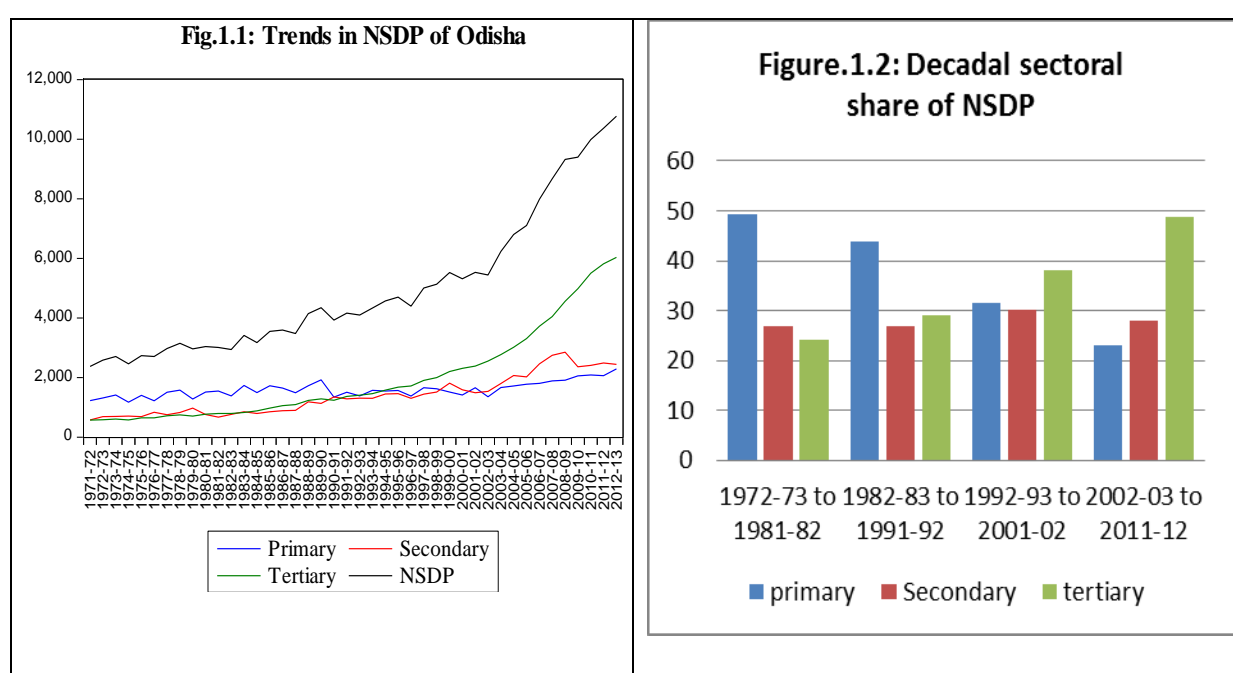
3: Sectoral Growth of NSDP in Odisha

The post-reform period has seen a higher growth rate at the national level as well in most of the states of India (Wallack 2003, Panigariya 2004, Balakrishnan 2007, Kaur 2007). The state Odisha is bestowed with huge natural resources and is having the potential for high economic growth. But, amidst the plenty, it has been considered as backward states of India. Odisha's annual per capita income for the fiscal year 2014 was Rs. 24,928, which was about 62 per cent of the all-India average of Rs. 39,904. The ratio of NSDP of Odisha to all India has been declined over time. This shows the state stills lags behind the national level. Odisha economy lags behind the national average in terms of both level and growth of NSDP. The long-run growth rate of the Odisha economy during the period 1950-51 to 1997-98 is around 2.7 % (Meher, 2003). According to him, the slow growth rate of the economy is due to the slower growth of the agricultural sector as it constitutes the major share of the income in the economy. This section analyses the sectoral composition of NSDP & trends in NSDP growth of Odisha economy. Figure.1.1 presents the output trends of the sectors which have been rising over the year. The trends of NSDP of tertiary sector increases at a faster rate only after 1991-92 having a significant impact on the overall NSDP trends. Hence the state economy is going through a structural transformation in output in the post-reform period. Figure.1.2 presents the sectoral composition of output for the state for the four decades. The mean average has been taken for each decade for each sector. While both primary and secondary sector has witnessed a decline in their respective share in total output, that of tertiary sector has been increasing. The period of analysis can be divided into two phases. The first period is from 1970-71 to 1991-92 and the second period is from 1992-93 to 2011-12. To calculate the period-wise compound annual growth rates (CAGR) dummy variable regression method has been used to save degrees of freedom.

