Odisha Economy Discussion Series 1

Intrastate Income Inequalities in Odisha

Examining Decomposition by Regions and Broad Sectors

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Intrastate Income Inequalities in Odisha: Examining Decomposition by Regions and Broad Sectors

Pratap Kumar Mahakur[1] and Narayan Chandra Nayak[2]

Abstract

Purpose – Odisha experiences a complex phenomenon of becoming not only the least developed state of the country but also striking disparities across its districts. An analysis of regional income inequalities across the districts of Odisha between 1995–96 and 2010–11 is decomposed by regions and sectors. This is done to get an understanding regarding region and sector specific contributions to the observed trends.

Design/methodology/approach – The study applies σ-convergence measures like Gini coefficient and Theil's index to estimate the extent of intra-regional income divergence across the regions. Decomposition of Theil's index is carried out to measure the inequality between and within regions. The sectoral decomposition is performed with the help of Williamson's weighted coefficient of variation to explore each sector contribution to the inequality.

Findings – The results indicate the persistence of intrastate income disparities in Odisha. The inequalities can be attributed largely to within-division inequality and the contribution of the northern division is the highest. The results also ascertain the overriding role of industrial sector disparities towards overall regional income disparities. Services are also found to be of significance though not as much as industrial sector is. This is also seen from the rising share of covariance term between industrial and service sector. This reveals not only a shift in state's income from the agricultural sector to the non-agricultural sector but also the complementarity nature of development of the industries and the services. However, there is an interesting revelation that both industry and services have reached the turning points and hence, any further growth in these two sectors is likely to create positive redistributive effects. In order for the state to realize balanced regional development, it may be necessary to bring about regional balance in the distribution of industries and services across the state.

Originality/value – While most of the prevailing studies on regional income disparities in India primarily focus on inter-state analysis, this study attempts to understand the dynamics of intrastate income disparities in a less developed state. It establishes that any effort to bring about regional balance may require renewed attention to the laggard regions. The industrial sector needs special attention to narrow down its increasing contribution to overall regional inequality.

Keywords: *Between-Region Inequality, Within-Region Inequality, Intra-regional Divergence, Decomposition Analysis, Odisha.*
JEL Classification: R11, R12

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1. INTRODUCTION

In India, regional disparities are all-pervading. While states diverge considerably from one another on income, human development, poverty, consumption, etc., rising regional differences within states have also turned out to be far serious challenges. Though in recent years, the nature and causes of disparities across Indian states have attracted significant attention (Cherodian and Thirlwall 2015; Mishra and Mishra 2018; Sanga and Shaban 2017; Sofi and Durai 2015, 2017), attempts to examine the intrastate disparities are limited. In a vast country like India, regional diversities within a state carry as much significance as that across the states. It is these intrastate diversities, which appear to be the driving forces behind increasing demands for regional autonomy, carving out of new states, rising social unrest and economic blockade across different parts of the country.

Odisha, a state in India's eastern region, is a case in point. The state experiences a distinctive phenomenon of becoming not only the least developed state of the country (Rajan et al. 2013) but it also experiences striking disparities across its districts. Having a geographical area of 155,707 sq. km., Odisha is the ninth largest state of the country. The state is predominantly rural and is heavily dependent upon agriculture for livelihoods. With population of 41.9 million (3.47% of India's population), Odisha's demographic pattern is unique in the country as it is home to a large proportion of tribal population (22.85%) among the major states. Ironically, the tribal population is heavily concentrated in the less developed regions of the state (Census of India 2011a). In terms of most indicators of the living standards, the deprivation of the tribal people is strikingly large. Any development effort, which fails to attach adequate importance to the living standards of this extremely vulnerable and deprived group, will not only be self-defeating but also be unjust (Nayak et al., 2016).

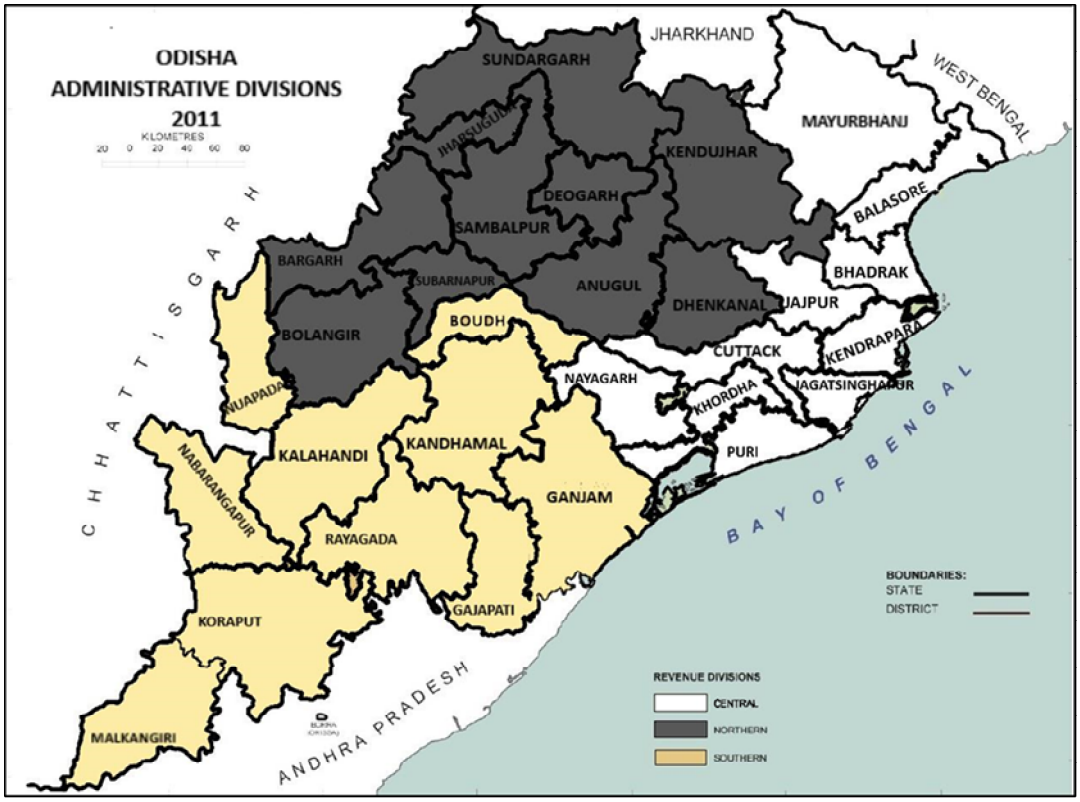

Figure 1: Map of Odisha according to Revenue Divisions
Source: Accessed from http://www.orissalinks.com/orissagrowth/wp-content/uploads/image/Provisional%20Population%20Total%20Orissa-Book%204.jpg on September 26, 2016 and subsequently color given for use

Odisha has 30 administrative districts equally distributed across three revenue divisions, namely central, northern and southern (Figure 1). Ironically, it witnesses stark disparities among its districts on several vital development indicators both within and across administrative divisions. On rural poverty ratio, Odisha's southern and northern divisions exceed their coastal counterpart by about two and half times, and one and half times, respectively. In the former two divisions, about 89 percent of the scheduled tribe and 46 percent of the scheduled caste population of the state inhabit (GoO 2004), thus signifying the nature and extent of vulnerabilities associated with such regions and the people inhabited therein. In 2010–11, per

capita gross district domestic product (GDDP) of an industrialized district like Jharsuguda was INR 70765 as against INR 16554 for Nabarangpur district (GoO 2016). If one ranks the districts according to literacy rates, the top five districts have exceeded 84% each, while the bottom five have not even reached 55% each (Census of India 2011b).

