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MULTIDIMENSIONAL POVERTY AMONG SOCIAL GROUPS IN KERALA AND BIHAR: A DECOMPOSITION ANALYSIS

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Abstract: This paper aims to analyse the incidence and magnitude of multidimensional poverty among various social groups in two states of India — Kerala and Bihar — through the capability approach using household-level primary data. These regions are placed in the extreme positions in Human Development Index (HDI) ranking and growth trajectory in India. Incidence, intensity, and Multidimensional Poverty Index (MPI) of the social groups are estimated using the methodological framework of Oxford Poverty and Human Development Initiative (OPHI) and analysed within the human development framework. Decomposition of MPI reveals a disproportionate burden of incidence and proportional intensity of multidimensional poverty among Scheduled Tribe (ST) households in Kerala and Bihar, irrespective of their attainment in human development. In multidimensional analysis of poverty, deprivation of ST households alone explains more than half of all people's deprivation in Kerala. The paper highlights the influence of social identity of households and their inadequate attainment of elementary functionings such as education, health, and standard of living on the deprivation of social groups leading to unequal human development outcomes of the regions.

Keywords: Multidimensional poverty, Deprivation, Human development, Social groups, Capabilities, Social identity

Introduction

The incidence of poverty is generally assessed by a shortfall of financial resources of households relative to the official norms. However, the efficiency of the broadly accepted income-based poverty estimates in revealing the deprivation of 'elementary functionings' of people, namely education, health, and standard of living, is being debated widely. It is also argued that income is the only 'means' of an individual to attain people's 'valuable ends'. The well-being of individuals depends not only on the income they have but also on the 'capabilities' of people in achieving their valued 'functionings' with their given level of income. Unlike the traditional income-based approach of poverty analysis, the present study follows the 'capability approach' developed by Amartya Sen as an alternative paradigm.

Sen (1981) argues that utility-based evaluations of an individual's well-being might not reveal

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essential dimensions of life and could result in misleading inter-personal comparisons. Sen (1985) observes that people and societies differ in converting income and commodities into preferred outcomes. The essential facets of poverty are its multidimensionality and continuous evaluation, as its determinants vary across countries and within the region of the same territory (Baiju and Sivaraman, 2018). This intellectual exercise of poverty analysis aims to find those determinants (subsets of commodities) required to satisfy people's basic needs. According to Sen (1981), 'basic capabilities' is the ability to meet certain crucial 'functionings' minimally to an adequate level. The present discussion on multidimensional poverty relies on the basic capabilities and its levels among the households belonging to various social groups classified by the National Sample Survey Organization (NSSO) in India, viz., Scheduled Castes (SC), Scheduled Tribes (ST), Other Backward Communities (OBC), and General Castes (GC). A study on inter-state inclusiveness in India measured rural/urban mean and median per-capita consumption levels and revealed that the more affluent income groups experienced an increase in income and consumption at higher rate than the poor ones (UNDP, 2011). Social groups further highlight that the STs are the most impoverished community, followed by the SCs, OBCs and GCs, respectively. The economic status profile of the social groups in different states could differ from the one obtained at the national level as there is heterogeneity in size and economic environment (Suryanarayana and Das, 2014). The sample comprised households in the selected regions, Kerala and Bihar, the two states, placed at the top and bottom positions in India's human development ranking. These states more or less show the same pattern in the economic growth performance among the Indian states.

Education, health, resources, and freedom are the basic requirements in human life, which help an individual to achieve his 'valued functionings'. Human poverty exists in a society where people's choices are limited, leading to capability failure. According to Sen, human development is enlarging people's choices and raising the level of well-being achieved. Therefore, poverty can be perceived as the denial of opportunities and options, namely 'to lead a long and healthy life', 'to be educated', and 'to enjoy a decent standard of living' which are basic to the process of human development (UNDP, 2014). In the human development framework, poverty reduction is assessed through the changes in the disadvantages of the deprived people belonging to all groups in each community (UNDP, 2018). Empirical studies on poverty deal with various aspects of poverty, including measurement of poverty, the extent of the shift in poverty, identification of the poor, and inconsistency between official estimates and other estimates of poverty (UNDP, 2019). Caste discrimination has become one of the enabling factors in explaining the intensity of poverty in India (Ray and Lancaster, 2005).

Poverty statistics of India underlines this fact as the incidence of poverty is very high among the households belonging to SCs, STs, and other backward communities in India (Government of India, 2011). Further, it is supplemented by the incidence of wealth inequality as a few people in India holds a major portion of the wealth of the country. For instance, 20 per cent of people at the bottom in India get only 8.1 per cent of national income in contrast to the top 20 per cent of people who hold 45.3 per cent of national income (HDR, 2008). The Oxfam data 2019 on inequality further reveals that 73 per cent of India's Gross Domestic Product (GDP) is held by merely one per cent of people in India. The significant proportions of the bottom 20 per cent of the income ladder by social groups belong to the socially and economically backward communities, viz., SCs, STs and OBCs. Hence, the present paper aims at a decomposition analysis of multidimensional poverty of the selected social groups residing in Kerala and Bihar, to elicit the 'deprivation gap' and the 'indicator specific' intensity of deprivation. This would enable the policymakers to identify the particular indicator for intervention at the micro-level through a capability approach using household-level primary data. Incidence, intensity, and Multidimensional Poverty Index (MPI) of

social groups are estimated using the methodological framework of the Oxford Poverty and Human Development Initiative (OPHI) and analysed within the human development framework.

Poverty as Capability Failure

The process of the enlargement of 'choices of people' includes the provision of adequate social opportunities through which individuals can shape their destiny and help each other (Sen, 1999). It provides the role of multiple agents who are obliged to provide opportunities, and the actual agency of each individual is responsible for the proper use of all opportunities. The theory establishes a two-way relationship between the social, economic, and political arrangements that expand freedoms and the use of individual freedom to improve the respective lives and enable these arrangements to make appropriate and effective. The outcomes of development are relative to the 'process' involved (Sen, 1985).

The capability theory of Sen states that human development involves 'freedoms from' and 'freedoms to'. Sen defines 'capability' as the individual freedom to achieve 'functionings' such as good nourishment, good health, education, self-respect, and social integration (Sen, 1997). To ensure 'freedom to choose resources such as income, education, and food, the abilities to use these commodities and resources are needed. Sen envisages the type of freedom as positive freedom, i.e., the capacity to do this or be that, in contrast to negative freedom or 'freedom from' constraints. The multiple agents involved in this process should reframe from interferences that generate harmful consequences and act positively to create, provide, and expand freedom enhancing opportunities qualitatively (Sen, 2002).

The outcome of the human development process is the continuous expansion of the agency of each individual. An expanded agency is capable of exerting informed choices (Sen, 2004). The Capability Theory distinguishes between the 'means' and 'ends' of the well-being of people and development. In this approach, the 'ends' have only intrinsic importance, whereas 'means' are instrumental in realising better well-being and development. The 'ends' of well-being and development should be conceptualised in terms of the capabilities of people to 'function'. It implies effective opportunities for people to understand the action and activities they want to engage in. Sen calls these 'beings' and 'doings' as 'functionings'. That includes working, being educated, being healthy, being part of society, and being respected. These 'functionings' together make the life of an individual valuable. According to Sen, the people have the freedom or capabilities to live the kind of life they want to lead, do what they want to do, and be the person they want to be (Alkire, 2003). Once the individuals effectively have these substantive opportunities, they can choose the options they value most (UNDP, 2015).

Dimensions of Multidimensional Poverty

The present study follows all the theoretical dimensions of capability theory, namely, personal, social, and environmental, which determine individuals' capability. Sen explains development as an expansion of individuals' abilities, which is the prime requisite for human development. The purpose of development is the improvement of human lives by expanding the range of things that a person can 'be' and 'do' (UNDP, 2017). It includes the basic dimensions of human life, namely, education, health, and standard of living (Alkire, 2002). In this perspective, development should remove the obstacles of human lives such as illiteracy, ill health, and lack of access to resources. It emphasizes assessing effect by expanding capabilities of all people belonging to different socio-economic groups (UNDP, 2018). It pinpoints that the monitoring of development limits through the national averages of income dimension and the measures of deprivation (Sen, 1992). Even

though some capabilities require greater public intervention, the relative importance of capabilities varies with social and spatial context. Therefore, the present study chose basic dimensions of human life, namely education, health, and standard of living to explore the determinants and correlates of multidimensional poverty among the people belonging to different social groups (social context) across the selected regions of India (spatial context). The study incorporates ten 'indicators' corresponding to the three basic dimensions of human life: education, health, and standard of living (Alkire, 2005). All indicators corresponding to each dimension are the proxies for human capabilities, and its deprivation is termed as poverty. The dimensions and indicators used in the study are summarized in Table 1.

Table 1: Dimensions and Indicators of Multidimensional Poverty

	Dimensions		
	Education	**Health**	**Standard of Living**
Indicators	Years of Schooling	Nutrition	Cooking Fuel
	School Enrollment	Child Mortality	Sanitation
			Clean Drinking Water
			Electricity
			Housing (Floor)
			Asset Ownership

Source: Alkire et al. (2011)

Education and Multidimensional Poverty

Education is the most critical dimension in human development paradigm. Better education is an important means to better job, income, and better quality of life. The investment in education helps the country to transform its population into human capital, which in turn accelerates the economic and human development of the country. Education helps an individual to get wider opportunities to enlarge his functionings. Deprivation in education is the major cause for multidimensional poverty (UNDP, 2010). Hence, 'education' is taken in this study as an important dimension of human development and multidimensional poverty. There are two indicators namely 'years of schooling' and 'school enrollment' selected to examine the deprivation in education. 'Years of schooling' indicates the period of time an individual spends for education. This is an important indicator that can be used to understand the basic 'functionings' of an individual 'to be educated'. Inability to complete five years of schooling is considered as deprivation in this indicator corresponds to the dimension, education. Another indicator used in this study to examine the deprivation in education is 'school enrollment'. The status of school-aged child (i.e., children between the age groups 6 and 13) is considered to examine the deprivation in this indicator corresponding to the dimension called education. A child of a family belonging to the age group of 6-13 who is neither enrolled nor attending school is considered deprived in the dimension of education.

Health and Multidimensional Poverty

Health is also a critical dimension of human development and multidimensional poverty. In this dimension, two indicators are taken into account to analyze the deprivation in health. *Malnutrition* and *child mortality* are used to examine the health status of the family. To analyze malnutrition of the individual, age-specific indicators are used. Those indicators are *height-for-age* (stunted), *weight-for-age* (underweight) and *weight-for-height* (wasted). If any one of the family members belongs to this category of malnutrition, that member will be considered as deprived in the indicator *nutrition*

corresponding to the dimension called health. Child mortality is yet another indicator used to examine the deprivation. The case of either *infant mortality* or *under five child mortality* in the family is considered as deprivation in health.

Standard of Living and Multidimensional Poverty

Poverty is the inability of an individual to lead a desired standard of living. In the human development framework six indicators are used to examine the deprivation in this dimension. Nature of *cooking fuel*, facilities for *sanitation*, access to *clean drinking water,* facilities for lighting (electricity), quality of the *floor of the house*, and *ownership of assets* of the family are the select indicators to examine the deprivation in the standard of living of the households. Use of *dung*, *wood*, or *charcoal* for cooking food is considered deprivation in this indicator. If the family is either sharing sanitation facility with other families or using traditional sanitation facilities are considered as deprivation in the indicator, sanitation. Access to clean drinking water is considered as an important indicator of human life and the standard of living. Either unavailability of clean drinking water or long distance (30 minutes of walk) to the source of clean drinking water from the house is considered as deprivation in this indicator. Proper lighting facility is an important indicator of the quality of life of the family. A household without an electricity connection is considered deprived of electricity. The quality of the floor of the house is one of the determinants of the standard of living. In this framework, the floor made of dirt, sand, or dung is considered deprived in this indicator. Ownership of assets is another determinant of standard of living. Lack of own vehicle (at least two-wheeler), information devices (radio, television, phone), etc. are considered as deprived.

Methodology

Method Adopted

The descriptive survey method is used in the study to analyse the incidence and intensity of deprivation with a decomposition analysis in the framework of the Multidimensional Poverty Index.

Population and Sample

The broad classification of social groups of Kerala and Bihar as per the NSSO classification forms the population. This descriptive cross-sectional study mainly relies upon the primary data collected through multi-stage random sampling. Initially, two regions in India—Kerala (0.7) and Bihar (0.3)—are selected from among *High HDI states*, and *Low HDI states*, respectively. In the second stage of sampling, two districts each were selected from these two states with district-level values of the respective indicators of MPI closer to the states' averages. Likewise, at the third stage, a block from each selected district was taken. In the fourth stage, following the indicators published in Primary Census Abstract (Government of India, 2011), one village each was selected at random from the selected blocks having due representation of all social groups namely SC, ST, OBC and GC. From each chosen village, an equal number of households from the four major social groups were randomly selected.

A random sample of 60 households each from the social groups namely SC, ST, OBC and GC from the selected village of the blocks chosen from the two districts each from the selected states Kerala and Bihar. That is, a sample comprising 480 (i.e., 2 x 240) households from each state making the total sample size 960 (i.e., 2 x 480) households.

Data Collection Instruments

A pretested schedule was used for the household survey. The NSSO household schedule 1.0 (consumer expenditure) and deprivation indicators of the Multidimensional Poverty Index of OPHI formed the basis of the schedule prepared for this cross-sectional survey. In addition, secondary sources like the District Census series and primary census abstract of Kerala and Bihar, UNDP Global Human Development reports, National Family Health Survey reports and various Economic surveys of the Government of India were also used.