With the growth of an economy the sectoral composition of income changes. The share of primary sector in GDP starts falling while the shares of secondary and tertiary sector start rising. Though the share of manufacturing starts rising at the initial stages, it starts declining after a point. Odisha has achieved a higher growth rate in the recent decade. Odisha's economy has been undergoing a structural change with the service sector becoming more prominent accounting for more than half (56%) of the NSDP followed by the industrial sector (24%). The agriculture sector has a mere 20% share of the total NSDP of Odisha in the year 2011-12. The structural transformation is directly from primary to tertiary sector bypassing

the industrial sector. Hence the structural transformation taking place in India, as well as in Odisha, are stunted in nature. The tertiary sector is the major driver of growth in all these two periods. The green revolution does not seem to have much impact on the growth of the primary sector. While the impact of liberalization on the secondary sector especially on the mining sector is very high. The major structural break happens in the post-reform period with higher growth of all the sectors. While the post-reform period witnessed a twice higher growth rate (5.11%) than the pre-reform period growth rate (2.72%).

Figure 1: Trends in Real NSDP (Rs. Lakhs) and sectoral share of NSDP in Odisha

Source – Authors estimation

Table.1: The sectoral growth rate in NSDP of Odisha in pre-reform and post-reform period.

ODISHA-SECTORS	1972-73 to 1991-92	1992-93 to 2011-12	1972-73 to 2011-12
AGRICULTURE&AH	1.76	1.83	1.00
FORESTRY&LOGGING	-0.98	1.57	-0.75
FISHING	7.61	3.81	6.91
PRIMARY	**1.30**	**1.89**	**0.84**
MINING & QUARRYING	5.07	10.06	9.65
MANUFACTURING	2.93	4.46	3.24
REGD.MFT	4.69	4.84	4.45

UNREGD. MFT	1.10	0.97	0.76
ELECTRICITY GAS WS	4.93	5.04	4.68
CONSTRUCTION	2.91	2.47	2.97
SECONDARY	**3.10**	**4.12**	**3.76**
TRADE-HOTEL-REST	3.64	8.06	5.67
TRANS-STO-COMM	6.63	12.62	9.07
RAILWAY	8.53	7.84	8.51
TRANSPORT BY OTHER	5.68	11.68	8.04
COMMUNICATION	6.59	22.98	13.49
BANKING INSURANCE	12.69	13.61	11.89
REAL EST. & OWN DWE	3.13	3.69	3.14
PUBLIC ADMIN	6.37	4.59	5.32
OTHER SERVICES	5.67	7.18	6.77
TERTIARY	**4.69**	**7.82**	**6.00**
TOTAL NSDP	**2.72**	**5.11**	**3.51**

Source – Authors calculation from EPW Research have data

4. Disparities among districts of Odisha

Odisha as an economy has diverse agro climatic zones and socio-economic characteristics. The National sample survey Organisation too classified the regions into three categories as coastal, southern and northern. The coastal districts are predominantly dominated by the agricultural activities whereas the mining activities are taken place in the northern districts of Odisha. The southern districts are inhabited by a large scheduled tribe and are hilly regions. The major tertiary sectors are being situated in the twin city Bhubaneswar & Cuttack. The Bhubaneswar city only consists of half of the educational institute of the states. The city recently has been ranked as the number one smart city of the country by the Government of India for the year 2016. The state has 30 districts. Though recently the state has achieved a high growth rate after 2002-03, there persists a huge regional disparities among the districts of Odisha in terms of irrigation, occupational pattern, demography, income, etc.

The district map of Odisha is presented in figure.2. In terms of geographical location, the districts of Odisha have their advantages or disadvantages. Districts as Baleswar, Bhadrak, Kendrapara, Jgatsinghpur, Cuttack, Puri and Ganjam are situated in the coastal belt and hence are having the advantage of having more production of agricultural commodities and high cropping intensity. Districts such as Gajapati, Kandhamal, Koraput and Malkangiri, Nabarangpur, Mayurbhanj, sundergarh, and Rayagada are having a higher percentage of

scheduled caste and scheduled tribe population and hence are underdeveloped. The road connectivity, village electricity, credit availability, health care unit and educational achievement to these regions are also lower. It shows there is diversity among the districts of Odisha.There exist huge regional disparities in the sectoral share of income among districts of Odisha. Malkangiri, Baudh, Kandhamal are having a higher share of primary sector and are the districts having lower PCI and considered as backward districts of Odisha. Rayagada, Sonepur, Angul, Jharsuguda, Sundergarh are the highly industrialized districts where as Khorda, Cuttack, Bhadrak, Kendrapada, and Baleswar are the districts dominated by tertiary sector income. All the districts having higher income coming from the tertiary sector are from the coastal region of Odisha. While the districts having higher income share from primary sectors are from southern regions and are mostly lived by the tribals.