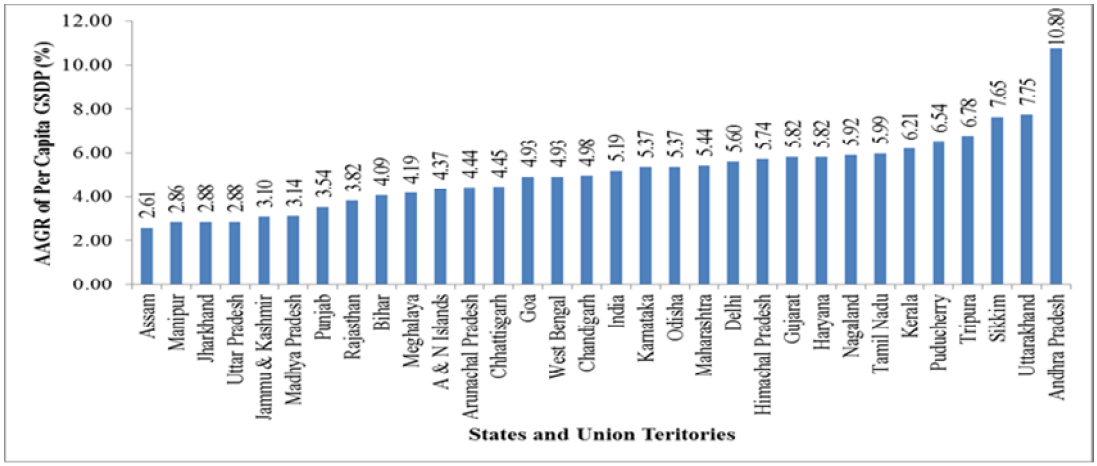

Figure 2: Growth Rate of Per Capita GSDP across the States and Union Territories of India during 1995–96 to 2010–11 at Constant (2004–05) Prices
Source: Estimated from the data acquired from the CSO.
Note: Per Capita GSDP at factor cost for Andhra Pradesh represents undivided Andhra Pradesh; A & N Islands represents Andaman and Nicobar Islands

In recent years, Odisha has achieved phenomenal success on growth front with its annual average long-run growth rate (5.37%) exceeding the national average growth rate (5.19%) (Figure 2). Annual average growth rate (AAGR) of the gross state domestic product (GSDP) has recorded an exponential rise from a meager 2.45% in 1998–99 to about 8.08% in 2014–15 (advanced estimate) with a staggering 12.85% achieved in 2006–07 (GoO 2015). Despite such achievements, Odisha is still relegated to the bottom on many critical development parameters (Rajan et al. 2013). This raises the following pertinent question: Is Odisha's underdevelopment common to all the regions and sectors or is it the persistent backwardness of some regions or sectors that puts the state at this precarious position? The purpose of this study is, thus, to

examine the σ-convergence across the districts of Odisha and find out how its different regions and sectors contribute to its observed income disparities. An analysis of regional income inequalities across the districts of Odisha between 1995–96 and 2010–11 is decomposed by regions – within and between and by sectors – agriculture, industry and services. This is done to get an understanding regarding which region and sector contributing more to the observed trends.

2 THE RATIONALE

An intrastate study in the context of Odisha is significant from the following standpoints. As there seems to exist stark differences between developed and laggard districts of the state, this study adds to the debate over the failure of the laggard regions to catch up with the advanced regions. Further, if it can be ascertained that intrastate disparities have accentuated in Odisha, it might alter the standard notion that the state in general is underdeveloped. Rather it could be the relative backwardness of the less developed regions, which might have been contributing to its overall state of underdevelopment. Needless to say, a micro-level study on regional disparities will make one understand the local processes involved in the uneven spatial development, which, in turn, will help undertake specific interventions (Wei 1999).

An empirical study on economic convergence at the micro level has two important ramifications. One may be keen to know whether interregional income differences tend to increase or decrease and eventually disappear over time. If it decreases or disappears, the need for policy intervention may be of less relevance, while in the opposite case, one may need to formulate appropriate measures to arrest the regional dispersion. Besides, one may also be eager to know if the regions which are poor today were poorer in the remote past. If the poverty tends to persist over time, measures in the form of a direct attack on poverty would perhaps gain significance (Sala-i-Martin 1996). In a state like Odisha, both the above questions carry

significance as intrastate income differences over the years have conceivably not declined as desired and abject poverty still persists in certain parts of the state, needing urgent attention.

The movement of the regional income levels at the aggregate is said to reveal only a part of the story regarding the observed disparities. An investigation of the sectoral income disparities can possibly help us identify the underlying forces behind such disparities. A decomposition analysis of income according to sectors carries importance especially in a situation where the movements of the sectoral disparities are not uniform (Mathur 1983). In effect, a sectoral decomposition helps one explore the extent to which each sector contributes to the overall regional income disparities (Akita and Lukman 1995). This paper, thus, attempts to examine the regional income disparities according to three broad sectors of the economy of Odisha and consequently, provides evidences regarding the contribution of each sector towards aggregate regional income disparities.

3 METHODOLOGIES

3.1 Measurement of Convergence

In the present study, intrastate income disparities in Odisha are analyzed using the estimates of σ-convergence. The measures used for estimating σ-convergence are Gini coefficient, CV_w, and Theil inequality index (global and decomposed). In this study, a sectoral decomposition analysis is carried out to explore the extent to which each sector contributes to the overall regional income disparities in income per capita across the districts of Odisha during the study period. For this purpose, the CV_w is used to capture the contribution of each sector to the overall regional inequality. In addition, Gini coefficient and Theil index are also estimated to check the

robustness of the results across different measures of σ-convergence. The procedures of estimating these three inequality measures are given as follows:

3.1. Sigma (σ) Convergence

3.1.1. Gini Index

Gini index is the most frequently used measure of inequality, which looks at all parts of the distribution. Gini coefficient ranges between 0 and 1, where 0 represents perfect equality among regions and 1 indicates that all developments are concentrated in one region only, exhibiting complete inequality. This measure of inequality helps one make direct comparison between two regions irrespective of their sizes. The Gini Coefficient is estimated by

$$G = \frac{\sum_{i=1}^{n}(2i - n - 1)X_i}{n^2 \mu} \quad \ldots (1)$$

where i is the individual rank order of the district, n is the number of districts, X_i is the per capita income of the individual districts and μ is the average per capita income of the districts.