Framework of Analysis

The MPI is a measure of acute global poverty developed by the OPHI, which has been subsequently introduced by the United Nations Development Programme (UNDP) in its Human Development Report (HDR, 2010). The index belongs to the family of measures developed by Alkire and Foster (2007; 2011). It is called M_0 or Adjusted Headcount Ratio. M_0 is the appropriate measure to be used whenever one or more of the dimensions of MPI considered are of ordinal nature, implying that the values of these dimensions have no cardinal measure. In this study, the mathematical structure insisted for measuring MPI comprises of 10 indicators where the M_0 measure with a particular selection of dimensions, indicators and weights in MPI. A weight of 33.3 per cent each is given to the three dimensions, viz, health, education and standard of living. To identify the multidimensionally poor, the deprivation scores for each household are summed to obtain the household deprivation, '*k*'. A cut-off of 33.3 per cent, which is the equivalent of one-third of the weighted indicators, is used to distinguish between the *poor* and *non-poor*. If '*k*' is 33.3 per cent or greater, that household is considered *multidimensionally poor*. The households with a deprivation score greater than or equal to 20 per cent but less than 33.3 per cent are considered *vulnerable* who are at risk of becoming multidimensionally poor. The households with a deprivation score of 50 per cent or higher are considered *severely multidimensionally poor*. MPI can be expressed as the product of two intuitive measures: the (multidimensional) headcount ratio (*H*) and the *average deprivation share* among the poor (*A*). '*H*' is the proportion of people that are poor. That is, $H = q / n$, where '*q*' is the number of poor people; it represents the incidence of multidimensional poverty. $C_i(k)/d$ indicates the fraction of weighted indicators in which the poor person '*i*' is deprived. The average of that fraction among those who are poor (*q*) is precisely '*A*', where its expression is given by: $A = \sum_{(j-1)}^{d} Ci(K) = dq$. '*A*' represents the intensity of multi-dimensional poverty.

The conventional methods of poverty estimation are not able to provide the intensity of poverty of households. The methodology of OPHI was used to estimate the intensity of poverty $(A) = \sum_{1}^{q} c / q$, where '*c*' gives deprivation score of households and '*q*' is the number of multidimensionally poor people. Estimation of both '*incidence*' and '*intensity*' of poverty becomes important as it helps to measure the real magnitude and dimensions of poverty helping indicator specific policy recommendations. Unlike this method, the conventional methods use income or consumption expenditure-based methods to calculate *Head Count Ratio* to trace out the incidence of poverty. In the multidimensional framework, the *Head Count Ratio,* '*H*' took the number of people who are multidimensional poor $(H) = q / n$, where '*q*' is the number of people who are multidimensionally poor and '*n*' is the total population. The MPI value is the product of the intensity of poverty and multidimensional headcount ratio. $MPI = H \times A$, where '*H*' represents multidimensional headcount ratio and '*A*' is intensity of poverty.

Findings

The multidimensional framework of poverty is designed for better assessment of human deprivation based on non-monetary characteristics namely, education, health, and living standards of people. It helped to categorize households into four segments of poverty based on household deprivation score '*c*'. The results of the same give an appalling depiction of human deprivation in the study area. Kerala, the region with the highest human development in India, succeeded to reduce the incidence of multidimensional poverty among its households.

Table 2: Classification of Households based on Multidimensional Poverty

Social Groups	Classification									
	Severely Multi-dimensionally Poor (C ≥ 0.5)		Multidimensionally Poor (C ≥ 0.3)		Vulnerable (0.3 > C ≥ 0.2)		Non-Poor (C < 0.2)		Total	
Kerala										
	N	%	N	%	N	%	N	%	N	%
SC	14	12	32	27	22	18	52	43	120	100
ST	51	43	12	10	43	35	14	12	120	100
OBC	06	5	28	23	13	11	73	61	120	100
GC	02	2	13	11	21	18	84	69	120	100
AG	73	15	85	18	99	21	223	46	480	100
Bihar										
	N	%	N	%	N	%	N	%	N	%
SC	71	59	30	25	12	10	07	6	120	100
ST	94	78	23	19	01	1	02	2	120	100
OBC	59	49	49	41	07	6	05	4	120	100
GC	07	6	41	34	39	32	33	28	120	100
AG	231	48	143	30	59	12	47	10	480	100

Notes: SC - Scheduled Castes; ST - Scheduled Tribes; OBC - Other backward castes; GC - General Castes; AG - All Groups
Source: Field survey

When compared to Bihar, its proportion of households (21%), which are vulnerable to the risk of multidimensional poverty is higher than that of the state with lower human development. The section of households who are vulnerable to poverty seems to be disregarded in the analysis of income-based poverty. It can be resolved by the multidimensional framework of poverty analysis. Unless these vulnerable households are treated as equal to multidimensionally poor, the incidence of poverty in the region would have been aggravated in the near future. Even though the proportion of households who are vulnerable is relatively less in Bihar (12%), a lion's share of its households is either multidimensionally poor or severely multidimensionally poor. In Bihar, about 90 per cent of households are either severely multidimensionally poor or multidimensionally poor or vulnerable to poverty. It shows the deplorable situation of the people who are not able to achieve their 'valued functionings' (see Table 2).

In the general analysis of poverty, households are classified into poor and non-poor based on a defined poverty line and give common consideration to all poor households that usually fail to make any significant impact upon them due to symmetrical allocation of resources among both priority group and non-priority group. Normally, a differential treatment for poverty reduction is required for the households who are poor based on their intensity of poverty. Access to goods and services such as public transportation, education, health care, supply of electricity and drinking water is very much essential for increasing the capability of poorer sections of the society. Not only that,

particular sections of the society are the main victims of poverty in all regions, even within the same territory which is normally ignored and treated equally as other sections of the society who demands less support for poverty reduction. The most revealing fact is that, as it moves from the region with higher human development to lower, the proportion of deprived households also follows the same path and vice versa. Hence, a higher proportion of deprived households could be seen in the regions with a lower incidence of human development and a lower proportion of the same in the regions with a higher incidence of human development. The very prominent fact is that the burden of deprivation always falls upon the disadvantaged groups (SC/ST) in all regions irrespective of their achievements in the progress of human development. In Kerala, ST households seem to be more deprived than other sections of households that follows the deprivation taxonomy pattern of Bihar.

It is clearly visible that ST households of Kerala are the most deprived section in Kerala whereas a relatively higher proportion of them is either vulnerable (35%) or severely multidimensional poor (43%). Incidence of deprivation among non-ST households is relatively low in Kerala where more than 60 per cent of OBC and GC households and 43 per cent of SC households are not deprived in the region. Severely multidimensional poor households in non-SC/ST households are very less in the region which is five per cent among OBC and two per cent among GC whereas the proportion of households who are vulnerable is exactly the same among SC and GC households (see Table 2).

The ST households in the region are often not able to access to proper education, adequate health services, and other basic supplies/services/ownerships that influence living standards, as they are located in remote and forest areas in pursuance of their livelihood. They are reluctant towards the interventions of the government and other agencies that are trying to ensure their better living standards. They are highly exploited by other sections of society due to their ignorance and constraints of communication and transportation. They are always keeping a distance from other sections of the society and their interactions with authorities are very insignificant. The striking matter is that, even with the presence of various NGOs who are working for the development of ST communities, the real status of this social group is not properly reported and documented by the authorities. Bihar is the region that registered the highest incidence of multidimensional poverty and the lowest human development in India. It is very appalling to report the fact that, the proportion of non-poor households belonging to SC/ST and OBC categories is less than 10 per cent in Bihar and the highest proportion of them are severely multidimensional poor. It is very disheartening to report that 78 per cent of ST and 59 per cent of SC households are severely multidimensional poor while a significant proportion of households in the SC category are vulnerable to deprivation. The proportion of non-poor households in SC/ST and OBC is very less which is less than five per cent in ST/OBC and six per cent in SC households (see Table 2).

As regards the well-being of households, SC/ST and OBC households face various forms of discrimination in society. It discourages them to participate in society with full freedom to achieve their primary 'functionings', viz., education, health, and a decent standard of living. The differential access to various services under the sphere of public education, health care, transportation, electricity, and drinking water for SC/ST households in the study area has an adverse impact on their education and health outcomes thereby the standard of living. Discrimination in the provision of basic infrastructure within the residential areas of ST households makes a severe adverse impact on their access to public education and health facilities.

In Kerala, the region with high human development, overall deprivation of households is very less which is the lowest among regions of India where the deprivation of ST households seems to be higher that is at par with the deprivation of ST households in Bihar, the region with less human

development in India. Common attributes that can be visible in the case of ST households for their higher incidence of deprivation in both the regions selected for the study are discrimination, displacement, isolation, exploitation, asymmetric access to public service and general reluctance to the administrative mechanism and governance. The majority of these issues could be seen in the residential areas of SC/OBC households in Bihar. These social groups fail to represent their demand and grievances to the concerned authorities through the proper political and institutional systems.

Incidence and Intensity of Multidimensional Poverty among Social Groups

Estimation of incidence (H) and intensity (A) of deprivation of households belonging to various social groups and regions is essential for the estimation of MPI and 'inter-regional' and 'inter-group' assessment of multidimensional poverty. Incidence of multidimensional poverty (H) gives the proportion of people (c) in a region/social group (n) who are multidimensional poor (c/n). This measure is similar to the 'head count' of the conventional analysis of poverty. It helps to understand the number of households in the region/social group whose household deprivation score is greater than 0.33 (33%). This cut-off score could be considered as the 'poverty line' in the conventional analysis. Generally, the magnitude of the incidence (H) of the multidimensional score is expressed in the values that lie between zero and one. It could be converted into percentages by multiplying by 100 and converted into absolute figures by multiplying with the size of the representative sample.

The intensity of deprivation (A) is the innovative measure in the multidimensional framework that reveals the depth of deprivation experienced by the people who are multidimensional poor (). MPI can be figured out from incidence (H) and intensity (A) of deprivation which is expressed as its product (HxA). These magnitudes are more comprehensive to make an inter-regional/group comparison of deprivation than that of other estimates. Hence, incidence (H), intensity (A), and MPI of the selected social groups and regions are estimated and results are given in Table 3.

Table 3: Estimated Magnitudes of Incidence (H), Intensity (A) and MPI

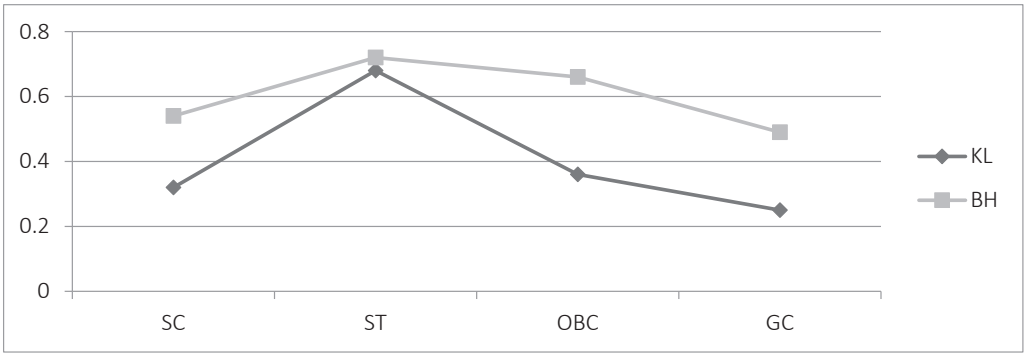
Social Groups	Kerala			Bihar		
	H	A	MPI	H	A	MPI
SC	0.382	0.318	0.121	0.842	0.537	0.452
ST	0.521	0.682	0.355	0.975	0.715	0.697
OBC	0.283	0.356	0.100	0.901	0.657	0.592
GC	0.121	0.252	0.030	0.395	0.487	0.192
AG	0.329	0.469	0.154	0.781	0.673	0.456

Notes: H - Incidence of multidimensional Poverty; A - Intensity of Multidimensional Poverty; MPI - Multidimensional Poverty Index; SC - Scheduled Castes; ST - Scheduled Tribes; OBC - Other Backward Castes; GC - General Castes; AG - All Groups

Source: Estimated from primary data

MPI is the outcome measure that uses to compare the regions and social groups in terms of deprivation. Empirical results reveal that the Intensities of Multidimensional Poverty (A) among ST households in both the regions in the study area are very high (Bihar showing the highest value, i.e. 0.715), compared to other social groups. The magnitudes of the Multidimensional Poverty Index (MPI) depict that households belonging to OBC (0.592) in Bihar are more deprived than that of SC (0.452), whereas the deprivation level of OBC households (0.100) in Kerala is found to be less than that of SC (0.121); and the deprivation levels of GCs in both the regions are very low, compared to other social groups.

Figure 1: Magnitudes of Intensity (A) of Multidimensional Poverty in Study Areas



Notes: SC - Scheduled Castes; ST - Scheduled Tribes; OBC - Other Backward Castes; GC - General Castes; KL - Kerala; BH - Bihar
Source: Estimated from primary data

The data in Table 3 reveals that ST households are the most deprived community in both the regions, irrespective of their human development levels, followed by SC. Region/social group-wise intensity of deprivation (A) follows similar pattern of MPI in the study area (see Table 3 and Figure 1).