Figure .2: The district map of Odisha

Table.2: The share of sectoral NDDP to the Odisha

	1993-94				2011-12			
Districts	primary	secondary	tertiary	NDDP	primary	secondary	tertiary	NDDP
ANUGUL	2.78	15.41	3.32	5.80	2.95	9.41	3.17	5.00
BALESWAR	4.76	3.44	4.79	4.48	5.36	2.15	5.06	4.51
BARAGARH	5.24	2.12	3.19	3.79	4.18	1.93	2.52	2.78

BHADRAKH	3.25	1.77	2.85	2.78	3.14	0.78	3.24	2.66
BALANGIR	4.19	2.47	3.67	3.62	3.92	2.49	3.29	3.33
BAUDH	1.37	0.38	0.74	0.92	1.53	0.47	0.59	0.77
CUTTACK	4.08	6.29	8.65	6.25	4.33	4.34	10.29	7.85
DEBAGARH	1.25	0.47	0.65	0.85	1.24	0.74	0.45	0.71
DHENKAL	3.19	3.18	2.82	3.05	3.20	1.49	3.26	2.88
GAJAPATI	2.05	1.22	1.44	1.64	1.83	1.13	1.10	1.30
GANJAM	7.48	5.15	8.46	7.32	5.55	7.33	9.16	8.30
JAGATSINGHPUR	3.06	2.37	3.24	2.97	3.15	2.14	2.89	2.85
JAJPUR	3.19	5.15	4.33	4.05	2.89	4.22	4.15	4.09
JHARSUGUDA	1.41	4.50	1.96	2.30	0.93	2.48	1.73	1.85
KALAHANDHI	3.68	1.72	2.85	2.94	4.36	2.26	2.62	2.97
KANDHAMAL	2.51	1.58	1.52	1.94	3.97	2.24	1.27	2.13
KENDRAPADA	3.39	1.56	3.02	2.85	2.75	1.39	2.72	2.46
KEONJHAR	4.37	4.50	3.81	4.20	5.31	7.29	3.98	5.33
KHORDA	3.09	1.43	7.90	4.49	2.94	3.29	11.38	7.89
KORAPUT	3.50	5.08	3.56	3.87	4.56	3.68	2.81	3.51
MALKANIGIR	2.32	0.87	0.98	1.50	2.31	0.71	0.56	0.97
MAYURBHANJ	6.26	3.63	5.02	5.22	6.18	5.56	4.11	5.09
NABARANGPUR	2.97	1.31	1.80	2.17	2.62	1.37	1.44	1.71
NAYAGARH	2.79	1.10	2.01	2.12	2.10	0.68	1.67	1.54
NUAPADA	1.76	0.90	1.09	1.32	1.76	1.13	0.93	1.19
PURI	4.14	1.83	4.02	3.58	3.83	0.86	4.12	3.32
RAYAGARHA	2.03	15.02	2.06	2.23	3.02	10.39	1.71	2.09
SAMBALPUR	3.20	3.29	2.97	3.13	3.08	4.01	2.99	3.41
SONEPUR	2.14	11.44	1.13	1.40	2.44	6.29	0.89	1.11
SUNDERGARH	4.54	13.90	6.15	7.23	4.56	7.73	5.91	6.39
ODISHA	100	100	100	100	100	100	100	100

Table.2 presents the sectoral contribution to each district to Odisha for two periods. It's the Ganjam district whose contribution to the primary sector of Odisha is highest (7.5%) for the year 1993-94 while Angul & Rayagada each contribute around 15% to the secondary sector of Odisha and its Cuttack & Ganjam districts which together contribute around 8.5 % each to the tertiary sector of Odisha for the year 1993-94. Districts like Ganjam & Sundergarh whose contribution to overall NSDP of Odisha remains the highest (around 7% each). The sector-wise contribution of Baudh, Debagarh, and Nuapada to the overall NSDP are negligible. For the year 2011-12, Mayurbhanj, Ganjam, and Baleswar are the highest contributor to the primary sector of Odisha. The contribution of Rayagada, Angul & Sundergarh to the secondary sector of Odisha remains the highest while Khorda, Cuttack & ganjam tops the list for contribution to the tertiary sector of Odisha. Ganjam, Khorda, and Cuttack are the highest

contributor while Debgarh, Malkangiri, and Baudh are the lowest contributor to the overall NSDP of Odisha for the year 2011-12.