3.1.2. Theil's Inequality Index

Theil inequality coefficient (Theil 1967) is a popular index for analyzing spatial income distribution. It is additively decomposable and in effect, it can be used to analyze inequality on various geographical scales simultaneously (Walsh and O'Kelly 1979). As a measure of regional inequality, it satisfies all the important properties, namely the Pigou-Dalton principle of transfers, mean independence and population-size independence (Bourguignon 1979; Shorrocks 1980). Theil coefficient is neither scale dependent nor mean dependent nor is it affected by extreme values. It is independent of the number of regions and hence, it is useful to compare inequalities across regional units (Terrasi 1999). These characteristics are particularly relevant to

Odisha as there seems to be strong variations across its three revenue divisions. Theil index can be represented as follows:

$$T = \sum_i y_i \log\left(y_i / p_i\right) = T_{br} + T_{wr} \quad \ldots (2)$$

$$T_{br} = \sum_r \left(Y_r / Y\right) \log\left(\frac{Y_r / Y}{P_r / P}\right) \quad \ldots (3)$$

$$T_{wr} = \sum_r \left(Y_r / Y\right) \left[\sum_i \left(y_i / Y_r\right) \log\left(\frac{y_i / Y_r}{p_i / P_r}\right)\right] \quad \ldots (4)$$

where T represents Theil total inequality, T_{br} is between-group inequality, T_{wr} is within-group inequality, Y, Y_r and y_i are the income of the state, revenue divisions and individual districts, respectively, and P, P_r and p_i are the population of the state, revenue divisions and individual districts, respectively. In regional economics context, within-group component captures the intraregional inequality, whereas between-group term measures interregional inequality. In simple terms, the interregional term captures the distance between the mean incomes of the aggregate groups, whereas the distance between incomes of regional units belonging to the same group is captured by the intraregional term (Rey 2001; Shaban 2006).

3.1.3 Weighted Coefficient of Variations

In order to examine the magnitude to which each sector contributes to the overall inequality and indicate the extent and the direction of covariations between sectors in the overall inequality, the present study applies Williamson's (1965) CV_w and its various formulations as adopted by Mathur (1983) in the context of India, and Akita and Lukman (1995) in the context of Indonesia. Accordingly, the procedures as followed are presented below.

The CV_w can be represented as follows:

$$CV_w = \frac{1}{\overline{Y}} \sqrt{\sum_{i=1}^{n} \left(Y_i - \overline{Y}\right)^2 \frac{P_i}{P}} \quad \ldots (5)$$

where P_i = population of the i^{th} region (district)

P = population of the state

Y_i = per capita income of the i^{th} region (district)

$\overline{Y}$ = per capita income of the state = $\frac{1}{P}\sum_{i=1}^{n} Y_i P_i$

n = numbers of regions (district)

As aggregate income is equal to the sum total of sectoral incomes, the squared weighted coefficient of variation (CVw^2) can be decomposed as

$$CV_w^2 = \sum_{j=1}^{m} Z_j^2 CV_{wj}^{\ 2} + \sum_{j \neq k} Z_j Z_k COV_w\left(j,k\right) \quad \ldots (6)$$

where Z_j = share of sector j in state GSDP

CVw_j = weighted coefficient of variation of sector j

$$= \frac{1}{\overline{Y_j}} \sqrt{\sum_{i=1}^{n} \left(Y_{ji} - \overline{Y_j}\right)^2 \frac{P_i}{P}} ;$$

$COVw\left(j,k\right)$ = weighted coefficient of covariation between sector j and sector k

$$= \frac{1}{\overline{Y_j}} \frac{1}{Y_k} \sum_{i}^{n} \left(Y_{ji} - \overline{Y_j}\right)\left(Y_{ki} - \overline{Y_k}\right) \frac{P_i}{P}$$

$\overline{Y}_j, \overline{Y}_k$ = state GSDP per capita of sector j and sector k respectively;

Y_{ji}, Y_{ki} = GSDP per capita of sector j and sector k respectively in region i ; and

m = number of sectors

As there are three broad sectors, namely primary (agriculture), secondary (industry) and tertiary (services), the equation (6) can be expressed as

$$CV_w^2 = Z_1^2 CV_w 1^2 + Z_2^2 CV_w 2^2 + Z_3^2 CV_w 3^2 + 2Z_1 Z_2 COV_w(1,2) + 2Z_1 Z_3 COV_w(1,3) + 2Z_2 Z_3 COV_w(2,3) \quad \ldots (7)$$

This equation helps us understand to what extent three broad sectors of the economy of Odisha independently contribute to the overall weighted coefficient of variation of income per capita. By using three covariation terms within this formulation, it also provides estimates regarding the magnitude and direction of covariations between three sectors in the overall coefficient of variation (Akita and Lukman 1995).

In addition to the above sectoral decomposition analysis, the present study also attempts to examine whether Kuznets' inverted U-shaped curve hypothesis holds good for different sectors in the context of Odisha, implying thereby that Odisha has experienced a rise in regional income inequalities in the initial years followed by a fall in inequality after reaching a threshold level of per capita income. This is tested by estimating the income and time trend through different inequality measures with the help of following two equations:

$$Inequality_t = \alpha + \beta_1 \left(\ln(Income)\right) + \beta_2 \left(\ln(Income)\right)^2 + \varepsilon_t \quad \ldots (8)$$

$$Inequality_t = \delta + \lambda_1 (time) + \lambda_2 (time)^2 + \varepsilon_t \quad \ldots (9)$$

where inequality is the measure of income inequality.

The income inequality indices have been measured by taking Williamsons' CV_w, Gini and Theil index. Three different indices are taken to check the robustness of the result. The Kuznets' hypothesis holds if the estimated value of the coefficient of income or time is positive and the coefficient of the squared term of income or time is negative. The turning point for the Kuznets' hypothesis is calculated by taking the antilog of $(-\beta_1 / 2\beta_2)$ (Stern 2004; Dinda 2004).

The turning point helps one understand the movement of the development process when inequality reaches its highest value and starts declining thereafter.

4. DATABASE

The study is based on secondary data. The time period considered is 1995–96 to 2010–11. The starting period coincides with the post-division of the districts of Odisha from 13 to 30. Odisha witnessed division of the districts in 1993–94. In order to remove the adjustment shocks, the present study considers 1995–96 as the beginning of the study period. In order to evolve a comparable per capita income with a single base year, technique of base shifting by splicing method has been applied for GDDP data taking 2004–05 as the base. The data pertaining to GDDP and per capita income have been collected from the Directorate of Economics and Statistics (DES), and Government of Odisha.