The incidence of deprivation (H) among ST/OBC households in Bihar is more or less close to unity, revealing the most pathetic condition of these households in the region, followed by SC. Incidence of deprivation is the lowest among GC households in Kerala (0.121), followed by OBC (0.283), and highest among ST households in Bihar (0.975). Deprivation of ST households is the highest in Kerala, followed by SC (see Table 3).

The incidence of multidimensional poverty should be discussed in connection with its intensity (A) to get a comprehensive depiction of deprivation among social groups in the study areas. Intensity (A) is the measure of profundity that gives the depth of deprivation experienced by multidimensional poor households in a region or social group. It could be considered as a guiding tool to prioritise social groups and regions for the implementation of poverty eradication programmes and policies with immediate effect. The intensity of deprivation is found to be the highest for the ST households of Bihar (0.715), followed by ST of Kerala (0.682) and OBC of Bihar (0.657). These magnitudes of intensity give us a clear picture of deprivation in the study areas.

Households belonging to OBC in Bihar (0.657), and SC in Bihar (0.537) are experiencing the high intensity of deprivation after ST households of Bihar and Kerala, and OBC in Bihar (see Table 3). A very conspicuous fact is that 98 per cent of ST households in the low human development region, i.e., Bihar, and 88 per cent of ST households in the relatively high human development region, i.e., Kerala, are experiencing approximately the same profundity of deprivation (Table 2). Compared to all other social groups in the study area, in both the regions, STs are deprived of around 70 percent of the indicators corresponding to primary functionings such as education, health, and a decent standard of living. The lowest incidence (0.121) and intensity (0.252) of deprivation are observed among GC households in Kerala, whereas the intensity of deprivation in GC households in Bihar (0.487) is greater than that of OBC (0.356) and SC (0.318) households in Kerala. This implies that the living conditions of households who experience a higher intensity of deprivation are very deplorable and they belong to SC/ST in both the regions under study. Therefore, need-based

intervention programmes for poverty eradication are to be designed in accordance with the incidence and intensity of deprivation for each region and social group for reducing their deprivation.

The prime priority should be given to the region/social group whose intensity of deprivation is high while implementing the programmes. The deprivation gap among the social groups should be balanced for ensuring social justice, equity and inclusiveness. Even while trivial regional differences exist, the living conditions of ST households in all regions under study are the same. However, a few of them get better access for the attainment of their 'functionings'. The living conditions of SC/ST/OBC households in Bihar are a matter of serious concern as they experience severe incidence and intensity of multidimensional poverty. The debate on the 'reservation system of India' is to be revisited and reoriented in this direction and the real causes of intensified deprivation among SC/ST households need to be studied within the multi-disciplinary framework at the grass-root level to reduce their 'deprivation gap' and intensity of deprivation enabling more inclusive development.

Deprivation Gap among Social Groups

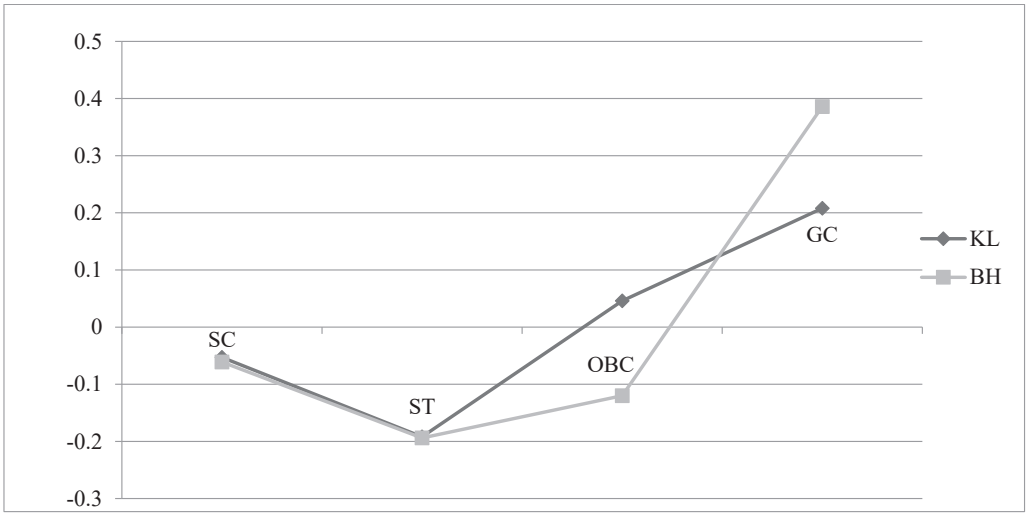
The well-being of people depends on their 'functionings', 'doings' with their education, health, and standard of living, that is determined by personal, social, and institutional factors. More of these 'doings' are helping people to increase their ability to lead a life free of socio-economic and cultural deprivation. In the study area, the majority of SC/ST households particularly in Bihar are often not able to obtain access to adequate education, quality health services, transportation, and communication that force them to lead a life of poverty and become backward in several facets of human life compared to the other social groups that reflect the negative 'deprivation gap' among these social groups. The deprivation gap reveals the difference between the incidence of deprivation of each social group and the whole group deprivation.

The deprivation gap of social groups may be positive, or zero, or negative, depending on their incidence of deprivation. A higher incidence of deprivation of a social group than that of the whole group in the region makes the deprivation gap negative and vice-versa. In the study area, a positive deprivation gap was registered among the households belonging to GC in both the regions and OBC of Kerala, whereas the highest deprivation gap could be seen among GC of Bihar (0.386), followed by GC of Kerala (0.208). This implies that the incidence of multidimensional poverty experienced by the households belonging to GC is lower than the whole group deprivation of the region and the difference in its magnitudes between Kerala and Bihar invites the question of social justice which is better in Kerala and worse in Bihar. The deprivation gaps of SC households in these regions are negative but close to zero. It reveals that there is only a negligible increase in the incidence of deprivation of these social groups compared to the whole group deprivation of the respective regions.

As shown in Figure 2, the deprivation gaps of ST households in both regions and OBC households in Bihar are negative. All this is similar to ST households in Kerala and Bihar (-0.19). That means, these social groups need more intensive indicator specific interventions from the authorities to resolve the harshness of deprivation. These social groups are still predominately engaged in employment of poor quality and entail low levels of education and poor health compared to the other social groups in the study area. Hence, their issues are unique in character that demand an apparent insight for designing more effective need-based policy interventions for these social groups and regions. In this process, the identification of determining factors of multidimensional poverty in the regions is crucial to locate the persisting needs of different social groups and regions of the country. Dimension wise decomposition of indicators of multidimensional poverty would help to

identify the felt needs of these social groups and regions to overcome their capability failure to achieve their valued 'functionings' for their well-being.

Figure 2: Deprivation Gap of Social Groups



Notes: SC - Scheduled Castes; ST - Scheduled Tribes; OBC - Other Backward Castes; GC - General Castes; KL - Kerala; BH - Bihar

Source: Estimation based on primary data

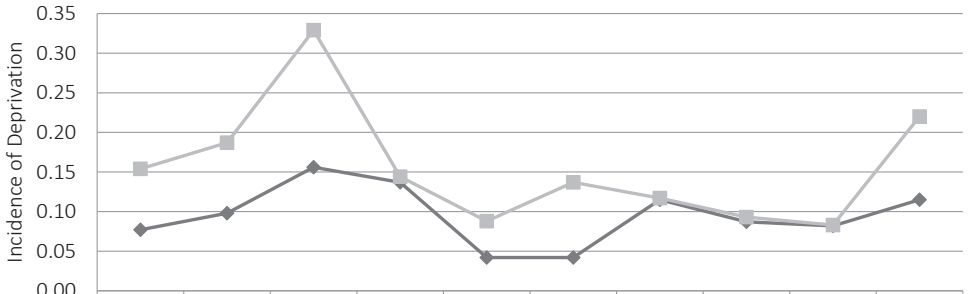
Decomposition of the indicators of Multidimensional Poverty

In the process of decomposing the various indicators of multidimensional poverty, it is observed that higher magnitudes of deprivation are found in terms of child mortality (0.33), asset holdings (0.22), school attendance (0.19) and malnourishment (0.14) in Bihar. In Kerala, relatively high levels of deprivation are found in terms of child mortality (0.16), malnourishment (0.14), safe drinking water (0.12) and ownership of assets (0.12).

The indicators such as electricity (0.04) and sanitation (0.04) registered the lowest level of deprivation in Kerala, whereas the indicators such as clean cooking fuel (0.8), quality of housing (0.9) and electricity (0.9) registered very low levels of deprivation in Bihar. Therefore, with lower human development and higher incidence of deprivation, Bihar needs to take urgent initiatives to reduce the child mortality rate and increase more opportunities and choices for people to improve their standard of living. Lack of quality health services, impediment to skill development of the working population, and dearth of income and employment opportunities are making the issue more severe in Bihar. Deprivations in terms of schooling and school attendance are relatively higher in Bihar and lower in Kerala, whereas deprivations in terms of malnourishment (0.14) and drinking water (0.12) seem to be equal among all social groups in both the regions under study (Figure 3).

The decomposition analysis pinpoints the influence of multidimensional indicators in worsening the incidence of multidimensional poverty, leading to unequal 'functionings', and thereon causes disproportional deprivation and human development outcomes among various social groups and within and between regions under study.

Figure 3: Decomposed Magnitudes of Multidimensional Poverty of the Study Area



	DSS	DSA	DM	DN	DEL	DSN	DDW	DFL	DCF	DOA
KL	0.08	0.10	0.16	0.14	0.04	0.04	0.12	0.09	0.08	0.12
BH	0.15	0.19	0.33	0.14	0.09	0.14	0.12	0.09	0.08	0.22

Notes: D (for all indicators) - Deprivation; SS - Years of Schooling; SA - School Attendance; M - Child Mortality; N - Malnourishment; EL - Electricity; SN - Improved Sanitation; DW - Safe Drinking Water; FL - Floor (Quality of Housing); CF - Clean Cooking Fuel; OA - Ownership of Assets; KL - Kerala; BH - Bihar
Source: Estimated from primary data

Magnitudes of Deprivation among Social Groups in Kerala

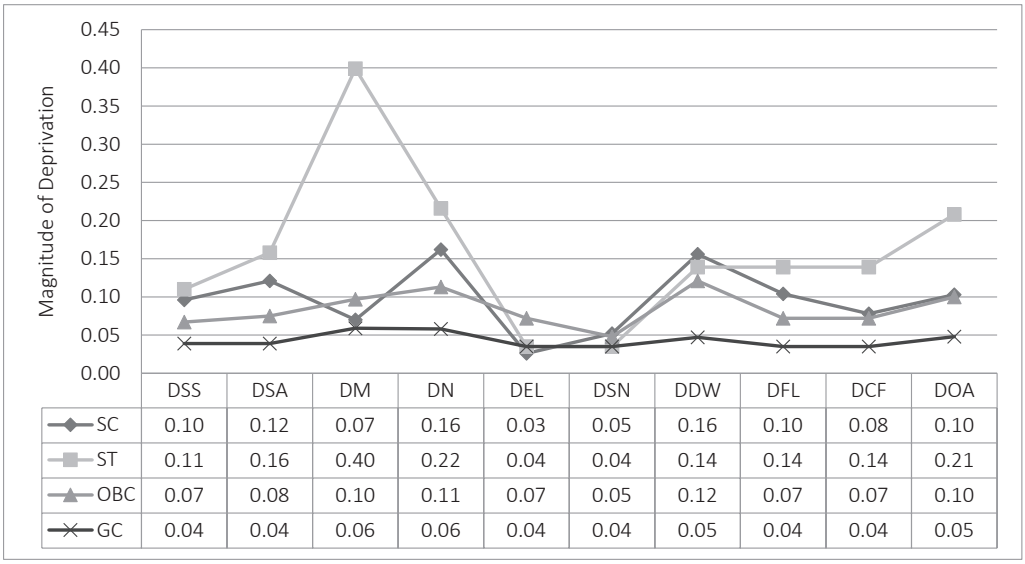
The decomposed magnitudes of multidimensional poverty reveal that deprivation of asset ownership is very high among ST households (0.21) compared to the other social groups and most of the child mortalities are happening among ST households and its magnitude is 0.40. Deprivations in terms of school attendance (0.16) and malnourishment (0.22) are also very high among ST households compared to the other social groups. The deprivation in terms of drinking water among SC/ST households is very high in Kerala compared to non-SC/ST households. That means, deprivation in terms of asset ownership, child mortality, malnourishment, school attendance among ST households and deprivation in terms of drinking water among OBC and ST households are the prominent factors that determine the incidence of multidimensional poverty among the households in Kerala (see Figure 4).

Magnitudes of Deprivation among Social Groups in Bihar

The results reveal that deprivation in terms of child mortality is very high among ST households (0.58), followed by SC (0.39), and OBC (0.28) in Bihar, whereas deprivation in terms of asset ownership among ST households of the region is 0.29. Deprivation in terms of asset ownership is 0.25 among SC and is 0.19 among OBC households in the region (see Figure 5).

Deprivation in terms of school attendance is the highest among ST households (0.29), followed by OBC (0.18) and SC (0.15) households. The results show that deprivation in terms of cooking fuel in Bihar is almost the same among all social groups, while malnourishment is the highest among OBC households which is similar to SC/ST households in the region. The foregoing analysis reveals that child mortality, and deprivations in terms of asset ownership, school attendance, cooking fuel, and malnourishment among SC/ST and OBC households are the prominent determinants of multidimensional poverty in Bihar.