Table.3: Growth of PCI and Sectoral NDDP in Odisha

District	Per capita Income				Sectoral Income			
	Primary	secondary	Tertiary	NDDP	Primary	secondary	Tertiary	NDDP
ANUGUL	4.17	7.68	9.95	7.78	5.33	8.93	11.28	9.03
BALESWAR	3.56	5.59	10.00	7.19	4.94	6.80	11.39	8.55
BARAGARH	2.19	8.30	9.22	6.06	3.05	9.07	10.11	6.92
BHADRAKH	4.02	5.38	10.41	7.61	5.42	6.57	11.77	8.98
BALANGIR	3.73	9.25	9.19	7.32	5.09	10.43	10.53	8.65
BAUDH	4.78	12.13	8.33	7.24	6.21	13.25	9.81	8.66
CUTTACK	3.97	7.34	10.38	8.72	5.29	8.43	11.55	9.92
DEBAGARH	2.24	9.79	7.88	5.61	3.45	10.80	9.18	6.82
DHENKAL	3.71	4.86	10.90	7.44	4.68	5.74	11.90	8.41
GAJAPATI	3.76	7.60	8.74	6.57	4.77	8.55	9.78	7.58
GANJAM	2.89	9.53	10.12	8.11	4.06	10.41	11.25	9.21
JAGATSINGHPUR	5.08	8.75	10.07	8.32	5.39	9.18	10.50	8.70
JAJPUR	3.78	9.13	9.64	8.30	5.00	10.30	10.86	9.52
JHARSUGUDA	0.27	9.44	9.41	8.26	1.41	10.64	10.61	9.46
KALAHANDHI	4.04	8.88	9.17	7.01	5.52	10.10	10.66	8.46
KANDHAMAL	6.40	13.13	8.81	9.18	7.59	13.99	10.14	10.33
KENDRAPADA	3.29	7.22	9.49	7.04	4.27	8.04	10.47	8.00
KEONJHAR	4.50	11.60	9.92	9.08	5.83	12.61	11.28	10.33
KHORDA	3.01	8.22	11.05	9.39	4.91	9.72	12.76	11.13
KORAPUT	4.82	6.53	8.80	6.95	6.13	7.71	10.12	8.22
MALKANIGIR	3.05	7.20	7.05	4.76	4.65	8.66	0.17	6.38
MAYURBHANJ	3.44	10.20	8.45	7.07	4.71	11.24	9.75	8.31
NABARANGPUR	2.35	7.89	8.46	5.65	3.93	9.27	10.09	7.22
NAYAGARH	3.58	5.48	9.44	6.61	4.47	6.28	10.35	7.50
NUAPADA	3.34	9.41	9.17	6.62	4.44	10.36	10.32	7.72
PURI	3.06	4.35	10.01	7.15	4.22	5.41	11.16	8.30
RAYAGARHA	5.75	6.71	8.87	7.14	7.03	8.00	10.22	8.43
SAMBALPUR	2.82	9.31	10.01	7.72	3.90	10.26	11.13	8.79
SONEPUR	4.06	5.47	8.67	6.29	5.51	6.91	10.13	7.73
SUNDERGARH	3.09	8.29	9.66	7.87	4.29	9.52	10.91	9.11
ODISHA	3.66	8.53	9.81	7.72	4.90	9.64	11.05	8.94

Source – Authors calculation from DES data on NDDP and per capita NDDP

Table.3 presents the sectoral growth of per capita income and income NDDP for the districts of Odisha for the period 1993-94 to 2011-12. The table shows that there are large disparities