5. RESULTS

5.1 Intrastate Income Disparities: σ-Convergence

As mentioned earlier, as measures of σ-convergence, the study applies Gini coefficient, CV_w and Theil inequality index. The results of all the three measures indicate that there has been an increase in intrastate income disparities in Odisha since the beginning of the new century. Gini, CV_w and Theil estimates were, by and large, constant till 2001–02, but they started exhibiting increasing trends thereafter (Figure 3). As Odisha has three revenue divisions – each comprising equal number of districts – this study also examines the extent of disparities between and within these three administrative divisions by disaggregation of Theil inequality coefficient. The disaggregation, by and large, revealed a decreasing trend in total and within-division inequality during 1995–96 to 1997–98 and constant values during 1997–98 to 2001–02. However, along the

overall trend, total and within-division inequality were on the rise since 2002–03. The between-division inequality remained more or less stable till 2002–03 and thereafter, an increasing trend was in vogue (Figure 4).

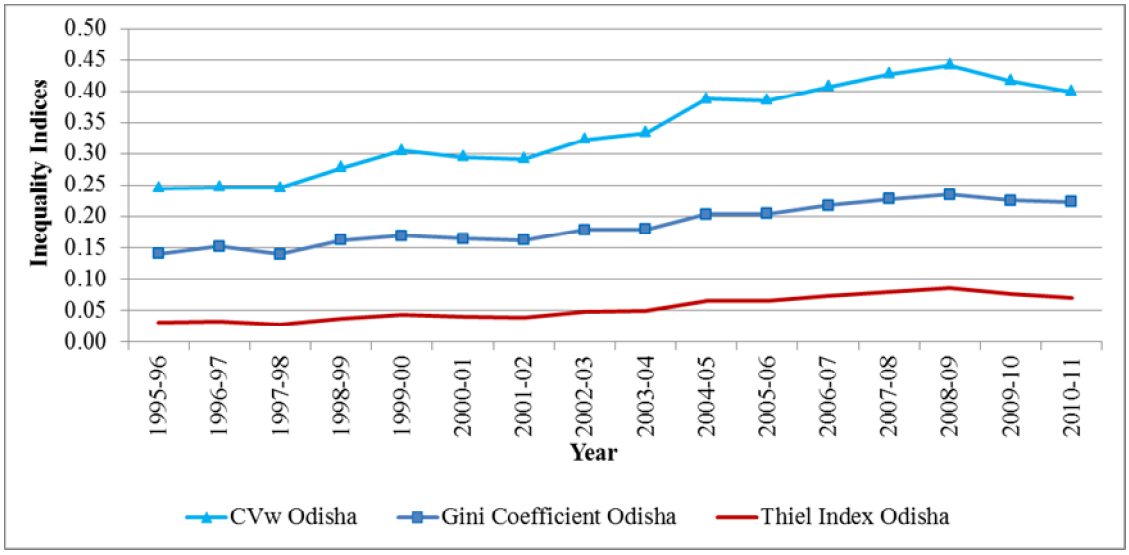

Figure 3: Trends in Regional Income Inequality in Odisha
Source: Estimated from the data acquired from the DES, GoO

In essence, Odisha's overall regional income inequality can be largely attributed to within-division inequality, which varied from 0.021 in 1997–98 to 0.059 in 2008–09. The contribution of within-division component to total inequality was about 69% in 2008–09. Contrarily, between-division component was relatively stable with Theil coefficient ranging from 0.005 in 1995–96 to 0.019 in 2010–11 (Figure 4). Evidently, the contribution of the northern division to within-division inequality was the highest in almost all the years (Figure 5). Such a situation with northern division may be attributed to very large differences in per capita income between some of its highly industrialized districts like Jharsuguda and Angul and relatively backward districts like Subarnabur and Deogarh.

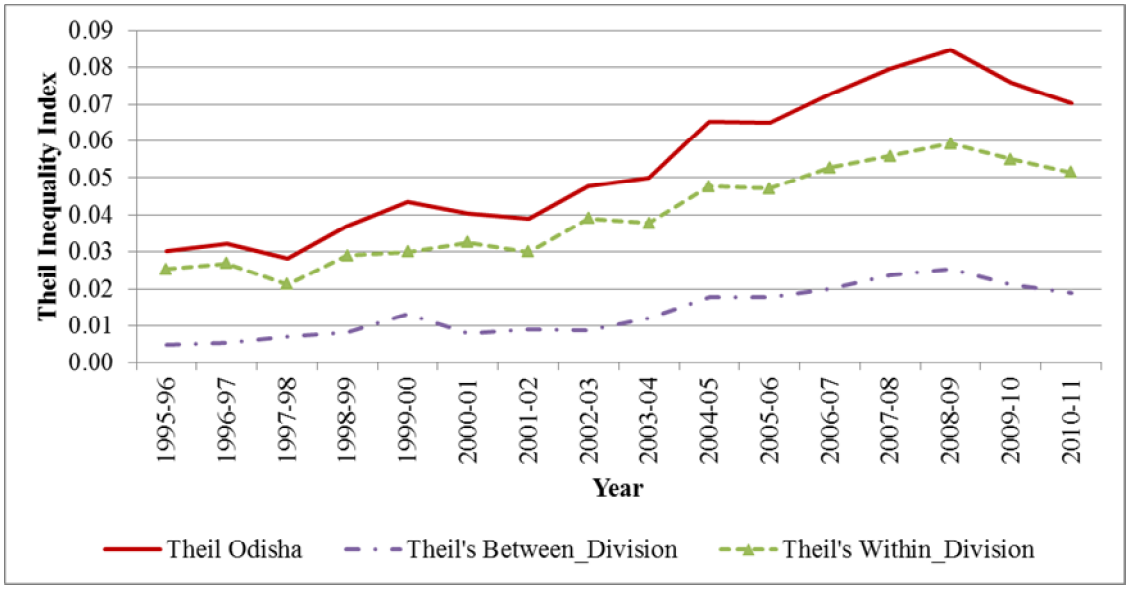

Figure 4: Decomposition of Theil Inequality Index in Income for Odisha
Source: Estimated from the data acquired from the DES, GoO

