



RELATIVE PERFORMANCE AND FISCAL POSITION OF DISTRICTS IN THE INDIAN STATE OF ODISHA

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In this paper, we focus on relative performance of districts in the Indian state of Odisha so far as development parameters are concerned and compare these to their relative fiscal position. We resort to Data Envelopment Analysis (DEA) for this. To our knowledge, this is the first study to employ DEA to analyse Odisha's districts on these dimensions.

There have been a lot of studies around the world applying DEA for analyzing inter- region disparities and also using it to rank the regions. At this point, we are reluctant to resort to DEA for ranking. We use it only for comparing comparable districts that are brought out by the DEA analysis output. These comparisons have important policy implications.

Section I reviews existing literature and pinpoints the objective of this paper: Section II describes the data and Section III methodologies. Section IV presents the findings, while Section V concludes.

I: Literature Review

Ranking of regions has always interested researchers. There are numerous studies in the world on this dimension. India has been exception. In of the early studies, CERPA(1971), using 1971 data for Indian states and their districts, ranked districts within each state. But, here, the ranking was based simply on an overall score which equals the sum of scores on various parameters.

Some studies have focused on the state of Odisha. Meher (2002) has developed an infrastructure development index for the districts of Odisha based on 2000-2001 data for Transport, Energy, Irrigation, Banking, Communication, Education, and Health. Mishra (2010) categorizes Odisha districts into mining, KBK, industrial, and non-industrial categories and evaluates their relative performances in agriculture, industry, and mining, while Mishra and Mishra (2014) compare these four categories on some health-related parameters. Tripathy, Das and Padhi (2011) rank districts by focusing on development indices pertaining to" agriculture, industry, infrastructure, and human-resource and weighing them using the Sudarsan Iyengar two- stage weighing scheme. Nayak (2014a) uses 2001 data and PCA technique to analyse inter- regional disparities in rural infrastructure, broken down into three groups: physical, social, and financial. PCA identifies factors that explain variation in district-level indicators and factors weighted-average is used to construct an index for each of the three groups; a rural infrastructure index is derived from the three group indices and is used to rank the districts. Nayak (2014b) follows a similar approach to study the impact of rural infrastructure on cropping-intensity. Comparison of Odisha's districts across different dimensions are presented in Nayak, Panda, and Pattanaik (2016) by various researchers.

Some researchers have applied DEA for inter-entity (inter-region, inter-district, inter- organization) comparison in India. Most of the studies have in the area of education and health and some in agriculture. Some have used DEA to rank the entities, typically districts. But, to our knowledge, there has been no study applying DEA for inter-districts comparison in Odisha, especially for the three sectors we are focusing on or for overall development. That is what we intend to do in this paper. That inter-district analysis also leads us to investigate whether central and state funding bears any relation to the efficiency of the districts and their resource needs.

II: Data

We gather data on various aspects of Odisha. Our focus is on following dimensions: health and agriculture. Though we look at a lot of data-points for each dimension, we select only specific ones that we think best meets our research need. They are collected from government departments and databases, mainly Economic Surveys and Statistical Abstracts. We take the data for or at the end of 2010-2011, as the case may be. For central and state budgets we use the 2013-2014 data to allow some policy lags. If 2010-2011 year is not available for the other variables, the closest year for which it is available is taken. Here are the variables we have chosen for each district for the three sectors and the overall development.



Health: Total Number of Patients Treated, Number of Hospitals, Number of Health Sub- centres, Number of Private Hospitals, Number of Beds, Number of Doctors, Number of Beds, Population

Agriculture: Net Agriculture District Domestic Product, Area, Density, Rural Population, Total Rural Participation Percent, Total Number of Workers, Net Area Sown, Gross Cropped Area, Cropping Intensity, Area Irrigated , Population

Overall Development: Net District Domestic Product, Geographical Area, Total Number of Workers, Consumer Expenditure, and Gross Irrigated Area, Cropping Intensity, Number of Literates, Population.