in terms of the growth in income and per capita income among the districts. While the average growth of NSDP of Odisha for the primary, secondary and tertiary and NSDP are 4.90%, 9.64 %, 11.05% and 8.94% respectively. Khorda, Kandhamal, and Keonjhar top the list for the high growth of NDDP and per capita NDDP. Bargarh, Debagarh, and Malkangiri are in the lowest end of the growth rate of the NDDP and per capita NDDP. Anugul which is having per capita income (PCI) of Rs 11423 tops the list where as Bhadrak having PCI Rs 4708 is in the lowest among the districts for the year 1993-94. But the growth of PCI doesn't seem to be the same trend as the level of PCI. Khorda which comes under the medium income districts is growing at a faster rate among the districts (3.97%) within the above reference period while Malkangiri recorded a slow growth rate of 2.03 % which is coming under the high-income districts. As we know, the convergence hypothesis tells that the low-level income economy will grow faster than the high-level income economy to converge. Hence it raises a question whether there is a convergence of income among the districts of Odisha.
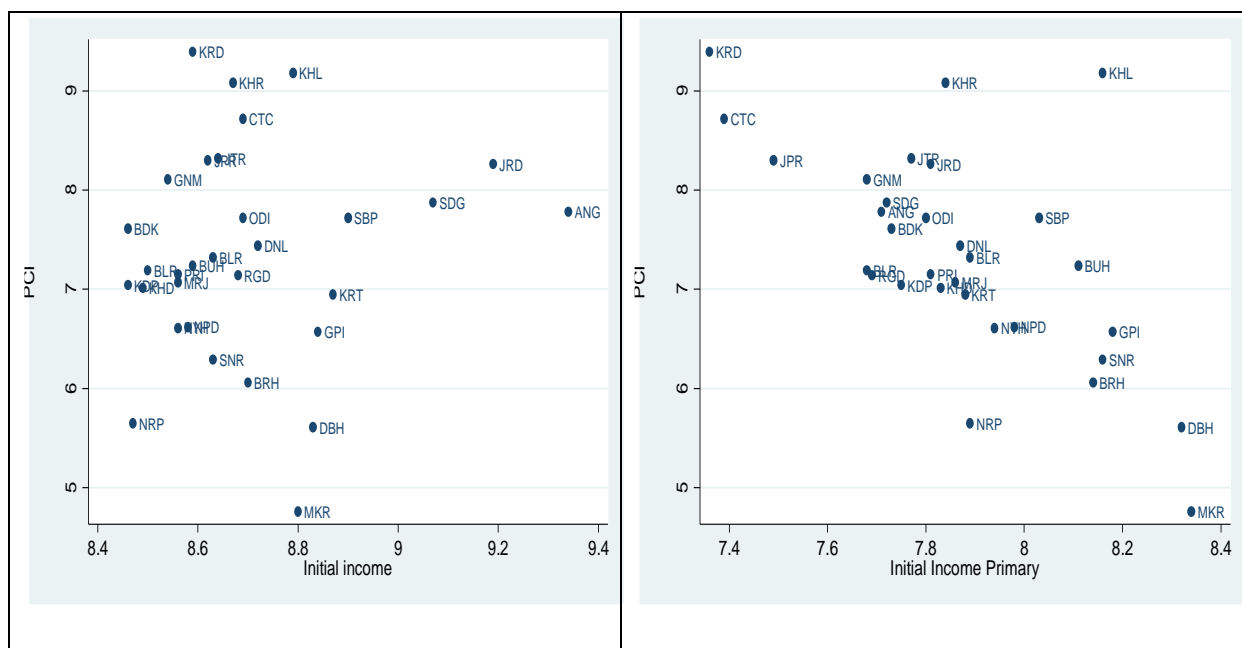
5. Regional Disparities in Odisha: Analysis of Convergence - Divergence

With the high economic growth in the post-reform Odisha, the state witnessed higher regional disparities among the districts. The present section deals with the regional disparities in income among the districts of Odisha. The convergence and divergence in income among the districts can be looked into by calculating the sigma and beta convergence. The districts have been classified as rich, medium & low income to have a better understanding of the convergence among each group of the districts. There is a large volume of literature on the convergence of level of income among the economy. The convergence literature starts with the seminal work of Solow (1856) where he explains the negative relationship between the growth of per capita income with the initial level of income. To him, it's the poor economy which will grow faster than the rich and hence will achieve the convergence. The basic assumption of the Solow model is the neo classical production function with diminishing returns to physical capital. The poor economy is having a low level of physical capital, and hence high marginal productivity of capital and the reverse is the case for the rich economy. Hence the poor economy grows faster to reach a steady state growth rate. The steady-state growth of an economy is determined by the technological progress which is an exogeneous factor. Assuming the technology freely available for the country, the model predicts that all the economy will achieve the steady state growth rate.