Figure 4: Magnitudes of Deprivation among Social Groups in Kerala

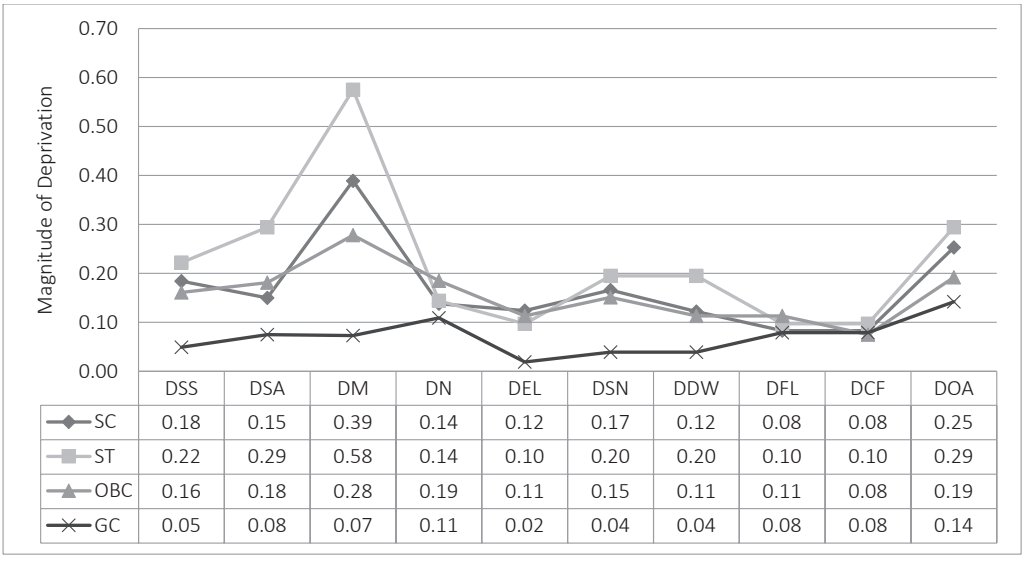


	DSS	DSA	DM	DN	DEL	DSN	DDW	DFL	DCF	DOA
SC	0.10	0.12	0.07	0.16	0.03	0.05	0.16	0.10	0.08	0.10
ST	0.11	0.16	0.40	0.22	0.04	0.04	0.14	0.14	0.14	0.21
OBC	0.07	0.08	0.10	0.11	0.07	0.05	0.12	0.07	0.07	0.10
GC	0.04	0.04	0.06	0.06	0.04	0.04	0.05	0.04	0.04	0.05

Notes: D (for all indicators) - Deprivation; SS - Years of Schooling; SA - School Attendance; M - Child Mortality; N - Malnourishment; EL - Electricity; SN - Improved Sanitation; DW - Safe Drinking Water; FL – Floor (Quality of Housing); CF - Clean Cooking Fuel; OA - Ownership of Assets; SC - Scheduled Castes; ST - Scheduled Tribes; OBC - Other Backward Castes; GC - General Castes

Source: Estimated from primary data

Figure 5: Magnitudes of Deprivation among Social Groups in Bihar



	DSS	DSA	DM	DN	DEL	DSN	DDW	DFL	DCF	DOA
SC	0.18	0.15	0.39	0.14	0.12	0.17	0.12	0.08	0.08	0.25
ST	0.22	0.29	0.58	0.14	0.10	0.20	0.20	0.10	0.10	0.29
OBC	0.16	0.18	0.28	0.19	0.11	0.15	0.11	0.11	0.08	0.19
GC	0.05	0.08	0.07	0.11	0.02	0.04	0.04	0.08	0.08	0.14

Notes: D (for all indicators) - Deprivation; SS - Years of Schooling; SA - School Attendance; M - Child Mortality; N - Malnourishment; EL - Electricity; SN - Improved Sanitation; DW - Safe Drinking Water; FL - Floor (Quality of Housing); CF - Clean Cooking Fuel; OA - Ownership of Assets; SC - Scheduled Castes; ST - Scheduled Tribes; OBC - Other Backward Castes; GC - General Castes

Source: Estimated from primary data

Determinants of Multidimensional Poverty among Social Groups

Inter-regional variations in the determinants of multidimensional poverty among the social groups have been identified in this study. Kerala is the 'better performing region' in India that has registered the highest incidence of HDI (0.625) and the lowest MPI (0.154) in India. The incidence of multidimensional poverty (H) in Kerala is 0.329 and its 'intensity' (A) is 0.469. The highest magnitudes of MPI (0.355), incidence (0.521), and intensity (0.682) in the state are estimated among its ST households. Therefore, magnitudes of multidimensional poverty in Kerala is mainly identified with the deprivation of ST households. If we look at further details, we find that deprivation of ST households in terms of school attendance, child mortality, malnourishment, safe drinking water, asset ownership and deprivation of OBC households in terms of safe drinking water appear to be the prominent indicators of MPI that determine the 'incidence' (H) and 'intensity' (A) of multidimensional poverty in Kerala. Bihar is the 'least performing region' in India that has registered the lowest incidence of HDI (0.447) and the highest MPI (0.456) in India. Higher values of MPI, incidence (H), and intensity (A) are estimated among ST, SC, and OBC households in Bihar. Hence, magnitudes of multidimensional poverty in Bihar are mainly identified with the deprivation of ST, SC, and OBC households where their deprivation in terms of school attendance, child mortality, malnourishment, clean cooking fuel, and asset ownership remain the prominent indicators of MPI that determine higher 'incidence' (H) and 'intensity' (A) of multidimensional poverty in Bihar.

Discussion and Conclusions

Even though authorities claimed success in reduction of income poverty in India, it has not been very successful in reducing non-income deprivation of people, especially in terms of education, health, and standard of living. More than half of the households, particularly ST, are suffering from severe incidence of multidimensional poverty in both Kerala and Bihar. The SC/ST households are highly excluded from the mainstream of human development in the study area. Decomposition of MPI reveals the disproportional burden of incidence and proportional intensity of multidimensional poverty among ST households in Kerala and Bihar, irrespective of their attainment in human development. On multidimensional analysis of poverty, deprivation of ST households alone explains more than half of the deprivation of entire people of Kerala. The risk of multidimensional poverty is more severe among the households belonging to SC/ST than that of non-SC/ST category which seriously retard their 'choices and voices' and thereby the overall development of the region. As the proportions of ST households in Kerala and Bihar are relatively lower than the other social groups, they are unable to represent their voice and choices properly in the different forums of the institutional governance and the society. Deprivations in terms of education, health, and standard of living of these social groups seem to be higher, particularly in Bihar. Deprivations of ST households in Kerala and Bihar are found to be approximately equal in the analysis of household-level data.

Suggestions

Concerted efforts are needed to break the vicious circle of multidimensional poverty among the disadvantaged social groups of Kerala and Bihar. It needs to be emphasized that reduction of multidimensional poverty among disadvantaged social groups of the region would greatly depend on the delivery of effective and sustainable interventions to SC/ST households in the dimensions of education, health, and rural development. Short term and long-term *deprivation- targeting, indicators-specific policies* — particularly among the disadvantaged social groups — are to be conceived, evolved and rolled out. This would help to break the vicious circle of trajectories of multidimensional poverty among the social groups in both Kerala and Bihar. This is applicable to both the 'better

performing regions' and the 'least performing regions' of India to ensure adequate attainment of elementary functionings such as education, health, and standard of living among the deprived social groups. In such process, the regional disparity in development could be reduced, leading to attain holistic human development outcome and thereon, ultimately, sustainable development.

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MAPPING THE MULTIDIMENSIONALITY OF MEDICAL CARE RELATED CATASTROPHE ON HOUSEHOLDS: A STUDY OF FOUR BLOCKS IN BIRBHUM DISTRICT, WEST BENGAL

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Abstract: Studies on medical expenses catastrophe is defined by a situation when household's out-of-pocket medical expenditure crosses a certain percentage of its income or total consumption expenditure. This approach has a number of limitations as it relies heavily on money-metric consumption data and is threshold-oriented as well. This paper, on the contrary, looks at medical care related 'catastrophe' from a multidimensional perspective. We find that larger household size, and presence of elderly, children, and chronically as well as acutely ill members in a family significantly increases healthcare utilisation and likelihood of incurring catastrophic medical expenses. Also, Muslim households, female-headed households, households with members engaged as casual labourers and poorer households face higher odds of resorting to distress financing, and seeking informal or no healthcare. We also find that the multidimensional approach exhibits higher vulnerability for poor, ST, SC and Muslim households and portrays a more reliable picture of medical-care related catastrophe than what conventional approach of medical expenses catastrophe suggests. This is helpful in making key policy decisions by directing resources and tailoring services for the most vulnerable population sub-groups.

Keywords: Catastrophic health expenses, Multidimensional vulnerability, Out-of-pocket health expenditure, Birbhum, West Bengal.

Introduction

In many developing countries where government provision of free medical care is limited or insurance coverage for medical care financing is poor, households' out-of-pocket (OOP) payments are the principal source of financing medical care expenses (van Doorslaer et al., 2006). A household is considered to have incurred catastrophic medical expenses (CME) or catastrophic healthcare payments (CHP), when its OOP medical expenses exceed a certain share (threshold) of its capacity to pay (CTP), often proxied by income, total consumption expenditure (TCE) or non-food

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expenditure (nFE) (Wagstaff and van Doorslaer, 2003). The threshold represents a pre-defined percentage of household income or expenditure which varies from 5 to 40 (Goryakin and Suhrcke, 2014; and Arsenijevic et al., 2013). It is reasonable to expect that when a non-rich household spends a large share of its income on medical care, it might be forced to compromise on its other consumption expenses or to draw on its savings kept for other important purposes. It might even resort to distressing methods to finance medical care expenses such as borrowing money or seeking help from friends and relatives, selling of productive assets (e.g. land, cattle) and/or borrowing money from moneylenders on high rates of interest. This holds true especially for poor households with little or no savings and have serious implications on their long-run welfare (Wagstaff and van Doorslaer, 2003; and van Doorslaer et al., 2006). Furthermore, fear for possible high OOP medical expenses may dissuade household from seeking timely medical care, seeking medical care from less expensive quacks or unqualified medical practitioners or even avoiding medical care. Therefore, even when a household does not show any actual CME, the fear for it might force them to behave in a way which compromises their current and future welfare levels in the form of untreated or undertreated morbidities and avoidable medical complications arising out of the same.

Following the approach of Wagstaff and van Doorslaer, a large number of studies using data from different contexts estimated the extent of CME and identified a number of household level characteristics which contributed to a household's CME. Among such characteristics, coverage of the household by medical insurance, type of medical care utilized (inpatient/outpatient care), type of facility utilised (public/private), economic condition and occupational type, socio-demographic and other characteristics of the household (e.g., place of residence, presence of chronically ill members, elderly and children, household size, etc.) are found influential (Mahumud et al., 2017; Kumara and Samaratunge, 2017; and Rashad and Sharaf, 2015). It is found that, not only the underlying reasons for CME are multiple, there are different ways in which medical care catastrophe gets reflected in a household's medical care seeking attitude and practices.

In spite of its ease of interpretation and popularity, the measure suggested by Wagstaff and van Doorslaer is plagued with several limitations. First, it is a money-centric measure based on a household's OOP medical expenses and disposable income data for a single year and ignores information related to a household's socio-economic and demographic conditions which are expected to have strong influence on a household's long-term capacity to pay, medical care need and vulnerability. Second, it ignores the information on how OOP medical expenses are financed by a household, its capacity to borrow and social capital. Third, the measure fails to include those households who lack capacity to mobilize funds for medical care and avoid medical care or seek medical care from unqualified/informal providers such as quacks. Against these limitations, we suggest a measure which attempts to incorporate multiple dimensions of a household's medical care related catastrophe. We also explore the correlates of healthcare utilization, likelihood of incurring CME, resorting to distress financing, availing informal care and avoiding care despite severe illnesses. Finally, we compare the empirical results obtained using our measure with that of Wagstaff and van Doorslaer's approach.

Methodology

Study design

The paper uses data from a cross-sectional household survey conducted in four community development blocks of Birbhum district in West Bengal by the Society for Health and Demographic Surveillance (SHDS) in 2012. SHDS was created by the Department of Health and Family Welfare,

Government of West Bengal in 2008. The survey covered 54585 individuals residing in 12557 households from 351 villages in four community development blocks, namely, Suri-I, Sainthia, Rajnagar and Muhammad Bazaar. The survey collected information on household and individual member level socioeconomic and demographic characteristics, self-reported general ailments and chronic ailments, hospitalisation (utilisation of inpatient care) and outpatient (OP) visits, expenditure on medical care and sources of financing medical care expenses. The recall period for collecting outpatient and inpatient care utilisation and expenditure were 15 days and 365 days respectively. The survey also collected medical care utilisation information related to preventive medical care and childbirth.

Since the survey was carried out way back in 2012, we have used another set of similar data from a more recent survey carried out by National Sample Survey Office (NSSO) in 2017-18 (75th round). Wherever relevant, we have compared the summary measures obtained from SHDS data with NSSO data for rural West Bengal and Eastern Plains region of rural West Bengal which included Birbhum district. The Eastern Plains of NSS Region also includes the districts of Uttar Dinajpur, Dakshin Dinajpur, Maldah and Murshidabad. The comparison of SHDS data with recent NSSO data is expected to provide us some indications of how representative has been the SHDS data for West Bengal and how the situation has changed between 2012 and 2017-18 in terms of select indicators.