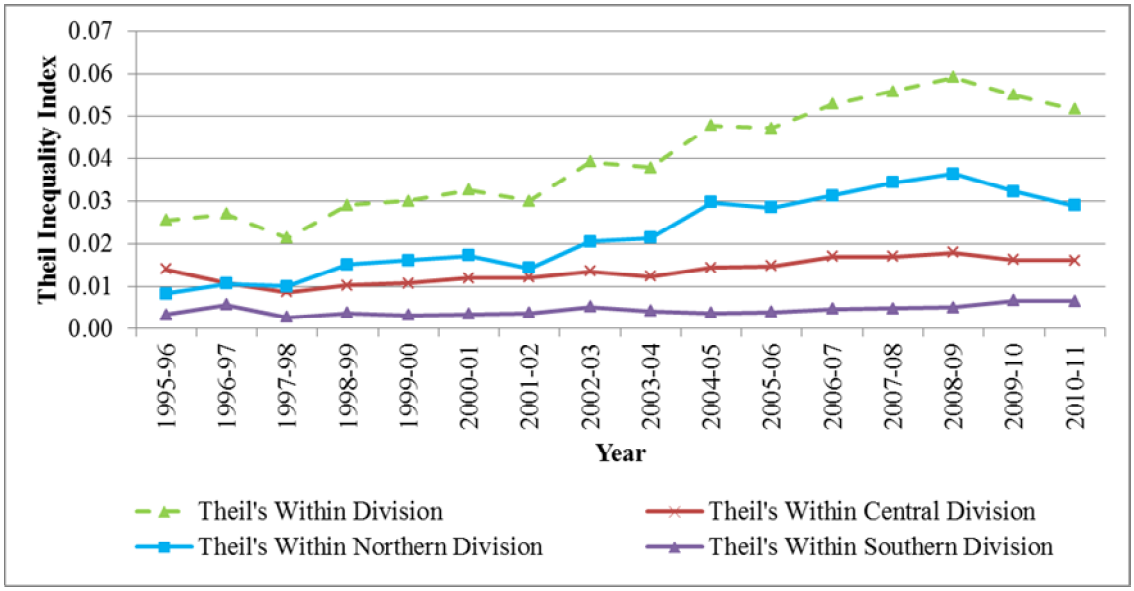

Figure 5: Within-Region (Revenue Division-wise) Theil Inequality Index in Income for Odisha
Source: Estimated from the data acquired from the DES, GoO

Angul is home to many industries including Talcher Thermal Power Station, National Thermal Power Corporation, National Aluminum Company Limited and Mahanadi Coal Fields Limited. Many small scale industries including service industries are also located in this district.

Jharsuguda is another industrially rich district of the northern division, which is rich in mineral resources like coals, quartzite and fire clay. Several industrial units including Vedanta Alumina, Bhusan Steel and Power, and TATA Refractories operate there, contributing to its economic growth.

5.2 Growth and Inequality Trends: A Preliminary Observation

In terms of income per capita (Figure 6) and its growth rate (Figure 7), northern division happens to be the leading region and the southern division is the most laggard one. That low within-division inequality in southern division and relatively higher within-division inequality in northern division followed by central division may further confirm that economic growth tends to accentuate regional disparities.

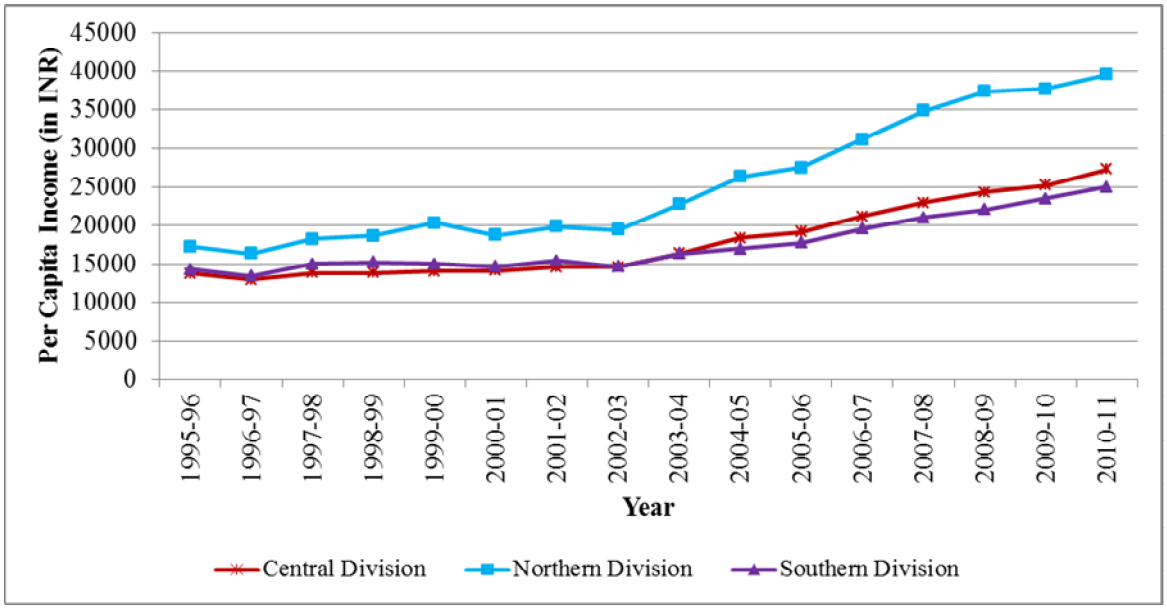

Figure 6: Revenue Division-wise Per Capita Income in Odisha at Constant (2004–05) Prices (in INR)
Source: Estimated from the data acquired from the DES, GoO

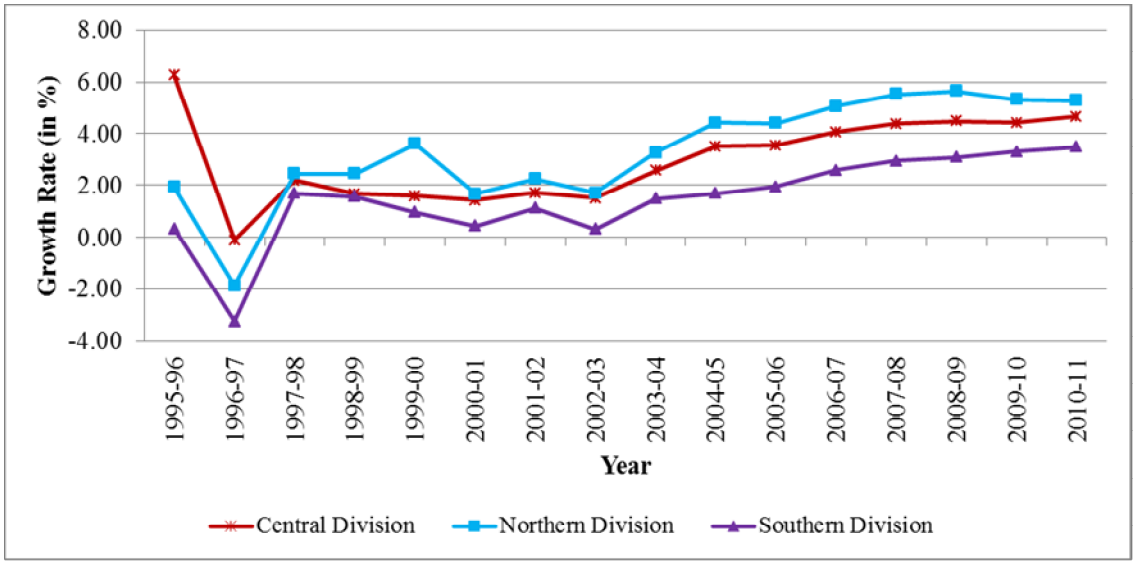

Figure 7: Revenue Division-wise Annual Growth Rate of Per Capita Income in Odisha at Constant (2004–05) Prices
Source: Estimated from the data acquired from the DES, GoO

5.3 Sectoral Decomposition and Regional Inequality

The results of the Gini coefficient, Theil index and CV_w for intrastate sectoral income inequality in Odisha are presented in this section (Table 1). The estimates of all the three measures indicate that for agriculture, the intrastate income dispersion is more or less stable except some erratic behavior in the year 1999–2000. Thus, the agricultural sector has developed more or less uniformly in relation to the population size. The increase in inequality coefficient for 1999–2000 can possibly be attributed to the loss of agricultural output due to occurrence of super-cyclone in that year. Similar to agriculture, the inequality measures for the service sector also reveal more or less stable behavior for the state.