A large volume of literature are there in studying the convergence divergence of income among the states of India. Cashin & Sahay (1996) , Bajpai & Sachs (1996), Rao, Shand & KaliRajan (1999), Nagraj et al(2000), Aiyar (2001), Trivedi (2002), Singh & Srinivasan(2002), Bhattacharya & Sakthivel (2004), Nayar (2008), Cherrodian & Thirwall (2013) are the most cited one. All these studies, studied the convergence either using the cross-section regression or using the panel fixed effect model. However, all these studies are based on the national level using the state level PCI data. Very few studies have been done at the state level to show district level convergence in per capita income. Hatekar & Raju (2013) study is based on Maharastra and Raychaudhuri & Haldar (2009) study is based on the district level convergence analysis in West bengal. This chapter looks into the disparities in income among the districts of Odisha in the post-reform period. The literature on regional disparities in India are as follows.
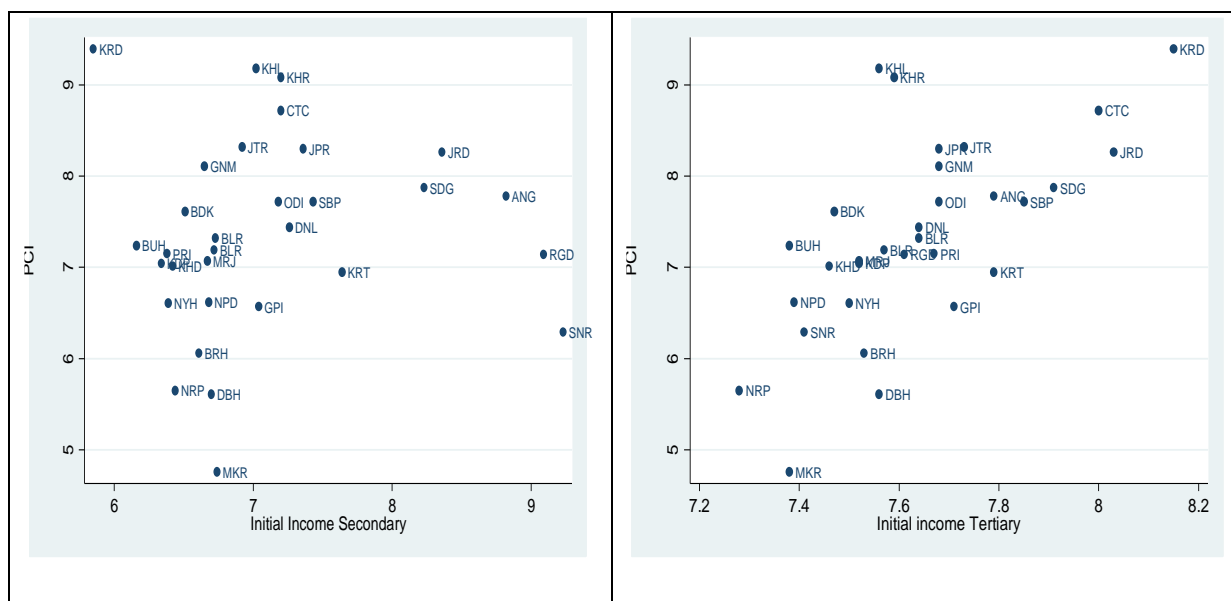
Though Odisha economy has achieved a higher growth rate in the recent past, it a huge regional disparities in terms of per capita income. Hence it became important to know whether some of the districts of Odisha are growing to push others in behind. Whether there exist any convergence or divergence among the districts of Odisha. The growth rate of the PCI among the districts and the log of the initial income for the year 1993-94 has been plotted in the figure.

Figure.4: Scatter plot of Growth of Per Capita Income with Log of Initial Income and Log of Initial income of the primary sector among districts of Odisha.

Figure.5: Scatter plot of Growth of Per Capita Income with Log of Initial Income of the Secondary sector and Log of Initial income of the tertiary sector among districts of Odisha.

Note- Angul- ANG, Baleswar- BLR, Baragarh-BRH, Bhadrakh-BDK, Balangir- BLR, Baudh- BUH, Cuttack -CTC, Debagarh - DBH, Dhenkanal-DNL, Gajapati- GPI, Ganjam-GNM, fJagatsingpur- JTR, Jajpur- JPR, Jharsuguda - JRD, Kalahandi - KHD, Kandhamal - KHL, Kendrapada - KDP, Keonjhar - KHR, Khorda - KRD, Koraput - KRT, Malkanigir-MKR, Mayurbhanj - MRJ, Nabarangpur-NRP, Nayagarh-NYH, Nuapada- NPD, Puri - PRI, Rayagada - RGD, Sambalpur- SBP, Sonepur- SNR, Sundergarh- SDG, Odisha- ODI

The scatter plot in the figure.3.1.1 shows the log of initial income in the x-axis with the growth of PCI in the y-axis. But the graph does not show any substantiative argument in favor of convergence. While the scatter, plot of growth of PCI with the log of initial income of the primary sector (figure.3.1.2) shows a convergence. That means the districts having low PCI in the primary sector at the initial year are witnessing a higher growth rate of NDDP and vice versa. The figure.3.1.3 and 3.1.4 presents the scatter plot of PCI growth with the log of initial income of the secondary and tertiary sector. The figure.3.1.3 does not show any convergence or divergence trends where the figure.3.1.4 shows a divergence trends showing the districts having low PCI of the tertiary sector are growing at a slower rate and the districts having high PCI od tertiary sector are growing at a faster rate. The graphical analysis shows

that while the primary sector shows a convergence trends, the tertiary sector shows a divergence trends in Odisha.