Variables

Dependent variables

To analyse utilisation of medical care, six dependent utilisation variables are considered which are: (i) number of hospitalisation (ii) number of hospitalisation in private facility (iii) number of hospitalisation outside the district (iv) number of OP visit (v) number of OP visit to private facility and (vi) number of OP visits outside the district. Following Wagstaff and van Doorslaer two distinct definitions of CME is used: (i) households with OOP medical expenditure exceeding 10 per cent of its TCE takes on value 1, and 0 otherwise (threshold 1); and (ii) households with OOP medical expenditure exceeding 40 per cent of its nFE takes on value 1, and 0 otherwise (threshold 2). To examine the correlates of distress financing, informal and no medical care, three binary variables are considered. A household is considered to have resorted to distress financing for meeting medical care expenses if it relied on sale/mortgaging of physical assets, borrowing and contributions from friends and relatives (value = 1; 0 otherwise). Low quality or informal medical care is defined if at least one member of the household went to seek medical care from a quack/informal medical care provider in case of a severe/chronic illness (value = 1; 0 otherwise). No medical care is defined if at least one member of the household remained without medical care in case of a severe/chronic illness (value 1); otherwise 0.

Proxy for household's economic and socio-religious status

We have used per capita consumption expenditure (PCCE) as proxy for a household's economic status and the 2011-12 poverty line for rural West Bengal (Rs 783) determined by erstwhile Planning Commission to categorize households into income groups (Planning Commission, 2012). Using this poverty threshold, households with PCCE less than Rs 783 have been classified as poor and those having PCCE equal to or higher than Rs 783 but lesser than twice the poverty line (Rs 1566) have been considered as lower-middle class. Similarly, households with PCCE equal to or greater than Rs 1566 but lower than four times the poverty line (i.e., Rs 3132) are labelled as mid-middle-

class households and those with PCCE greater than or equal to Rs 3132 are the upper-middle class households. For a household's socio-religious status, we have considered four categories-Scheduled Caste (SC), Scheduled Tribe (ST), Muslims and Others as the first three are more likely to be deprived as compared to the last.

Independent variables/covariates

The following indicators are chosen for determining medical-care related catastrophe of households: household size, numbers of elderly, children, women in the reproductive age group, acute and chronically ill members, number of hospitalisation, hospitalisation outside district, hospitalisation at private facility, number of OP visit, OP visit to private facility, OP visit outside the district, resorting to distress financing and seeking informal care and no medical care. Higher values of the indicators imply an increase in the likelihood of medical care induced catastrophe for the household. For example, higher number of elderly members, children, female members in the reproductive age group, chronically and acute ill persons in a household may increase the need for more medical care and require more financial resources for meeting medical care needs (Sen and Iyer, 2012; and Asfaw et al., 2008). An increase in demand for medical care may increase the household's OOP medical expenses if not covered by insurance or similar protection mechanism. Higher OOP medical expenses may have many unintended consequences on the households. First, it may force households to compromise on its consumption of basic necessities such as food and nutrition, education for children etc. Second, it may force households to sell productive assets (such as land and cattle) which may reduce their long run earning capacity. Third, fearing high medical expenses, many households might avoid or delay seeking medical care or may go to less expensive low-quality care, even under-consume medical care (by not fully taking the required medicines and not getting the suggested diagnostic tests done).

To incorporate a crucial gender-aspect, we have considered gender of the household head with female-headed households being the threshold (value = 1 and 0 otherwise) (Mondal et al., 2010; and Okedo-Alex et al., 2019). For medical insurance coverage, we have arbitrarily chosen half of the family members having insurance coverage as threshold. The lists of all indicators (variables) and their thresholds are provided in Table 1 and Table 2 (also see Table A1 in the Appendix).

Table 1: Household Level Indicators and Their Suggested Threshold Values

Indicators	Vulnerability Threshold
Household size	≥8
Number of elderly persons (above 60 years)	≥1
Number of children (0-5 years)	≥2
Number of females belonging to reproductive age group (15-49 years)	≥5
Number of chronically ill persons	≥1
Number of acute ill persons	≥2
Number of hospitalisation episodes	≥1
Number of hospitalisations at private facility	≥1
Number of hospitalisations outside the district	≥1
Number of outpatient (OP) visits	≥2
Number of OP visits to private facility	≥1

Indicators	Vulnerability Threshold
Number of OP visits outside the district	≥1
Per capita consumption expenditure (PCCE)	< Rs. 783
Gender of household head	Female-headed household
Occupational type of the household	Casual labour household
Household members not having health insurance coverage	>half of the members
OOP medical expenditure as a share of total consumption expenditure (%): *Threshold 1*	≥10 per cent
OOP medical expenditure as a share of total non-food expenditure (%): *Threshold 2*	≥40 per cent
Financing mechanism for meeting OOP expenditure	At least one case of borrowing/ contribution and selling / mortgaging
Low quality care	At least one visit to informal care providers for severe illness
No medical care	At least one episode of no medical care for severe illness

Source: Estimated from SHDS data (2012)

Table 2: Summary Statistics and Calculated Threshold for Select Indicators

Variables	Mean	Standard Deviation (SD)	Mean + SD	Threshold
Household size	5.02	2.21	7.23	8
Number of elderly persons (above 60 years)	0.39	0.61	1.00	1
Number of children (0-5 years)	0.46	0.73	1.19	2
Number of women belonging to reproductive age group (15-49 years)	2.84	1.52	4.36	5
Number of chronically ill persons	0.19	0.45	0.64	1
Number of persons reporting acute illness	0.64	0.85	1.48	2
Number of hospitalisation episodes	0.24	0.54	0.77	1
Number of hospitalisation at private facility	0.01	0.09	0.10	1
Number of hospitalisation outside the district	0.01	0.12	0.13	1
Number of OP visit	0.87	0.94	1.81	2
Number of OP visits at private facility	0.01	0.08	0.08	1
Number of OP visits outside the district	0.34	0.59	0.93	1
Resorting to distress finance for meeting OOP expenses	0.30	0.51	0.81	1
Informal / Low quality care	0.31	0.46	0.77	1
No medical care	0.07	0.25	0.31	1

Source: SHDS data (2012)

One may argue that incorporation of similar indicators might lead to problem of double counting and overestimation of medical care related catastrophe for the households. However, the similarity of indicators actually paves the way for rightly counting medical care related vulnerability for the households in desired direction. When related indicators such as at least one hospitalisation event, at least one hospitalisation event in private facility and at least one hospitalisation outside district is considered together, the total medical care related vulnerability score goes up to 3. Using

the SHDS data, we find that median OOP healthcare costs incurred by a household with at least one event of hospitalisation is Rs 477 while for a household with at least one hospitalisation event in private facilities and outside district, the OOP healthcare costs are Rs 2589 and Rs 2384 respectively. Similar differences in OOP healthcare expenses are also evident for indicators related to OP visits. This highlights the importance of incorporating multiple dimensions in the analysis as irrespective of them being similar they have varied catastrophic impact on the household.

Data Analysis

The data analysis has been carried out using statistical software STATA version 14. The analyses were carried out in four stages. In the first stage, descriptive statistics were estimated for examining the mean and standard variables of all the variables used. In the second stage, negative binomial regressions were estimated for analysing utilisation of medical care. Negative binomial regression method was chosen as it allowed a better fit for over-dispersed count variables and for attaining more precise results than other count data regression models (Cameron and Trivedi, 2005). In the third stage, correlates of CME, distress financing, low quality/informal care and no healthcare, were explored using logistic regressions. In the fourth and last stage, we have applied our measure which is drawn from the concept of multidimensional poverty suggested by Alkire and Foster (2011) in order to get a holistic picture of a household's medical care related catastrophe. Our unit of analysis is household. At first, a set of indicators based on socio-economic, demographic characteristics, healthcare utilisation and financing indicators and inability to cope up with health expenses have been identified to capture household's medical-care catastrophe. Following Alkire and Foster, we set thresholds for each indicator to identify if a household is in disadvantageous position with regard to that particular indicator. For indicators with count data, integer value of the indicator higher than mean plus one standard deviation is considered as threshold. Thus, a score is generated for each household depending upon the number of indicators disadvantageous to it which is likely to make the household vulnerable to medical care related catastrophe. Next, we set a threshold for the total score of each household which identifies similar percentage of medical care related vulnerable households as identified by the Wagstaff-van Doorslaer's measure.

Ethical Consideration

Both the data sets used in this paper are collected by agencies directly or indirectly supported by the Government. SHDS is a Government of West Bengal organisation, whereas NSSO is a Government of India organisation. SHDS maintained strict standards for protecting the privacy and confidentially of respondents during data collection and processing and as such no further ethical approval was required for analysing the data. SHDS data may be available from the concerned authority subject to approval. The NSS data is available in public domain and can be downloaded from the concerned ministry's website: http://mospi.nic.in/.

Results

Background Characteristics

The descriptive statistics of the sample are presented in Table 3. It is evident that the average household size in Birbhum, rural West Bengal and rural eastern plains of West Bengal varies between 4 and 5. The percentages of household with at least one chronically ill member are 19, 33 and 26 per cents of the households in Birbhum, rural West Bengal and rural eastern plains of West Bengal, respectively. The shares of female-headed households are 14, 10 and 12 per cents in 4 study blocks of Birbhum,

rural West Bengal and rural Eastern Plan region of West Bengal respectively. At least one insured member is present in 26 per cent of the households in Birbhum, as compared to 16 per cent and 11 per cent in rural West Bengal and rural eastern plains of West Bengal, respectively. In Birbhum, 24 per cent of the households have at least one event of hospitalisation compared to 90 per cent in rural West Bengal and 89 per cent in rural eastern plains of West Bengal. Regarding OP visits, 87 per cent of the households reported at least one OP visit, while 58 and 51 per cent of the households

Table 3: Household-level Summary Statistics of the Indicators

Indicators	Four Blocks of Birbhum District* Mean (SE)	Rural West Bengal** Mean (SE)	Rural Eastern Plains of West Bengal** Mean (SE)
Household size	5.02 (0.02)	4.47 (0.03)	4.27 (0.05)
Presence of at least one elderly member	0.39 (0.01)	0.36 (0.01)	0.26 (0.02)
Presence of at least one child	0.46 (0.01)	0.58 (0.01)	0.61 (0.02)
Presence of at least one female in the reproductive age	2.84 (0.01)	2.43 (0.02)	2.34 (0.04)
Presence of at least one chronically ill member	0.19 (0.01)	0.33 (0.01)	0.26 (0.02)
Presence of at least one acute ill member	0.64 (0.01)	-	-
Per capita consumption expenditure (PCCE) (Rs)	1371.17 (12.27)	1758.30 (11.26)	1716.91 (17.96)
Share of Female-headed households	0.14 (0.01)	0.10 (0.01)	0.12 (0.01)
Presence of at least one member having insurance coverage	0.26 (0.01)	0.16 (0.01)	0.11 (0.01)
Casual labourers	0.54 (0.01)	0.39 (0.01)	0.46 (0.01)
At least one episode of hospitalisation	0.24 (0.01)	0.90 (0.01)	0.89 (0.02)
At least one episode of hospitalisation at private facility	0.01 (0.01)	0.28 (0.01)	0.21 (0.01)
At least one episode of hospitalisation outside district/state$^{\psi}$	0.01 (0.01)	0.16 (0.01)	0.13 (0.01)
At least one OP visit	0.87 (0.01)	0.58 (0.01)	0.51 (0.02)
At least one OP visit to private facility	0.34 (0.01)	0.32 (0.01)	0.24 (0.02)
At least one OP visit outside district/state$^{\psi}$	0.01 (0.01)	0.02 (0.01)	0.02 (0.01)
Share of households with OOP medical expenditure exceeding 10 per cent of total consumption expenditure	0.24 (0.01)	0.38 (0.01)	0.35 (0.01)
Share of households with OOP medical expenditure exceeding 40 per cent of total non-food consumption expenditure	0.35 (0.01)	-	-
Share of households reporting at least one case of contribution/donation/ borrowing from friends/relatives/ neighbours and/or selling/mortgaging of assets to as major source to finance medical care	0.17 (0.01)	0.14 (0.01)	0.14 (0.01)
Share of households reporting at least one case of informal care despite severe/chronic illness	0.31 (0.01)	0.02 (0.01)	0.03 (0.01)
Share of households reporting at least one case of no care despite severe/chronic illness	0.07 (0.01)	0.02 (0.01)	0.02 (0.01)

Note: $^{\psi}$For SHDS, it indicates outside district and, for NSSO data, it indicates outside state.
Source: *Estimated from SHDS data (2012), **NSS 75th Round Unit Record Data (2017-18)

reported the same in rural West Bengal and rural eastern plains of West Bengal. Also, 24 per cent of the households reported incurring CME (OOP medical expenditure exceeding 10 per cent of total consumption expenditure) in Birbhum, which is 38 per cent and 35 per cent in rural West Bengal and rural eastern plains of West Bengal, respectively. The proportions of households that have reported at least one case of distress financing are 17 per cent in Birbhum and 14 per cent each in rural West Bengal and rural eastern plains of West Bengal. As high as 31 per cent and 7 per cent of the households reported at least one case of informal care and no care respectively in Birbhum, as opposed to much lower percentage figures in rural West Bengal and rural eastern plains of West Bengal (approximately 2-3 per cent).