Table 1: Sectoral Income Inequality Indices in Per Capita GDDP during 1995–96 to 2010–11

Year	Agriculture			Industry			Service		
	Gini	Theil	CV_w	Gini	Theil	CV_w	Gini	Theil	CV_w
1995–96	0.167	0.041	0.291	0.347	0.180	0.658	0.173	0.056	0.357
1996–97	0.182	0.044	0.312	0.344	0.168	0.637	0.172	0.058	0.367
1997–98	0.171	0.042	0.295	0.339	0.177	0.689	0.170	0.056	0.358
1998–99	0.164	0.036	0.276	0.372	0.218	0.787	0.175	0.060	0.373
1999–00	0.212	0.070	0.381	0.373	0.212	0.768	0.175	0.060	0.373
2000–01	0.190	0.050	0.327	0.378	0.222	0.788	0.176	0.060	0.372
2001–02	0.185	0.048	0.317	0.386	0.232	0.808	0.180	0.063	0.382
2002–03	0.194	0.054	0.347	0.409	0.261	0.858	0.180	0.063	0.379
2003–04	0.174	0.046	0.311	0.426	0.288	0.904	0.180	0.062	0.376
2004–05	0.164	0.038	0.288	0.457	0.341	0.991	0.183	0.062	0.376
2005–06	0.165	0.039	0.291	0.463	0.346	0.995	0.186	0.064	0.383
2006–07	0.171	0.040	0.295	0.465	0.348	0.983	0.190	0.066	0.389
2007–08	0.170	0.041	0.296	0.471	0.357	0.992	0.191	0.065	0.384
2008–09	0.176	0.046	0.311	0.492	0.394	1.048	0.189	0.065	0.384
2009–10	0.194	0.053	0.352	0.496	0.401	1.058	0.187	0.062	0.376
2010–11	0.179	0.049	0.324	0.481	0.365	1.002	0.192	0.063	0.376

Source: Estimated from the data acquired from the DES, GoO

The industrial sector, on the contrary, exhibits an increasing trend in income disparities in Odisha during the study period. The CV_w for the industrial sector ranged from 0.64 in 1996–97 to a high of 1.06 in 2009–10, hence exhibiting much higher inequalities in the recent years. Gini and Theil index also registered, by and large, similar trends. The increase in regional disparities in industrial sector is a pointer towards its unequal distribution across the districts of Odisha relative to the distribution of population.

Table 2: Weighted Coefficient of Variation and Covariation in Per Capita GDDP during 1995–96 to 2010–11

Year	CV1	CV2	CV3	COV12	COV13	COV23	Z1	Z2	Z3	CV
1995–96	0.29	0.66	0.36	0.02	-0.07	0.02	0.33	0.32	0.35	0.24
1996–97	0.31	0.64	0.37	0.01	-0.06	0.02	0.31	0.31	0.38	0.25
1997–98	0.30	0.69	0.36	0.02	-0.07	0.02	0.33	0.29	0.38	0.25
1998–99	0.28	0.79	0.37	0.01	-0.06	0.03	0.32	0.30	0.38	0.28
1999–00	0.38	0.77	0.37	0.04	-0.08	0.04	0.28	0.32	0.40	0.31
2000–01	0.33	0.79	0.37	0.00	-0.07	0.04	0.26	0.31	0.42	0.30
2001–02	0.32	0.81	0.38	0.02	-0.07	0.04	0.29	0.29	0.42	0.29
2002–03	0.35	0.86	0.38	0.03	-0.06	0.03	0.24	0.31	0.45	0.32
2003–04	0.31	0.90	0.38	0.02	-0.07	0.04	0.26	0.31	0.43	0.33
2004–05	0.29	0.99	0.38	0.01	-0.06	0.06	0.23	0.34	0.42	0.39
2005–06	0.29	1.00	0.38	0.02	-0.06	0.06	0.23	0.33	0.44	0.39
2006–07	0.29	0.98	0.39	0.02	-0.06	0.06	0.21	0.36	0.44	0.41
2007–08	0.30	0.99	0.38	0.01	-0.07	0.07	0.20	0.38	0.43	0.43
2008–09	0.31	1.05	0.38	0.03	-0.07	0.06	0.19	0.37	0.45	0.44
2009–10	0.35	1.06	0.38	0.01	-0.07	0.05	0.19	0.34	0.47	0.42
2010–11	0.32	1.00	0.38	-0.03	-0.08	0.07	0.18	0.34	0.48	0.40

Source: Estimated from the data acquired from the DES, GoO

Note: CV = CV_w of all sectors

CV1 = CV_w of agricultural sector

CV2 = CV_w of industrial sector

CV3 = CV_w of services sector

COV12 = COV_w between agricultural sector and industrial sector

COV13 = COV_w between agricultural sector and services sector

COV23 = COV_w between industrial sector and services sector

Z1= Share of agricultural sector in the GDP of Odisha

Z2= Share of industrial sector in the GDP of Odisha

Z3= Share of services sector in the GDP of Odisha

The estimates of COV_w (Table 2) provide some interesting revelations, which have ramifications for inter-sectoral dependence in connection with regional development. The values of the COV_w between agriculture and industry, and industry and services turn out to be positive, while that between agriculture and services are negative. The positive values of COV_w provide evidences of possible complementarity effects between agriculture and industry, and industry

and services across the districts of Odisha. The districts experiencing higher income per capita in the industrial sector are prone to having higher income per capita in service sector. Similarly, districts registering higher income per capita in the agricultural sector are likely to have higher income per capita in the industrial sector. The negative value of COV_w between agriculture and services may, however, imply a movement of the value added from the former to the latter (Akita and Lukman 1995) in the context of Odisha.