But the graphical analysis will unable to show the extent of convergence or divergence. To have the exact figures several models has been fitted here. An ordinary least square (OLS) regression has been fitted between the PCI with the initial income and other independent variable. Several models of estimation of the convergence and divergence are as follows. The period of analysis is from 1993-94 to 2011-12 for 19 observation among the thirty districts of Odisha. The model is based on the cross-sectional analysis. As the earlier section mention the positive coefficient of the model represents the divergence of income while the negative coefficient implies convergence of income among the districts.

Table.3.3: Convergence –Divergence of PCI among districts of Odisha

Model	Equation	Statistics Value
Model-1	PCI Growth = 2.017 + .611 (Initial Income)	T statistics (0.64) (0.24) Prob value (0.52) (0.81) R Square 0.014
Model-2	PCI Growth = -11.61 + .717 (Initial Income) + .229 (PCI Primary) + .260 (PCI Secondary) + 1.039 (PCI Tertiary)	T statistics (-3.19) (1.80) (3.12) (6.33) (10.72)Probability value (0.08) (0.00) (0.00) (0.00) (0.00) R Square Value 0.854
Model-3	PCI Growth = -7.33 - 0 .775 (Initial PCI of primary) + 0.084 (Initial PCI of Secondary) + 1.417 (Initial PCI of Tertiary) + 0.240 (PCI Primary) + 0.252 (PCI Secondary) +0.684 (PCI Tertiary)	T statistics (-1.39) (-1.96) (1.03) (3.21) (4.08) (7.73) (5.96) Probability value (0.17) (0.06) (0.31) (0.00) (0.00) (0.00) (0.00) R Square Value 0.925

An ordinary least square (OLS) regression between the growth rate of PCI among the districts with the log of income of the districts for the year 1993-94 has been estimated to know whether there is a convergence of income among the districts of Odisha. The result of the model is as follows. The 1st model model is having very low R square. The coefficient of the initial income variable is positive and not significant, and hence we can't conclude whether there is convergence or divergence of income among the districts of Odisha. By adding more variable to the right-hand side, i.e., to the independent variable, we got a high R square value with a significant result in the 2nd model. But as the coefficient of initial income has positive sign implying there is a divergence of income among the districts. The higher coefficient of the growth of PCI of the tertiary sector implies that the growth in PCI of tertiary sector has a higher impact on the PCI growth of Odisha than the primary and secondary sector. To know whether there is a convergence of income among the sectors the sector-specific initial income has taken. As there is a high correlation among the initial per capita income with the initial income of the individual sectors, the initial income of individual sector has taken instead of the total initial income in the 3rd model. The regression shows that the primary sector initial PCI has negative coefficient showing there is a convergence between primary sector income per capita with the total PCI growth. The districts having a low initial income per capita of the primary sector are growing at a faster rate and vice versa. But it is not the case for the secondary and tertiary sector. Except for the coefficient of initial income of the secondary sectors other coefficients are significant. As model 2 shows, a divergence and model 3 shows a convergence in the primary sector and hence it's the tertiary sector in Odisha which resulted in an increasing divergence over the year as secondary sector does not give either convergence or divergence in income among the districts of Odisha.
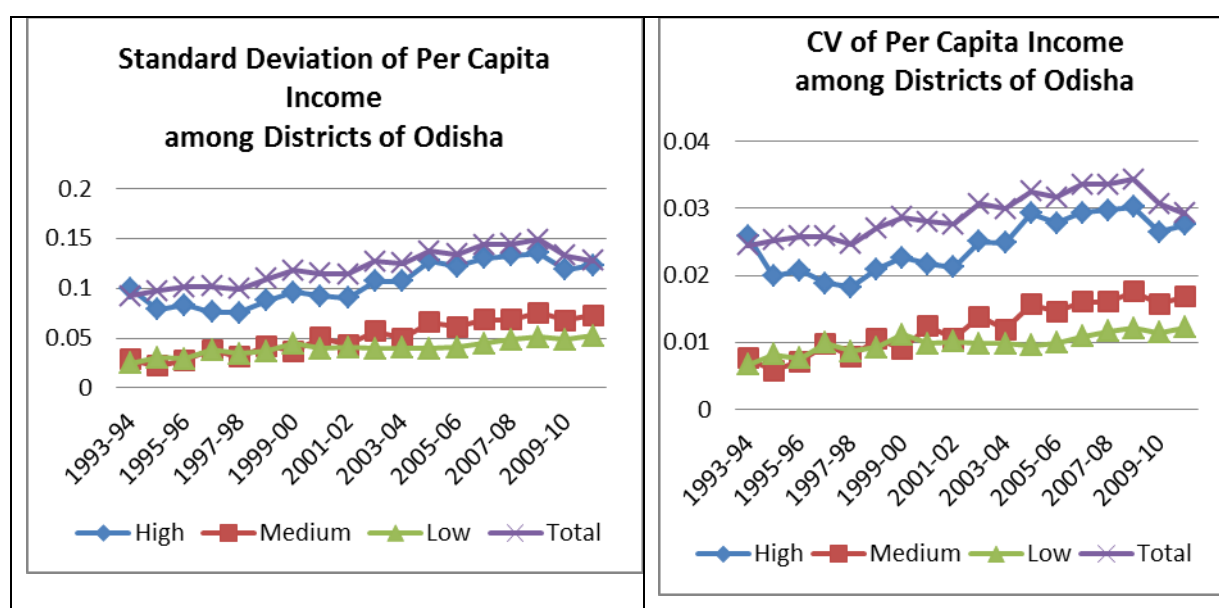
To know whether there is a convergence of income among the sectors, the sector-specific initial income has taken. As there is a high correlation among the initial per capita income with the initial income of the individual sectors, the initial income of individual sector has taken instead of the total initial income. The regression shows that the primary sector initial PCI as negative coefficient showing there is a convergence between primary sector income per capita with the total PCI growth. The districts having a low initial income per capita of the primary sector are growing at a faster rate and vice versa. But it is not the case for the