Risk Factors of Healthcare Utilisation

Table 4 presents the results of negative binomial regression for six healthcare utilisation variables. It is found that large households (IRR = 1.04), households with elderly (IRR = 1.11), children (IRR = 1.42), female members of reproductive age group (IRR = 1.06), chronically ill members (IRR = 1.15) and female-headed households (IRR = 1.12) have higher risks of hospitalisation. Also, SC and Muslim households have higher risks of hospitalisation (IRR = 1.26 and 1.44 respectively) than their respective counterparts. It is further evident that large family size also increases the risk of hospitalisation in private facility and hospitalisation outside the district (IRR = 1.43 each respectively). In addition, households belonging to poor, lower-middle and mid-middle-income categories have significantly lower risk of hospitalisation, even in private facilities and outside the district as compared to their rich counterpart. The risk of OP visit, in general, is found to be higher for households with large family size and chronically and acute ill members (IRR = 1.01, 2.13 and 1.97 respectively). Having large household size, presence of children, chronically and acute ill members also increase the risk of OP visit in private facility for households (IRR= 1.05, 1.10, 1.65 and 1.17 respectively). Lastly, risk of OP visit outside district also rises by presence of chronically ill members in household (IRR = 4.26).

Table 4: Results of Negative Binomial Regression#

Variables	Hospitalisation	Hospitalisation in private facilities	Hospitalisation outside district	Outpatient visits	Outpatient visits in private facilities	Outpatient visits outside district
Household size	1.04*	1.43*	1.43*	1.01*	1.05*	1.13
Number of elderly members	1.11*	1.18	0.92	0.98	1.01	1.45
Number of children	1.42*	1.04	1.07	1.01	1.10*	0.92
Number of women in the reproductive age group	1.06*	0.79	0.84	1.04	1.03	0.95
Number of chronically ill members	1.15*	0.97	1.05	2.13*	1.65*	4.26*
Number of acute ill members	1.04*	0.95	0.90	1.97*	1.17*	1.13
Number of members having insurance coverage	1.01	1.13	0.99	1.02	0.93*	0.94

Variables	Hospitalisation	Hospitalisation in private facilities	Hospitalisation outside district	Outpatient visits	Outpatient visits in private facilities	Outpatient visits outside district
Gender of household head (Ref: *Male*)						
Female	1.12*	1.14	1.32	0.86*	0.84*	1.47
Occupational type of household (Ref: *Others***)						
Casual labourers	1.03	0.80	0.81	1.01	0.89*	1.15
Socio-religious categories (Ref: *Others*)						
Scheduled Tribes	0.80*	0.35	0.78	0.97	0.48*	0.40
Scheduled Caste	1.26*	0.50*	0.88	1.01	0.77*	1.37
Muslim	1.44*	0.58	0.92	0.99	0.83*	1.82
PCCE category (Ref: *Upper Middle*)						
Poor	0.42*	0.03*	0.01*	0.96	0.42*	0.28
Lower Middle	0.59*	0.11*	0.14*	0.99	0.66*	0.63
Mid-Middle	0.84	0.34*	0.45*	0.94	0.93	2.10
Constant	0.16*	0.02*	0.02*	0.38*	0.34*	0.01*

Notes: #Results are provided in Incidence Risk Ratio (IRR); *p < 0.05; **'Others' include households with self-employed members, and regular wage/salaried members or members engaged in no/other occupation
Source: Estimated from SHDS data (2012)

Determinants of CME, Distress Financing, Low Quality/informal Care and No Healthcare

The results of logistic regressions are presented in Table 5. It has been found that the factors that increase the odds of incurring CME (with *threshold 1*) are presence of elderly (OR=1.62) and chronically ill members (OR=1.74), along with hospitalisation episodes in general and hospitalisation outside the district (OR= 4.93 and 2.96 respectively) and OP visit to private facility and OP visit outside the district (OR=1.90 and 2.36 respectively). On a similar note, presence of elderly, children and chronically ill members increases the odds of incurring CME (with *threshold 2*) (OR = 1.60, 1.42 and 1.65 respectively). Moreover, households with hospitalisation episodes in general and outside district and OP visit to private facility and OP visit outside the district, along with female-headed households have higher odds of incurring CME (with *threshold 2*) as compared to their respective counterparts (OR = 3.71, 4.87, 1.73, 2.19 and 1.27 respectively).

The factors which increase the odds of distress financing are presence of elderly and chronically ill members, along with hospitalisation events and OP visit to private facility in household (OR = 1.16, 1.46, 6.75, 1.68 respectively). In addition, female-headed, casual labour, SC or Muslim households have higher odds of resorting to distress financing as compared to their corresponding reference groups (OR = 1.31, 1.63, 1.94 and 1.85, respectively). It is further found that poor, lower-middle and mid-middle-income households have higher odds of incurring CME (Threshold 2)

(OR = 7.83, 5.49, 3.80 respectively) as well as resorting to distress financing (OR = 2.34, 1.89, 1.77 respectively) than their richer counterparts. However, households with more than half of the members covered with insurance coverage have lesser odds of incurring both CME (with *threshold 2*) as well as resorting to distress financing (OR = 0.86 and 0.74 respectively). Further analysis also suggests that households with acute and chronically ill members increase the odds of availing informal care (OR = 9.47 and 2.65 respectively) and no healthcare (OR = 3.65 and 4.48 respectively). In addition, households with members employed as casual labourers, ST, Muslim and lower-middle income households have higher odds of availing informal care as compared to their counterparts (OR = 1.23, 1.32, 1.29 and 1.25 respectively). Lastly, female-headed, casual labour, ST or poor households have higher odds of availing no healthcare despite severe or chronic illness as compared to their counterparts (OR = 1.30, 1.28, 1.34 and 1.78 respectively)

Table 5: Results of Logistic Regressions#

Variables	Catastrophic medical expenditure		Distress Financing	Informal care	No medical care
	Threshold 1	Threshold 2			
Household size	0.85	0.53*	0.71*	1.07	0.88
Presence of an elderly member	1.62*	1.60*	1.16*	0.99	1.03
Presence of a child	0.83	1.42*	0.91	1.02	0.95
Presence of a woman in the reproductive age group	0.78*	0.74*	0.80	0.89	1.07
Presence of an acute ill member	0.84	0.82	0.90	9.47*	3.65*
Presence of a chronically ill member	1.74*	1.65*	1.46*	2.65*	4.48*
Number of hospitalisation episode	4.93*	3.71*	6.75*	-	-
Number of hospitalisation at private facility	2.70	2.14	1.09	-	-
Number of hospitalisation outside the district	2.96*	4.87*	1.11	-	-
Number of OP visit	1.07	1.01	1.09	-	-
Number of OP visit to private facility	1.90*	1.73*	1.68*	-	-
Number of OP visit outside the district	2.36*	2.19*	1.20	-	-
Gender of household head (Ref: *Male*)					
Female	0.87	1.27*	1.31*	0.95	1.30*
Occupational type of household (Ref: *Others***)					
Casual labourers	1.01	1.02	1.63*	1.23*	1.28*
More than half of members having insurance coverage	0.94	0.86*	0.74*	0.99	1.12
Socio-religious categories (Ref: *Others*)					
Scheduled Tribes	0.47*	0.67*	1.01	1.32*	1.34*
Scheduled Caste	0.91	0.86*	1.94*	1.10	1.18
Muslim	0.97	1.01	1.85*	1.29*	1.12
Economic Class (Ref: *Upper Middle*)					
Poor	0.39*	7.83*	2.34*	1.20	1.78*
Lower Middle	0.47*	5.49*	1.89*	1.25*	1.37
Mid-Middle	0.79	3.80*	1.77*	1.08	0.72
Constant	0.28*	0.06*	0.03*	0.17*	0.02*

Notes: #Results are provided in Odds Ratio (OR); * $p < 0.05$; **'Others' include households with self-employed members, regular wage/salaried members or members engaged in other occupation

Source: Estimated from SHDS data (2012)

Analysis of Multidimensional Medical Care-related Catastrophe

It should be noted that when the threshold is low, higher percentage of households would qualify as catastrophe or vulnerable due to medical care related reasons and as the threshold rose higher, the percentage would come down gradually (Tables A2 and A3 in Appendix). To compare both the approaches, we ask the following question: if we set the threshold of Wagstaff and van Doorslaer method and the method suggested in this paper in such way that both measures generate almost same percentage of households with catastrophe or medical-care related vulnerability for the whole population, will the distribution of households across income and socio-religious group be similar? Using SHDS data, we find that percentage of households which have incurred OOP medical expenses more than 10% of their TCE is 24.32 and this is almost equal to households which are multidimensionally vulnerable in 7 or more dimensions (23.12 per cent). Figure 1 (Panel A) and Table 6 show how the aggregate percentages derived using both the methods are distributed across socio-religious groups. Wagstaff-van Doorslaer measure suggest that CME is highest for other class (non-ST, non-SC, non-Muslim), followed by Muslims, SC and ST. Our measure also shows that the percentage of multidimensionally vulnerable households is highest for Muslim households, followed by SC and ST and it is lowest for other households. Figure 1 (Panel B) and Table 6 show how aggregate percentages derived using both the methods are distributed across income groups. Here we find that percentage of households having incurred CME is lowest for poorest class and highest for the richest class. However, our measure portrays an opposite picture as the poorer households are more multidimensionally deprived than their better-off counterparts.

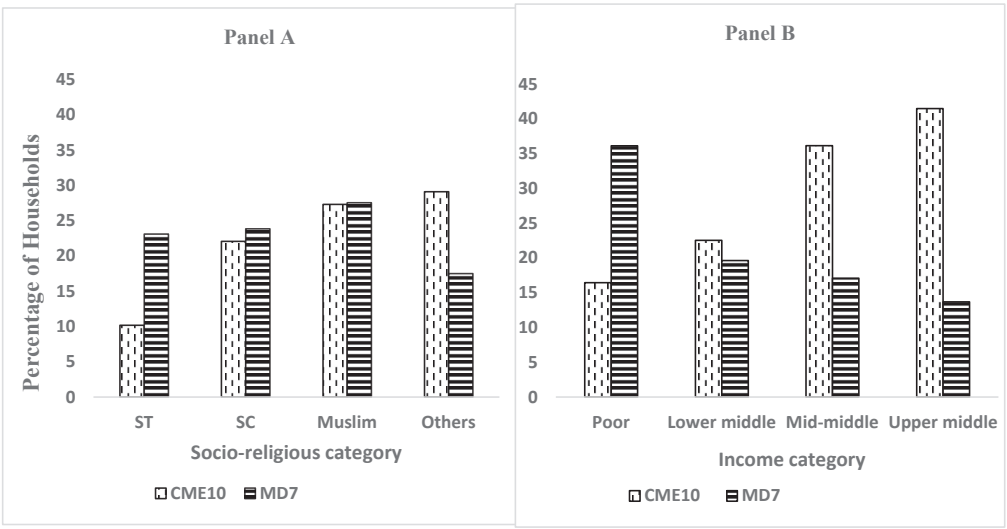
Table 6: Percentage of Households with Catastrophic Medical Expenditure (Threshold 1) and Multidimensionally Deprived Households by Socio-religious Categories and Income Groups

Variables	Households with catastrophic medical expenditure (%)[1]	Multidimensionally vulnerable households (%)[2]
Socio-religious category		
ST	10.16	23.09
SC	22.06	23.84
Muslim	27.29	27.53
Others	29.09	17.49
Income groups		
Poor	16.45	36.13
Lower middle	22.54	19.63
Mid-middle	36.14	17.08
Upper middle	41.49	13.68
Total	24.32	23.12

Notes: [1]Wagstaff and van Doorslaer approach with cut-off at 10 %; [2]Author's suggested measure with cut-off at ≥ 7 dimensions (in percentages)

Source: Estimated from SHDS data (2012).

Figure 1: Comparison of Households with Catastrophic Medical Expenses (CME) and Medical Care Related Multidimensionally Vulnerable across Socio-religious and Income Category



Source: Estimated from SHDS data (2012).

To validate our results with more recent data, a similar exercise is being done using NSS 75th health round data (2017-18) for rural West Bengal and rural eastern plains of West Bengal. It is found that for both the regions, CME is highest for the other class (non-SC, non-ST and non-Muslim). On the contrary, the multidimensional measure suggests that SC and Muslim have the highest share of multidimensionally deprived households in rural West Bengal and rural eastern plains of West Bengal respectively. Even across income groups, CME is highest for richest class and lowest for the poorest class, while using the multidimensional measure it is evident that poor households are more multidimensionally deprived as compared to its richer counterparts in both the regions of West Bengal (results not shown and can be obtained from the authors on request).