Table 3: Share of each Sector in GSDP at Constant (2004-05) Prices during 1995–96 to 2010–11 (in %)

Year	Z1	Z2	Z3	Total
1995–96	32.96	31.72	35.33	100.00
1996–97	30.65	30.92	38.43	100.00
1997–98	32.86	29.26	37.89	100.00
1998–99	31.76	30.07	38.17	100.00
1999–00	28.11	31.91	39.97	100.00
2000–01	26.47	31.38	42.15	100.00
2001–02	29.14	28.66	42.20	100.00
2002–03	24.27	30.69	45.04	100.00
2003–04	25.85	31.00	43.16	100.00
2004–05	23.49	34.12	42.39	100.00
2005–06	22.97	33.14	43.89	100.00
2006–07	20.75	35.65	43.61	100.00
2007–08	19.57	37.73	42.70	100.00
2008–09	18.50	36.86	44.64	100.00
2009–10	19.07	34.32	46.61	100.00
2010–11	17.99	34.35	47.66	100.00

Source: Estimated from the data acquired from the DES, GoO
Note: Z1= Share of agricultural sector in the GDP of Odisha
Z2= Share of industrial sector in the GDP of Odisha
Z3= Share of services sector in the GDP of Odisha

In order to examine which of the three sectors contributes most to the overall CV_w, it may be worthwhile to investigate the share of each sector's contribution to the Odisha's total income. It is evident from the table 3 that there has been a declining trend in the share of agricultural sector in Odisha's total income from a high of 33 percent in 1995–96 to a meager 18 percent in

2010–11. Though the share of the industrial sector has recorded an increase from 31.72 percent in 1995–96 to 37.73 percent in 2007–08, there was an upheaval during the interim years. The contribution of industrial sector after 2007–08 has seen a gradual decrease to record only 34.35 percent in 2010–11. The share of the service sector has, however, increased significantly from a low of 35.33 percent in 1995–96 to a high of 47.66 percent in 2010–11. This clearly indicates a structural shift of the economy of Odisha from agriculture to services bypassing the industrial sector, which is, more or less, in line with the national scenario.

The estimation of the percentage share of each sector in the sectoral decomposition equation of CV_w (Table 4) suggests that the share of the industrial sector in the squared CV_w is overwhelmingly larger than that for the two other sectors. It was 72.68 percent in 1995–96, which, though declined to 63.14 percent in 2001–02, increased further to 74.32 percent in 2010–11 with some variations in between. A large share of the industrial sector indicates its significant role in the overall interregional disparities in Odisha. The service sector also plays an important role in determining the overall level of interregional disparities. Though its share has been declining gradually, still it remains much higher than that of the agricultural sector (26.51 percent and 20.20 percent in 1995–96 and 2010–11 respectively). In the beginning of the study period, the share of agriculture in squared overall CV_w was much lower than two other sectors (15.32 percent in 1995–96). Interestingly, its share has declined significantly over the years to reach a low of 1.70 in 2008–09 and then to rise marginally to 2.13 in 2010–11.

The share of the covariance term between industrial sector and service sector has been increasing steadily from 6.46 percent in 1995–96 to 13.74 percent in 2010–11, except a fall in the year 2002–03 to 7.93 percent. This increasing share reveals not only a shift in income from

the agricultural sector to the non-agricultural sector but also the complementarity nature of development of the industrial sector and services (Akita and Lukman 1995).

Table 4: Share of each Component in Weighted Coefficient of Variation during 1995–96 to 2010–11 (in %)

Year	CVS1	CVS2	CVS3	COVS12	COVS13	COVS23	Sum
1995–96	15.32	72.68	26.51	5.47	-26.45	6.46	100.00
1996–97	15.02	63.77	32.76	3.54	-24.82	9.72	100.00
1997–98	15.59	67.19	30.52	7.32	-27.49	6.86	100.00
1998–99	10.00	72.90	26.39	1.54	-18.94	8.11	100.00
1999–00	12.32	64.44	23.84	7.43	-18.94	10.91	100.00
2000–01	8.61	70.16	28.29	-0.47	-18.26	11.67	100.00
2001–02	10.05	63.14	30.60	4.45	-20.28	12.04	100.00
2002–03	6.82	66.60	28.00	4.02	-13.37	7.93	100.00
2003–04	5.81	70.37	23.61	3.14	-13.46	10.54	100.00
2004–05	3.04	76.14	16.94	0.57	-7.81	11.12	100.00
2005–06	3.00	73.31	18.99	1.80	-8.29	11.19	100.00
2006–07	2.25	73.86	17.33	2.14	-6.93	11.34	100.00
2007–08	1.83	76.77	14.74	0.95	-6.33	12.03	100.00
2008–09	1.70	76.46	15.06	1.99	-5.96	10.75	100.00
2009–10	2.61	76.18	17.71	0.73	-7.27	10.05	100.00
2010–11	2.13	74.32	20.20	-2.20	-8.19	13.74	100.00

Source: Estimated from the data acquired from the DES, GoO

Note: CVS1 = Share of CV_w for agricultural sector
CVS2 = Share of CV_w for industrial sector
CVS3 = Share of CV_w for services sector
COVS12 = Share of COV_w between agricultural sector and industrial sector
COVS13 = Share of COV_w between agricultural sector and services sector
COVS23 = Share of COV_w between industrial sector and services sector

5.4 Sectoral Incomes and Kuznets' Hypothesis

This study also attempts to examine if Kuznets' U-shaped hypothesis applies to each broad sector of the economy of Odisha. Interestingly, while industrial sector and service sector provide the evidences of inverted U-shaped relationship between sectoral incomes and regional disparities, in case of agriculture, no such clear relationship is imminent. The results are more and less robust across all the three measures of inequality.

Table 5: Estimated Values of Gini, Theil, CVw with Time and Income (robust) to test Kuznets' Hypothesis in Odisha during 1995–96 to 2010–11

Sectors	Inequality Measures	t	t^2	R^2 of Time Eqn.	y	y^2	R^2 of Income Eqn.	Turning Point (in INR)
Agricult-ure	Gini	0.0010	-0.0001	0.0081	-7.7033	0.4533	0.2650	4904.04
		(0.38)	(-0.39)		(-1.42)	(1.41)		
	Theil	0.0006	-0.00003	0.0066	-3.7031	0.2180	0.1585	4891.69
		(0.47)	(-0.42)		(-1.14)	(1.12)		
	CV_w	0.0017	-0.0001	0.0151	-19.7173*	1.1637*	0.2570	4778.75
		(0.35)	(-0.19)		(-1.79)	(1.77)		
Industry	Gini	0.0129***	-0.0001	0.9523	3.6961***	-0.2006***	0.9305	10005.05
		(3.40)	(-0.36)		(5.43	(-5.21)		
	Theil	0.0178**	-0.0001	0.9394	5.2690***	-0.2857***	0.9353	10110.13
		(2.89)	(-0.17)		(5.22)	(-4.98)		
	CV_w	0.04709***	-0.0011*	0.9486	12.5596***	-0.6908***	0.8929	8871.42
		(5.10)	(-1.98)		(5.90)	(-5.75)		
Service	Gini	0.0015***	-0.000004	0.9135	0.2862**	-0.0146**	0.9201	17677.88
		(3.04)	(-0.14)		(2.69)	(-2.49)		
	Theil	0.0015***	-0.0001***	0.8452	0.3095***	-0.0167***	0.8274	10565.66
		(6.22)	(-4.47)		(5.08)	(-4.99)		
	CV_w	0.0051***	-0.0002***	0.7811	1.0524***	-0.0571***	0.7452	9995.00
		(5.70)	(-4.67)		(4.55)	(4.51)		

Source: Estimated from the data acquired from the DES, GoO

Note: 1. Values in parentheses represent t-values;

2. ***, ** and * represent significance at 1%, 5% and 10% levels, respectively.