III. Methodologies

The path-breaking work by Farnell (1957) in measuring efficiency of DMUs (decision making units) led to the development of DEA by Charnes, Cooper, & Rhodes (1978). It is an extension of standard linear-programming. Being non-parametric, it does not require or pre- suppose a specific input-output function. Based on the set of inputs and outputs across various entities, it determines efficiency of each entity and then compares it to that of a similar entity and not to the average one. It does not require the researcher to pre-specify weights for different inputs or outputs. But, to the extent that the researcher has to select the set of inputs and outputs, the implications are conditional upon that choice set. Moreover, the researcher has also got to pre-specify which are inputs and which are outputs. Here, however, there is some leeway. One can take a specific variable as input in one analysis and output in another; analysis of the output should throw some light on whether the variable is better suited as an input or output.

For our study, each unit is a district. We take various input and output characteristics of a sector across the 30 districts of Odisha and analyze them through DEA. We look at two sectors: health and agriculture. We then ferret out relationship between district efficiencies based on parameters from these three sectors and state and central funding they have received during 2013-2014.

IV: Findings

Table- I and Table-2 present DEA output for health sector. Our focal point is the Number of Patients Treated. Looking at the efficiency, we find that Baragarh, Debagarh, Dhenkanal, Kendrapada, Mayurbhanj, Nayagarh, and Sambalpur are the only districts which are at optimal efficiency. We would like to stress again that it does not mean that they are doing the best in health; all that it says is that, in a relative sense, they are using their inputs most efficiently to achieve the highest Number of Patients Treated possible. But, it does mean that each other district should be compared to only one or more of these above-cited efficient districts. These comparable districts – or peers as they are called - vary from district to district. For example, Balangir should be compared to Baragarh, Dhenkanal, and Nayagarh, while Jharsuguda only to Baragarh but not Dhenkanal and Nayagarh. Now, if we count peers for each district, we recognize that Nayagarh appears the highest number of times as a peer. So, one should analyze in details how this district is using its medical resources to achieve the highest relative efficiency.

Output targets highlight another aspect. For instance, Anugul's target for Number of Patients Treated – assuming importantly that its people are as healthy or unhealthy as that of the comparable districts - should be 1030463, while its current figure is only 650128, which is a meager 63.1 %. That is why its efficiency, as the Table shows, is only 63.1%, unlike Baragarh, which has 100% efficiency. In fact, if we look at Anugul 's input targets, we see that it requires 6 less medical sub-centres, 20 less private hospitals, and 215 less number of beds, but the number of hospitals and doctors are at the right levels. As we should expect, however, for the efficient district of Bargarh, all inputs are at the right levels.

Table-3 and Table-4 present results for the agriculture sector. Here, we find Baleswar, Bhadrak, Balangir, Cuttack, Ganjam, Jagatsinghapur, Kalahandi, Kandhamal, Kendujhar, Koraput, Mayurbhanj, and Sonepur are the efficient districts. Thus, there is no overlap with the health-wise efficient districts. So, at least in our sample, efficiency in agriculture sector is independent of efficiency in health sector.



Table-5 presents results for the overall development analysis. This suggests that efficient districts are Anugul, Bhadrak, Balangir, Ganjam, Jharsuguda, Kandhamal, Kendujhar, Khordha, Koraput, and Sundargarh. It is interesting to note that some of the agriculturally efficient districts are in this set, but none of the health-wise efficient ones. Does that mean that health sector is not important for overall development? Perhaps not.

To relate overall efficiency gaps to central and state budget, we took correlation between output gap, the difference between target output and the current output, and find that central and state budget is not at all related to it. That central and state budgets are related reasonably highly to the district domestic product makes it clear that budget – and perhaps funding too – is given to the 'richer' districts and not to those that need funds to achieve the higher target output. But, more analyses are required along this line by taking district-wise sectoral allocation of funds.

V: Conclusion

In this paper, we employ DEA (data envelopment analysis) to engage in inter-district analysis of Odisha's 30 districts in agriculture and health sector. We also do inter-district analysis for overall development and liken this to the state and central budgets for the districts. We observe that districts that are 'efficient' in health are not efficient in agriculture and vice versa. Interestingly, some of the agriculture-efficient districts are also overall-efficient, but none of the health-efficient district is overall-efficient. We also look at the overall development efficiency and find that central and state budgets are reasonably highly correlated to the level of district development product, not to the need for funds to achieve the ideal level of output and efficiency.