secondary and tertiary sector. Except for the coefficient of initial income of the secondary sectors other coefficients are significant. As model 2 shows, a divergence and model 3 shows a convergence in the primary sector and hence it's the tertiary sector in Odisha which resulted in an increasing divergence over the year as secondary sector does not give either convergence or divergence in income among the districts of Odisha.

Though there is a divergence in income among the districts of Odisha, there might be a possibility of convergence within the income groups. Therefore the districts of Odisha have been classified as high, medium and low-income district according to their per capita income for the year 1993-94. The low-income regions have taken as a reference group. After regressing the growth of PCI with the initial income among these three groups separately, we didn't get a significant result within the groups an and the coefficient remains positive which shows that there exists a divergence of income among the districts of Odisha within the groups. Table. 4 gives the classification of districts have various income groups.

The σ convergence as shown in figure3.2 shows an increasing trend for Odisha. It is important to know if there is any convergence or divergence among the districts and which income group increased the divergence of income in Odisha. The standard deviation and the coefficient of variation trends have been drawn to have a look into the σ convergence. The SD & CV among all the region has raised slowly showing a slow rise in the divergence of income among these districts. The rise in growth in Odisha resulted in increasing divergence among these groups.

Figure.5: Sigma Convergence among districts of Odisha

Source – Authors calculation

Note - **High Income** - Angul, Jharsuguda, Sundergarh, Sambalpur, Koraput, Gajapati, Debagarh, Malkanigiri, Kalahandi, Dhenkanal , **Medium Income**- Baragarh, Cuttack, Rayagada, Keonjhar, Jagatsinghpur, Balangir, Sonepur, Jajpur, Baudh, Khorda , **Low Income**- Nuapada, Nayagarh, Mayurbhanj, Puri, Ganjam, Baleswar, Kalahandi, Nabarangpur, Kendrapada, Bhadrakh.

6: Summary and Conclusion

This paper presents the sectoral growth and regional disparities in Odisha in the post-reform period. The post-reform period witnessed a faster growth in output in comparison to the pre-reform period. The tertiary sector is growing at a faster rate resulting in a higher growth rate of NSDP of Odisha. There exist huge regional disparities among the districts of Odisha in terms of growth in income and per capita income. Regarding demographic structure, geographical allocation and sectoral income show large disparities among the districts. The β convergence though shows a convergence it's not significant with the initial per capita income. While the initial per capita income of the primary sector shows a convergence , the tertiary sector PCI shows a divergence and secondary sector PCI shows an insignificant result. The SD & CV among the low and medium and high-income region has increases showing a rise in the divergence of income among this district. While the state has seen a sigma divergence in PCI among districts, the unconditional convergence among them is not avoidable. The growth of the primary sector plays an vital role for the reduction in regional disparities in the state of Odisha. The states should adopted the policies for the high growth of the primary sector.

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