These findings further reaffirm that the aggregate regional income disparities in Odisha are largely attributable to the regional income disparities in industry and services. Moreover, as the patterns of growth-inequality linkage in these two sectors indicate a declining trend in regional disparities beyond a threshold level of income, there is a sign of a regional income convergence for the state through industrial and service sector development. It is also equally revealing to note that industry and services have reached the turning points, which suggests that any further growth in these two sectors is likely to create positive redistributive effects, leading to reduction in regional disparities in Odisha.

6. DISCUSSION

From the above results it is, by and large, established that Odisha experiences increasing regional disparities and absolute divergence in regional income distribution. As measures of σ-convergence, Gini coefficient, CV_w and Theil inequality index have proved that regional income disparities in Odisha are on the rise. The findings proved the prevalence of income divergence in Odisha, corroborating the findings of Dubey (2009).

In Odisha, higher economic growth seems to have benefitted the richer districts more than the poorer ones. As Azzoni (2001) argues, during the periods of faster growth, richer regions are likely to be better prepared than their poorer counterparts to face the growing demand. As the former host the most dynamic sectors in the productive structure, their production mix is likely to be more diversified. This could be true for the economy of Odisha as well.

The southern revenue division of Odisha is extremely backward, which is heavily dependent upon subsistence agriculture and government welfare schemes for sustenance, registering very low growth rate and per capita income. Consequently, the regional disparities within this division do not seem to be so imminent. In contrast, the northern and central divisions are relatively better-off both in terms of industrialization, agricultural growth and non-farm activities. Accordingly, they maintain high per capita incomes and high growth rates. However, the benefits of such growth do not seem to percolate down to all.

Interestingly, Odisha has witnessed a rise in intraregional disparities in its periods of boom and vice versa, indicating that growth rate and inequality move in the same direction (Terrasi 1999). In essence, it implies that growth fails to create the 'trickledown effect'; rather it tends to accentuate intrastate disparities. However, the true linkage between growth and regional

inequality in the context of Odisha can be found out from the measures of testing Kuznets' inverted U-shaped hypothesis, which is also attempted in the study.

From the preceding findings of the sectoral decomposition and regional inequality, the following important points emerge. Among all the three sectors, the industrial sector seems to be predominantly at fault in the accentuation of interregional income disparities in Odisha during the study period. Not only is the share of the industrial sector in overall regional income inequality the highest but also it is on the rise. Hence, any effort to reduce intrastate income inequality must find a remedy to the lopsided industrial development in Odisha. Besides, the share of the services to the state's GDP is on a constant rise and its share in the overall inequality is also quite high. Hence, measures to spread services across districts would also help overcome the rising regional income inequalities attributable to services. Moreover, the rising share of covariance terms between industry and services reveals the increasing importance of the non-agricultural sector in Odisha's development, thanks to their complementarities. It is also revealing to note that there is a sign of simultaneous growth between agriculture and industry, hence creating room for a synergistic impact of their mutual development. However, the rise in income in service sector tends to be substituted by the fall in income in agriculture.

The implications of these results for the economy of Odisha are mixed. On the one hand, the negative covariation between agriculture and services indicates a structural shift of the output from agriculture to services having no scope for positive co-movements and agricultural sector is likely to suffer as the service sector expands. On the other hand, one can develop a contrary viewpoint that the complementarity between agriculture and industry and then between industry and services eventually may lead to indirect linkages between agriculture and services. However, similar to the nature of the structural shift the Indian economy has experienced in recent decades,

as Odisha seems to have experienced a structural shift characterizing movement from agricultural sector to services bypassing industrial growth, the absence of positive covariation between agriculture and services is likely to be an area of concern for the state.

It is, however, interesting to note that the industry and services in Odisha experience Kuznets' U-shaped curve. Hence, it reaffirms that the regional income distribution depends to a great extent on the pattern of income distribution these two growing sectors of the economy set for themselves. Any effort to reduce regional income dispersion must emphasize on the equitable distribution of these two sectors.

7. CONCLUSION

This study examined the trends in intrastate income disparities and the role of three broad sectors of the economy of Odisha in the overall regional income dispersion by evaluating the growth performance and convergence in income per capita across the districts of Odisha during 1995–96 to 2010–11. The study drew its results by estimating σ-convergence based on Gini coefficient, CV_w and Theil inequality index of income per capita across the districts of Odisha. Districts were considered as underlying regional units to measure regional income inequality. Though the study failed to address the intrinsic problems associated with the measures of regional inequality based on income per capita as the income dispersions within a regional unit is not estimated, it provided an insight into the inter-district inequalities and inequalities across the sectors for a backward state like Odisha.

A sectoral decomposition analysis was also carried out to explore the extent to which each sector contributed to the overall regional income disparities across the districts of Odisha during the study period. The extent and direction of covariations between sectors in the overall inequality were also examined. The estimates of sectoral decomposition of income inequality

indicated that the intrastate income dispersion for agricultural sector was more or less stable in the entire study period except an erratic behavior of 1999–2000. Similarly, the inequality estimates for the service sector also indicated more or less a stable behavior. However, the industrial sector exhibited an increasing trend in income disparities, registering a more prominent trend in recent years.

The COV_w between agriculture and industry, and industry and services was positive, while that between agriculture and services was negative. A positive COV_w signifies a possible complementarity between agriculture and industry, and industry and services across the districts of Odisha. To be specific, the districts registering higher per capita income in industrial sector have the tendency to achieve higher per capita income in service sector, and those experiencing higher income per capita in agricultural sector are also likely to attain higher income per capita in industrial sector. Contrarily, a negative COV_w between agricultural and service sector may signify a shift in income from the former to the latter.

The results ascertained the significance of industrial sector disparities towards overall regional income disparities in Odisha. Services were also found to be critical, though not as much as industrial sector was. Moreover, as the pattern of growth in these two sectors indicated a declining trend in regional income disparities beyond a threshold level of sectoral income, it provided indications of regional income convergence for the state through industrial and service sector development. As both industry and services have reached the turning points, any further growth in these two sectors is likely to create positive redistributive effects. Needless to say, of late, Odisha has been onto the path of industrialization, thanks to the concerted efforts of the government in that direction. Ironically, the industries are located in select districts of the state and so are the organized services, contributing to its lopsided growth. In the face of continued

complementarity between industries and services, the state often experiences simultaneous proliferation of industries and services in some specific regions of the state. In order for the state to realize balanced regional development, it may be necessary to bring about regional balance in the distribution of industries and services across the state.

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