Discussion

This paper—drawing ideas from Alkire-Foster's conceptualization of multidimensional poverty—attempts to provide a measure for households' medical-care related catastrophe which goes beyond the conventional money-metric approach of catastrophic medical care payments popularized by Wagstaff and van Doorslaer. In doing so, we explore the covariates of healthcare utilisation, likelihood of incurring CME, distress financing, seeking low quality/informal care and no care. Using data from four blocks of Birbhum district in West Bengal, we find that large households are more likely to have hospitalisation episode, hospitalisation in private facilities, hospitalisation outside the district and OP visit (overall and visits to private facilities). This is perhaps a reasonable finding as large households are expected to consist of children and elderly who have higher chances of falling sick. It is observed that households having elderly members, children, females of reproductive age group are more likely to experience hospitalisation. Women, elderly and children are generally dependent members in rural households and other studies have found their higher risk of falling sick leading to higher utilisation of healthcare services (Pandey et al., 2017; and

Gumber and Berman, 1997). Moreover, presence of chronically ill members in household increases the likelihood of hospitalisation episode as well as OP visit including OP visit to private facility and OP visit outside the district. As chronic illnesses require prolonged care and diagnostic tests on multiple occasions, households having members suffering from such illnesses are expected to utilize more healthcare, both in hospital and OP settings (Schäfer et al., 2012). Therefore, presence of elderly or chronically ill member in the household places substantial burden on its budget leading to impoverishment (Rahman et al., 2013; and Van Minh and Xuan Tran, 2012). Female-headed households are observed to seek more hospitalisation care. The female headed households may be more risk averse and cannot afford to ignore the medical care need of its members resulting in higher medical care utilisation (Flory et al., 2018). In the absence of poor health insurance coverage, especially government health insurance for the poor, hospitalisation and OP expenses leading to high OOP medical care costs is also observed in other contexts (Okedo-Alex et al., 2019; and Yazdi-Feyzabadi et al., 2018).

Households with elderly and chronically ill members, having hospitalisation events and OP visits to private facilities are more likely to resort to distress financing. With these factors augmenting households' likelihood of incurring CME, it is quite obvious that households would resort to distress modes to finance them, thereby putting them at a greater risk of indebtedness (Joe, 2015; and Sangar et al., 2019). However, households with more than half of the members with health insurance coverage have lesser likelihood of incurring CME (with threshold 2) and resorting to distress finance as insurance coverage reduces OOP expenditure and provides financial protection against CME (Aryeetey et al., 2016). We also find that being a female-headed household increases the probability of incurring CME (with threshold 2) and these households are more likely to resort to distress financing. This finding is consistent with studies conducted in China and India (Li et al., 2014; and Mondal et al., 2010). A plausible explanation is that female-headed households are found to have lower educational status and low paying jobs which reduces their capacity to cope up with medical care costs, thereby increasing the odds of incurring CME and resorting to distress financing. In another context households with female heads are found to allocate a relatively greater share of household resources for medical care as compared to male-headed households (Onah and Horto, 2018). Our results suggest that casual labour households and households belonging to poorer income groups and backward socio-religious categories such as SC and Muslims have higher likelihood of resorting to distress financing as compared to their counterparts. Low- and irregular-income sources and poor savings are likely to compel these households to depend upon distress financing modes to cope with OOP medical expenses (Joe, 2015; and Sangar et al., 2019).

It is found that households with chronically ill members are more prone to seek apparently low-quality care from informal care provider and no medical care. It should be noted here that a chronic illness persists over an extended time period and requires repeated healthcare which escalates the costs as well. This might induce the poor to resort to informal medical care providers for seeking care or avoiding medical care, especially in the context of West Bengal (Bose and Dutta, 2018). Our analysis reveals that ST, SC and economically disadvantaged households are more likely to seek informal care and no medical care despite severe/chronic illness (Rashad and Sharaf, 2015; and Chhim et al., 2015). A possible explanation is that these households may not be having adequate CTP and are possibly unable to divert resources from other basic needs which prevent them from seeking medical care from relatively expensive formal providers and probably force them to depend on less expensive informal care providers. (Ahmed et al., 2018; and Chhim et al., 2015). Seeking medical care from informal providers such as quacks can also be due to culturally ingrained traditions and beliefs and lack of access to healthcare services.

A comparison of results obtained by using the approach of Wagstaff and van Doorslaer and our multidimensional approach shows that backward economic and socio-religious categories such as ST, SC, Muslims and poor households account for higher share of burden related to medical care catastrophe or vulnerability. This implies that these households are deprived in multiple indicators of wellbeing due to medical catastrophe, which are not merely limited to experiencing CME. Evidence suggests that there exist marked differentials in access to material and health resources and in exposure to health risks with regard to caste and religion, especially in the Indian context (Acharya 2018; and Baru et al., 2010). Studies assessing the degrees of inequality, discrimination and social exclusion across caste and religious groups have found that backward groups have poorer health outcomes, lower subjective health status, greater financial burden of medical care, lower utilisation of medical care services and inequalities in access to medical care services, with their marginal sociocultural positions being a possible reason for such outcomes (Borooah et al., 2012; and Dasgupta and Thorat, 2009). It has been estimated that backward caste households have substantially lower per capita medical care expenditure compared to the other caste households along with huge unmet need for chronic medical care (Mukherjee et al., 2011). It is also evident from another study in the Indian context that multidimensionally deprived households are more likely to have higher illness episodes, higher incidence of CME and inability to afford such payments as compared to their non-deprived and non-poor counterparts (Mohanty et al., 2017). Thus, households with multiple deprivations are more likely to face medical-care catastrophe, which is expected to be further augmented by their lower socio-cultural positions and low-income earning capacity and result in higher proneness to avail medical care from informal or unqualified providers and avoid medical care from formal sources.

So, while the measure of catastrophic medical expenses focuses only on the money-metric measures, the multidimensional approach looks at demographic, household, medical care seeking and financing dimensions and highlights those households who are more vulnerable to face medical-care related catastrophe due to multiple reasons. Hence it provides a more convincing and reliable picture of vulnerability imparted as it goes with our intuitive expectation and depends on multiple set of information to identify a household's vulnerability with regard to medical care. By depending on a single type of information (i.e., expenditure figures) and yielding us a result which is counter-intuitive, the Wagstaff-van Doorslaer's measure of medical care catastrophe is less reliable than our multidimensional measure. However, the multidimensional measure used by us is not free from limitations. First, only headcount measures are considered for the analysis. For fully capturing the medical care related catastrophe of households, other measures – that captures the intensity and depth –are required as well. Second, the study is not free from the regular limitations of self-reported consumption expenditure, illness, medical expenditure and medical care utilisation data that have been provided to the field investigators by the respondents.

Conclusions and Policy Implications

The frequently applied threshold-sensitive money metric measure of Wagstaff and van Doorslaer (2003) has several limitations. By using multiple dimensions related to household, individual, medical care seeking and financing behavior, this study tries to capture medical-care related catastrophe faced by households. The multivariate analysis brings out many findings which make the justification of using multiple indicators stronger. The results of our study suggest that the multidimensional measure presents a more convincing picture of medical-care related catastrophe faced by the households as compared to the Wagstaff and van Doorslaer's method of identifying households

based on CME. Comparing the results of both these approaches, it is clearly evident that when the percentage of households facing medical-care related catastrophe and incurring CME is same at the aggregate level, there is a stark contrast in the distribution of catastrophic or vulnerable households across economic classes and socio-religious groups. As a matter of fact, the multidimensional measure, unlike the CME measure of Wagstaff and van Doorslaer (2003) show a higher medical care catastrophe for the poorer households and backward caste and religious groups. This emphasises the practical relevance of a multidimensional measure to capture the burden and vulnerability of households due to reasons related to medical care.

The findings of the study can be instrumental for crafting policies as many components of this multidimensional measure can be assessed *ex ante* helping policy makers and health administrators identify the vulnerable households. Using this approach, policymakers can identify specific types of medical care related deprivations and deprived population subgroups, which might allow them to design different type of interventions for varying needs of the population. Such provision of public institutions for hospitalisation well as OP care, especially for the socio-religiously and economically disadvantageous groups can improve their health outcomes as well as unintended medical catastrophe. In addition, targeted policies for chronic illness care, adequate funding for public medical care facilities and expansion of government sponsored insurance, especially for the vulnerable groups can reduce the incidence of medical catastrophe and its inequitable distribution across population subgroups substantially.

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Appendix

Table A1: Binary Indicators of 'Catastrophe' and Their Definitions

Variables	Definitions and binomial values
Large household	8 or more members (1); otherwise (0)
Elderly	At least one elderly (1); no elderly (0)
Children	Two or more children (1); otherwise (0)
Female	Five or more females of reproductive age group (1); otherwise (0)
Chronic	At least one chronically ill person (1): otherwise (0)
Acute	At least two acute ill person (1): otherwise (0)
Poor	Household with PCCE less than Rs 783 (1); otherwise (0)
Gender of household head	Female headed household (1); Male headed household (0)
Insurance	More than half of the family members having no insurance coverage (1); otherwise (0)
Occupation type of household	Casual labour households (1); otherwise (0)
Hospitalisation	Any episode of hospitalisation (1); no episode of hospitalisation (0)
Private hospitalisation	At least one episode of hospitalisation in private hospital (1); no episode of private hospitalisation (0)
Outside district hospitalisation	At least one episode of hospitalisation outside district (1); no episode of hospitalisation outside district (0)
OP visits	Two or more than two OP visits (1); less than 2 OP visit (0)
Private OP visits	At least one OP visit to private facility (1): no OP visit to private facility (0)
Outside district OP visit	At least one OP visits outside district (1): no OP visit outside district (0)
Catastrophic medical expenditure1 (Threshold1)	Out-of-pocket medical expenditure as a percentage of household consumption expenditure ≥10% (1); <10 % (0)
Catastrophic medical expenditure2 (Threshold2)	Out-of-pocket medical expenditure as a percentage of household non-food consumption expenditure ≥40% (1); <40 % (0)
Distress finance	At least one medical episode in the household is financed by borrowing or contribution from friends/relatives or by selling or mortgaging assets (1): by other sources (0)
Low quality/informal medical care	At least one informal medical care in case of severe/chronic illness in the household (1): otherwise (0)
No medical care	At least one untreated care in case of severe/chronic illness in the household (1): otherwise (0)

Source: SHDS data (2012).

Table A2: Absolute and Cumulative Percentages of Households Multidimensionally Deprived Due to Medical Care Related Catastrophe

Multidimensional deprivation scores	Frequency (%)	Cumulative deprivation to health scores	Cumulative population (%)
0	13 (0.1)	≥0	100
1	254 (2.02)	≥1	99.9
2	1378 (10.97)	≥2	97.88
3	2110 (16.8)	≥3	86.91
4	2358 (18.78)	≥4	70.11
5	1976 (15.74)	≥5	51.33
6	1565 (12.46)	≥6	35.59
7	1149 (9.15)	≥7	23.13
8	787 (6.27)	≥8	13.98
9	457 (3.64)	≥9	7.71
10	289 (2.3)	≥10	4.07
11	118 (0.94)	≥11	1.77
12	63 (0.5)	≥12	0.83
13	27 (0.22)	≥13	0.33
14	10 (0.08)	≥14	0.11
15	2 (0.02)	≥15	0.03
16	1 (0.01)	≥16	0.01
17	0 (0.00)	≥17	0.01
18	0 (0.00)	≥18	0.01
19	0 (0.00)	≥19	0.01
20	0 (0.00)	≥20	0.01
21	0 (0.00)	≥21	0.01
Total	12557 (100)		

Source: Estimated from SHDS data (2012).

Table A3: Cumulative Percentages of Households Facing Catastrophic Medical Expenditure by Threshold Percentages

Threshold 1[1]	Cumulative households (%)	Threshold 2[2]	Cumulative households (%)
≥1	93.01	≥1	96.88
≥5	45.69	≥5	87.78
≥10	24.32	≥10	75.96
≥15	15.58	≥15	64.98
≥20	10.80	≥20	56.94
≥25	7.76	≥25	49.93
≥30	5.71	≥30	43.33
≥35	4.42	≥35	38.24
≥40	3.69	≥40	34.60
≥45	3.05	≥45	31.09
≥50	2.53	≥50	28.69
≥55	2.17	≥55	25.53
≥60	1.85	≥60	23.57
≥65	1.66	≥65	21.78
≥70	1.47	≥70	20.08
≥75	1.32	≥75	18.85
≥80	1.19	≥80	17.60
≥85	1.08	≥85	16.40
≥90	0.95	≥90	15.38
≥95	0.89	≥95	14.53
≥100	0.83	≥100	13.91

Notes: [1]OOP medical expenditure as a percentage of household consumption expenditure ≥10%;
[2]OOP medical expenditure as a percentage of household non-food consumption expenditure ≥40%
Source: Estimated from SHDS data (2012).

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STRUCTURAL FEATURES OF ODISHA ECONOMY: A STUDY USING INPUT-OUTPUT FRAMEWORK

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Abstract: The sectoral composition of the Odisha economy has undergone a structural shift over the years. One of the best ways to examine the structural relationship among the sectors in an economy is the Input-Output approach. This technique provides valuable insights into the interdependence of various sectors in an economy. Attempt has been made in this paper to examine this aspect. 'Chenery-Watanabe linkages' approach is used to study the structure of the economy. The approaches such as 'Rasmussen Backward and Bulmer-Thomas Forward Linkages' are applied for specification of key sectors. Finally, 'Output and Income Multipliers' approaches have been employed in order to lay emphasis on those sectors that are responsible for strengthening the production base of the state economy. It is observed that agro-based industries, along with mineral-based industries, have an edge over other sectors in the state economy.

Keywords: Inter-industry approach, Linkage analysis, Multiplier index, Odisha economy, Structural change

Introduction

The Indian federation constitutes 28 States and 8 Union Territories. Odisha is one of them. The state had a history of being characterised as an agrarian economy since its existence in 1936. Although it is endowed with rich natural resources, a major segment of its population is reeling under acute poverty. However, with the onset of economic reform in 1991 in India, Government of Odisha adopted a paradigm shift in its development planning and policy programmes. Over the past decades, the economy of Odisha has undergone a significant structural shift and this has changed its tag from a *lagging behind state* to *a state on march*. The state has experienced robust growth during the period from 2012-13 to 2019-20. A comparative analysis of growth performance of Odisha vis-à-vis other states of India during the above mentioned period reveals a positive differential trend in the state's average annual growth rate. It is observed that between 2012-13 and 2019-20, Odisha's

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economy grew at an average annual rate of 7.1 per cent, a rate higher than the national average of 6.6 per cent and 13 other states of the country including Goa, Maharashtra and Punjab (Government of Odisha, 2021: 12). This shows that the economic base of Odisha is getting stronger.