Table 1 (Summary: Health Sector)

District	Technical Efficiency	Peer Districts	No of Patients Treated	Potential No of Patients to be Treated	Gap
Angul	0.631	Nayagarh Kendrapara	650, 128	1,030,463	380,335
Balasore	0.400	Dhenkanal Nayagarh Bhadrak	783,644	1 ,960,824	1,177,180
Baragarh	0.682	Dhenkanal Kendrapara	902,536	1,323,688	421 ,152
Bhadrak	1.000	Bhadrak	1,315,249	1,315,249	0
Bolangir	0.351	Dhenkanal Kendrapara	516,096	1,469,22 1	953, 125
Boudh	0.730	Kendrapara Deogarh Nayagarh	243,428	333,533	90, 105
Cuttack	0.846	Sambalpur Nayagarh	1,716,985	2,030,526	313,541
Deogarh	1 .000	Deogarh	221 ,874	221 ,874	0
Dhenkanal	1.000	Dhenkanal	1,176,527	1,176,527	0
Gajapati	0.730	Kendrapara Nayagarh	419,711	574,781	155,070
Ganjam	0.725	Sambalpur Nayagarh	2,079,542	2,867,410	787,868
Jagatsinghpur	0.505	Kendrapara Nayagarh	51 1,423	1,012,714	501,291
Jajpur	0.920	Kendrapara Dhenkanal Bhadrak Nayagarh	1,472,586	1,600,369	127,783
Jharsuguda	0.430	Bhadrak	209,634	487,677	278,043
Kalahandi	0.283	Kendrapara Nayagarh Bhadrak	479,269	1,693,424	1,214,155



Kandhamal	0.966	Deogarh Nayagarh	854,756	884,659	29,903
Kendrapara	1.000	Kendrapara	1,181,859	1,181,859	0
Keonjhar	0.582	Kendrapara Nayagarh	991,430	1,704,418	712,988
Khurda	0.547	Bhadrak	816,177	1,492,586	676,409
Koraput	0.617	Kendrapara Nayagarh	728,461	1,180,740	452,279
Malkangiri	0.765	Kendrapara Nayagarh	503,925	658,681	154,756
Mayurbhanj	1.000	Mayurbhanj	2,346,925	2,346,925	0
Nabarangpur	0.506	Kendrapara Nayagarh	523,293	1,033,975	510,682
Nayagarh	1.000	Nayagarh	1,169,115	1,169,115	0
Nuapada	0.092	Kendrapara Deogarh Nayagarh Bhadrak	56,669	615,898	559,229
Puri	0.841	Nayagarh Sambalpur	1,314,243	1,562,315	248,072
Rayagada	0.457	Kendrapara Nayagarh	462,339	1,011,539	549,200
Sambalpur	1.000	Sambalpur	1,183,354	1,183,354	0
Subarnapur	0.971	Dhenkanal Kendrapara	497,226	512,323	15,097
Sundargarh	0.567	Sambalpur Nayagarh	1,274,542	2,247,978	973,436

Table 2 (Input Slake: Health Sector)

District	No of Hospitals	Medical Sub-Centres	Private Medicals	No of Beds	No of Doctors	Population
Anugul	0	6	20	215	0	315029
Balangir	0	0	8	0	30	401997
Baleshwar	6	0	24	0	16	73394
Bargarh	0	0	0	0	0	0
Baudh	9	0	43	0	39	88101
Bhadrak	0	6	0	5	0	0
Cuttack	0	44	480	5424	0	928589
Debagarh	0	0	0	0	0	0
Dhenkanal	0	0	0	0	0	0
Gajapati	12	41	1	179	0	0
Ganiam	0	54	0	252	1	1123130
Jagatsinghapur	1	7	11	0	24	0
Jajapur	0	0	0	0	25	186549
Jharsuguda	1	0	7	89	15	20976
Kalahandi	6	0	104	36	0	0
Kandhamal	34	46	0	138	16	0



Kendrapara	0	0	0	0	0	0
Kendujhar	21	59	1	0	12	0
Khordha	1 1	·o	1 60	3421	12 .	542234
Koraput	26	88	31	0	1 5	0
Malkangiri	1 8	56	3	0	1 2	0
Mayurbhanj	0	0	0	0	0	0
Nabarangapur	14	95	1	298	0	0
Nayagarh	0	0	0	0	0	0
Nuapada	3	0	0	74	0	0
Puri	0	19	16	0	1 9	405871
Rayagada	23	74	4	1 52	0	0
Sambalpur	0	0	0	0	0	0
Sonapur	1 0	0	9	0	20	24231
Sundargarh	0	71	31	445	0	239598

Table 3 (Summary: Agriculture Sector)

District	Technical Efficiency	Peer Districts	Agriculture NDDP (In Rs lakh)	Potential Agri NDDP	Gap
Angel	0.609	Cuttack Bolangiri Kandhamal Balasore	43.382	71,177	27,795
Balasore	1.000	Balasore	80.904	80,904	0
Baragarh	0.928	Subarnpur Bolangir kandhamal	79.218	85,367	6,149
Bhadrak	1.000	Bhadrak	50.449	50,449	0
Bolangir	0.768	Bolangir	94.662	94,662	0
Boudh	1.000	Subarnapur Bolangir Kandhamal	25.774	33,542	7,768
Cuttack	1.000	Cuttack	75.010	75,010	0
Deogarh	0.555	Subarnapur kandhamal bolangir	15.364	27,680	12,316
Dhenkanal	0.854	Kandhamal cuttack jagatsinghpur bolangir subarnapur	49.575	58,011	8,496
Gajapati	0.729	Jagatsinghpur Cuttack Kandhamal Subarnapur Bolangir	30.816	42,268	11,452
Ganjam	1.000	Ganjam	99.824	99,824	0
Jagatsinghpur	1.000	Jagatsinghpur	46.668	46,668	0
Jaipur	0.887	Cuttack bolangir bhadrak jagatsinghpur	47.777	53,873	6,096
Jharsuguda	0.553	Jagatsinghpur subarnapur kandhamal bolangir	13.849	25,035	11,185
Kalahandi	1.000	Kalahandi	91.986	91,986	0



Kandhamal	1.000	Kandhamal	68.328	68,328	0
Kendrapara	0.924	Bolangir Jagatsinghpur Balasore Cuttack	51.411	55,612	4,201
Keonjhar	1.000	Keonjhar	84.066	84,066	0
Khurda	0.893	Bolangir kandhamal cuttack jagatsinghpur	43.745	48,975	5,230
Koraput	1.000	Koraput	88.900	88,900	0
Malkangiri	0.766	Subarnapur kandhamal bolangir	41.270	53,899	12,628
Mayurbhanj	1.000	Mayurbhanj	89.298	89,298	0
Nabarangpur	0.827	Jagatsinghpur bolangir cuttack kandhamal	54.359	65,748	11,389
Nayaghar	0.768	Kandhamal cuttack jagatsinghpur bolangir	38.548	50,171	11,623
Nuapada	0.784	Subarnapur kandhamal bolangir	35.326	45,087	9,761
Puri	0.942	Subarnapur jagatsinghpur balasor kandhamal cuttack	56.883	60,366	3,482
Rayagada	0.752	Balasore kandhamal bolangir subarnapur	52.954	70,388	17,434
Sambalpur	0.687	Kandhamal subarnapur bolangir	44.924	65,362	20,438
Subarapur	1.000	Subarnapur	44.985	44,985	0
Sundargarh	0.824	Bolangir kandhamal	62.940	76,382	13,442

Table 4 (Input Slack: Agricultural Sector)

District	Area (sq km)	Density	Rural Population	Total Rural Participation	Total Workers	Net Sown Area (000 Hectares)	Gross Cropped Area	Cropping Intensity (%)	Area Irrigated (000 Hectares)	Population
Angul	0	0	68153	0	160088	0	31	23	6	118825
Balasore	0	0	0	0	0	0	0	0	0	0
Baragarh	0	0	5008	8	409806	0	14	2	50	30760
Bhadrak	0	0	0	0	0	0	0	0	0	0
Bolangir	0	0	0	0	0	0	0	0	0	0
Boudh	0	57	25353	27	256387	2	8	85	0	0
Cuttack	0	0	0	0	0	0	0	0	0	0
Deogarh	0	47	7608	33	0	14	16	85	0	0
Dhenkanal	0	0	108390	4	50428	0	16	41	0	0
Gajapati	0	0	1306	22	67161	0	20	89	0	0



Ganjam	0	0	0	0	0	0	0	0	0	0
Jagatsingh pur	0	0	0	0	0	0	0	0	0	0
Jajpur	0	174	549930	0	76555	0	26	40	0	420291
Jharsugud	0	176	0	33	96137	6	0	85	0	188417
Kalahandi	0	0	0	0	0	0	0	0	0	0
Kandhama l	0	0	0	0	0	0	0	0	0	0
Kendrapar	0	40	97400	0	7026	0	25	35	4	0
Keonjhar	0	0	0	0	0	0	0	0	0	0
Khurda	0	315	252646	0	285748	0	18	30	0	121428
Koraput	0	0	0	0	0	0	0	0	0	0
Malkangir	0	0	10400	11	7866	42	78	33	9	0
Mayurbha ni	0	0	0	0	0	0	0	0	0	0
Nabaram pur	0	0	192502	13	298728	0	8	17	0	160163
Nayagarh	0	0	85547	6	50276	0	30	65	0	18478
Nuapada	0	21	28546	17	70276	54	90	46	0	0
Puri	0	0	125071	0	0	0	46	44	7	180293
Rayagada	0	0	12089	3	136205	0	4	0	4	62748
Sarnbalpu r	0	28	0	8	166343	40	57	0	24	222723
Subamapu r	0	0	0	0	0	0	0	0	0	0
Sundargar h	355 2	35	284985	5	553268	50	39	0	0	882181



Table 5 (Overall Development)

Districts	Technical Efficiency	Peer Districts	Total NDDP (in Lakh)	Potential NDDP	Gap
Anugul	1.000	Angul	475152	475152	0
Balasore	0.725	Khurda Sundargarh	443514	611699	168185
Baragarh	0.559	Bhadrak Jharsuguda Khurda Koraput Sundargarh	274480	491304	2824
Bhadrak	1.000	Bhadrak	260708	260708	0
Bolangir	1.000	Bolangir	380757	380757	0
Boudh	0.443	Khurda Jharsuguda	94673	213897	1 19224
Cuttack	0.982	Khurda Ganjam	760724	774994	14271
Deogarh	0.429	Jharsuguda Kandhamal	60469	140956	80487
Dhenkanal	0.601	Khurda Kandhamal Jharsuguda Sundargarh	273761	455587	181 827
Gajapati	0.626	Kandhamal Bhadrak Jharsuguda	124724	199362	74638
Ganjam	1.000	Ganjam	802899	802899	0
Jagatsinghpur	0.684	Khurda Jharsuguda	278236	406958	128722
Jajpur	0.652	Jharsuguda Khurda Kandhamal	391977	601098	209121
Jharsuguda	1.000	Jharsuguda	282255	282255	. 0
Kalahandi	0.687	Khurda Kandhamal Bhadrak Koraput	302744	440502	137757
Kandhamal	1 .000	Kandhamal	296307	296307	0
Kendrapara	0.463	Khurda Kandhamal Jharsuguda	247623	5_34369	286746
Keonjhar	1.000	Bhadrak Sundargarh Khurda KandhamalKoraput	519454	519678	224
Khurda	1.000	Khurda	776912	776912	0
Koraput	1 .000	Koraput	343788	343788	0
Malkangiri	0.498	Bhadrak Kandhamal	95192	191056	95864
Mayurbhanj	0.846	Ganjam Sundargarh	478557	565447	86890
Nabarangpur	0.578	Bhadrak Kandhamal Khurda Koraput	177620	307196	129575
Nayagarh	0.406	Khurda Kandhamal Jharsuguda	156211	384660	228449
NuapaCJa	- 0.524 .	Bhadrak Kandhamal Jharsuguda	116869	222820	105951
Puri	0.537	Khurda Kandhamal Jharsuguda	327026	608700	281675
Rayagada	0.717	Bhadrak Kand hamal Khurda Koraput	203913	284304	80391
Sambalpur	0.789	Angul Kandhamal Jharsuguda Sundargarh	315397	399721	84324
Subamapur	0.432	Bhadrak Kandhamal Jharsuguda Khurda	115355	266758	151403
Sundargarh	1 .000	Sundargarh	610675	610675	0