As said, Odisha economy has experienced significant structural change. The change can perhaps be best explained by the shares of primary, secondary and tertiary sectors in the State Domestic Product. The shift from a primarily agro-based economy in 1970s to the predominance of service sector in 1990s is an important feature of the structural transformation of Odisha economy. In tune with Kuznets's (1966) doctrine, we can say that a growing 'tertiarisation' of the structure of production and employment has been taking place in the State economy. The shift in the composition caused substantial changes in production and demand linkages among different sectors of the economy and, in turn, might have led to significant ramifications on the growth and development processes of the Odisha economy.

Against this backdrop, an attempt has been made in this article: to examine the structure of the Odisha economy; to investigate the interdependence among different sectors of the State; to suggest a few steps to strengthen the state economy so that the economy becomes more stable and can record higher growth rates in future.

The plan of the paper is as follows: Section I gives a bird's eye view of sectoral share of GSDP in Odisha. Section II provides a brief note on past studies in this field. Section III presents the theoretical model adopted for analysis. Section IV depicts data and empirical results. The conclusion is drawn in the last section.

Section I: Tracking Sectoral Composition of Odisha Economy

Sectoral shares of Gross State Domestic Product of Odisha at 2004-05 prices are given in Table 1. It can be observed from the table that, over the last five decades (1970-71 to 2019-20), there is a major shift away from the agriculture towards industrial and service sectors. Agricultural sector which accounted for about 50 per cent of the total GSDP in 1970s contributed only 22 per cent in the decade 2000s. On the other hand, during the same period the share of the service sector was consistently increasing and reached to a level of 54 per cent in 2000s from around 38 per cent in 1970s. Over the corresponding period, the share of the industrial sector has been doubled from 12 per cent to 24 per cent. During 2012-20, even though the share of service sector has declined, this has been compensated by the industrial sector, leaving the agricultural sector at around one-fifth of the state domestic product. The sectoral growth pattern reflects that the performances of all the sectors were reasonably good during the decade of 1980s, contributing to a GSDP growth of 4.14 per cent. But in the 1990s, the economy decelerated and the growth rate of GSDP was found to be only 3.67 per cent per annum. However, the growth rate remarkably rose up in 2000s. GSDP grew at a rate of 8.42 per cent per annum during the decade 2000-2010. The growth rate of the industrial sector was the highest, i.e., 13.58 per cent per annum, followed by the service sector (8.42 per cent) and agriculture sector (3.87 per cent), respectively. In the period of 2012-20, the Odisha economy registered more than 7 per cent growth rate in both industrial and service sectors. Although the growth rates were much lower than that of the previous decade, they are found to be higher than the national rates in the corresponding period (Government of Odisha, 2021).

Table 1: Sectoral Composition of GSDP in Odisha (%)

Year	Agriculture	Industry	Service	GSDP
1970-80	50.11	12.23	37.66	100
	(0.93)	(5.77)	(4.03)	(2.69)
1980-90	46.62	13.12	40.26	100
	(2.07)	(7.97)	(5.30)	(4.14)
1990-00	32.57	17.51	49.92	100
	(1.45)	(5.00)	(4.62)	(3.67)
2000-10	22.14	23.43	54.43	100
	(3.87)	(13.58)	(8.24)	(8.42)
2012-20	20.67	38.90	40.43	100
	(4.42)	(7.13)	(7.11)	(7.05)

Notes: Figures in parentheses show the decadal growth rates. For 1970-2010, the 2004-05 prices and, for 2012-20, the 2011-12 prices have been used.

Source: Computed by the author; original data taken from various sources of government.

Section II: Past Studies

Structural relationship among sectors in an economy is generally examined in three different ways. These are statistical analysis, econometric models and input-output technique. In the Indian context, all the above techniques have been extensively used by various researchers. Quite a large number of studies have been done in this area. Dhawan and Saxena (1992), Chowdhury and Chowdhury (1995), Ahluwalia and Rangarajan (1989), Pani (1984), Storm (1997), Palanivel and Klein (1999), and Papola (2012) are only a few to name. Papola (2012) adopted statistical approach to forge the linkages between different sectors of the Indian economy. Pani (1984), Storm (1997), and Palanivel and Klein (1999) examined the interrelationship among different sectors of the Indian economy through the econometric analysis. Dhawan and Saxena (1992) and Chowdhury and Chowdhury (1995) followed input-output approach to find the nexus between different sectors of the Indian economy. Statistical methods examine the relationship between the growth of different sectors of the economy, whereas econometric models forecast the future with simulations and help in policy formulations. However, inter-industry approach provides valuable insights into the interdependence of various sectors by examining the way in which different sectors are interlinked with each other in the web of production. Such an approach guides us to explore the notion of the 'key sectors' (Hirschman, 1958; and Rasmussen, 1957). The key sectors are those which—by their powerful linkages with other sectors—are in a favourable position to induce the expansion of other sectors. It is argued that if certain resources can be concentrated on these key sectors, then output, income and employment in the region will grow more rapidly than when those resources were put elsewhere. In this way, we can formulate future plans and policies to move a regional economy in right direction. Thus, in this research article, we have attempted an input-output approach to study the structure of the Odisha economy.

The Input-output model is the brainchild of Nobel laureate Wassily Leontief. The first ever input-output model of the American economy came into existence in 1936 (Leontief, 1936). In several countries, work on the construction of input-output table was in a full swing after 1939. Progress in the preparation of national input-output models gained momentum in 1940s and 1950s. In India, the origin of input-output study dates back to 1950s. Initially, the work for construction of a national model was undertaken by several individual researchers (Mukherjee, 1967; Datta, 1954; Biswas, 1954; Goodwin and Choudhuri, 1955; Chakravarti, 1968; Dhar, 1967; and Saluja, 1980),

and later the same was taken over by research institutions as well as government organisation, viz., Indian Statistical Institute (1961) and Central Statistical Organisation (1981, 1989, 1990, 1997, 2000, 2005, and 2007).

Planning at the regional level in the context of a vast country like India having wide regional disparities in terms of economic development necessitates creation of sub-national or regional level input-output tables indispensable. Pioneering tasks on regional input-output analyses at the international level were carried out by Leontief (1953), Moses (1955), Chenery (1956), Isard (1960), Polenske (1970) and others. A regional input-output table was prepared by experts like Moore and Peterson on a particular state named Utah in the year 1955 (Moore and Peterson, 1955). Regional Input-output models in India were prepared for Assam (Barua, 1977), Bihar (Ghosh, 1975), Gujarat (Kashyap and Alagh, 1971) Haryana (Bhalla, 1974), Karnataka (Panchamukhi, 1981), Madhya Pradesh (Prakash and Patankar, 1978), Maharashtra (Koti, 1973), Punjab (Bhalla, 1975), Rajasthan (Mehta, 1979), Uttar Pradesh (Government of Uttat Pradesh, 1982) and West Bengal (Singh, 1972; Government of West Bengal, 1985). Venkatramaiah et al. (1979) derived 21 regional-level tables from the National Table of 1965—i.e., for 15 States and 6 Union Territories of India—during 1970s.

Preparation of input-output model requires huge amount of data. A comparative analysis of different models for different time periods would reveal the broad trends in structural shift of the economy. However, results based on these are generally static and relate mainly to the reference periods (Sonis et al., 1995; and Zakariah and Ahmed, 1999). Interestingly, for Odisha economy, four such tables are available for the reference years 1983-84[2] (Dhal, 1996), 1994-95[3] (Patra, 2010), 2003-04[4] (NCAER, 2007) and 2015-16 (Chadha et al., 2020). But, the sectoral divisions of these tables are not uniform. Therefore, we are not in a position to compare these tables and ultimately confine our attention to examine a snapshot view of the Odisha economy for the latest time period, i.e., 2015-16.

Section III: Analytical Framework

The inter-industry model serves as a useful device for economic analysis and policy formulation. This is basically designed for the analysis of the production process of an economy. The inter-industry transaction table shows the flow of goods and services from a sector of the economy to all other sectors over a specified period of time (say, a year). It gives the systematic description of interdependence of different sectors of the economy by way of a two-way table. Under this technique, the economy is segregated into a number of homogeneous sectors, each of which is

[2] The first ever Input-Output Table prepared for Orissa is for the reference year 1983-84 which consists of 31 sectors. Of them, one belongs to Agriculture and Allied Activities, one to Mining, 23 to Manufacturing and 6 to Service Sectors.

[3] The second Input-Output Table for Odisha is related to the reference year 1994-95 and has 23 sectors. Three of these sectors belong to agriculture, 14 to manufacturing and one each to Animal Husbandry, Forestry & Logging, Fishing, Mining, Construction and Electricity.

[4] The Input-Output Table prepared by the National Council of Applied Economic Research (NCAER) for the Odisha economy, with the reference year 2003-04, is segregated into 43 sectors. In the primary production, 4 categories belong to agriculture, 4 to mining and 1 each to animal husbandry, forestry & logging, and fishing. The manufacturing activities are sub-divided into 16 categories. Tertiary activities include sub-sector one each to construction, electricity, gas & water supply, railway transport services, other transport services, storage & warehousing, communication, trade, hotels & restaurant, banking, insurance, ownership of dwellings, education & research, medical & health, other services and public administration.

represented in the table by a row and a column. The rows of the table give the distribution of the output of the sector while the columns give the inputs consumed by the sector. Since each entry in any horizontal row is also an entry in vertical column, the output of each sector is shown to be an input in some other. The additional columns, known as final demand, record the sales by each sector to the consumers.

The Leontief model is represented through the equation: $X = (I-A)^{-1}Y$ (Leontief, 1960), where X and Y are column vectors of outputs and final demand, respectively. A is the matrix of technical input coefficient ($a_{ij} = X_{ij} / X_j$), where X_{ij} is the output of sector i used in sector j as input and X_j is the total output of sector j.

The Input-output table is an ideal analytical tool for the study of mutual dependence of different sectors. The table has been used for establishing the linkages between sectors of the economy. The concept of linkage was introduced by Hirschman (1958). Linkages are of two types: backward and forward. A sector is linked with other sectors, which supply inputs to it, and also with those, which use its output as their own inputs. Thus, the expansion of a sector induces a large demand for inputs for its input-supplying sectors and also provides large input supply to other sectors using its output. The former is known as backward linkage and the latter as forward linkage.

The first attempt to quantify linkages of a sector was made by Chenery-Watanabe (1958). However, these indices explain only direct linkages. Under this method the sectors of the economy are classified into four categories on the basis of linkage effect. Backward linkage (U_j) is defined as the ratio of intermediate input of sector j to the total output of sector j ($U_j = X_{ij} / X_j$) and forward linkage (W_i) is defined as the total intermediate demand for output of sector i to the total demand for sector i ($W_i = X_{ij} / X_i$). The words 'primary' and 'final' describe the sectors with low value of U and W, respectively, while the words 'manufacturing' and 'intermediate' denote high value of U and W, respectively. Accordingly all the sectors of the economy are clubbed into four categories. They are: Low Backward & Low Forward Linkage (Final Primary production); Low Backward and High Forward Linkage (Intermediate Primary); High Backward and High Forward Linkage (Intermediate Manufacture); and High Backward and Low Forward Linkage (Final Manufacture). In the present analysis we have used 'Chenery and Watanabe' method to study the structure of Odisha economy.

To measure both direct and indirect linkages of a sector, Rasmussen (1957) has used the Leontief inverse matrix. He has used a normalisation process to compare the 'average' stimulus created by a sector j with the overall average of all the sectors in order to assess the direct and indirect backward linkage. The index can be expressed mathematically as:

$$Y_j = \frac{\frac{1}{n}\sum_{i=1}^{n} z_{ij}}{\frac{1}{n^2}\sum_{j=1}^{n}\sum_{i=1}^{n} z_{ij}}$$

where z_{ij} denotes the i, jth element of Leontief Inverse Matrix (its entries represent the direct and indirect requirements of inputs produced by i per unit of output produced by industry j) and 'n' is the number of sectors. From the formula, it reveals that the expression $Y_j > 1$ implies the following: an investment in jth sector would yield above-average backward linkage; while the converse is true if $Y_j < 1$. However, the ordering of sectors only on the basis of Y_j would not reflect the true picture of the stimuli created by a sector in the production process, as a high index might have been due to purchase of inputs from one or two particular sector(s). Therefore, the dispersion of the 'stimuli' should be taken into account. This can be measured through the coefficient of variation, V_j:

$$V_j = \frac{\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(z_{ij} - \frac{1}{n}\sum_{i=1}^{n} z_{ij}\right)^2}}{\frac{1}{n}\sum_{i=1}^{n} z_{ij}}$$

A low V_j means that the investment in sector j would create stimuli for other sectors in an even manner and a high V_j implies that the outcome of stimuli in the form of 'backward linkage' would be shared unevenly.

In an analogues manner Rasmussen measured the forward linkage of a sector and its dispersion with the help of the following formulas:

$$Y_i = \frac{\frac{1}{n}\sum_{j=1}^{n} z_{ij}}{\frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n} z_{ij}} \quad \text{and} \quad V_i = \frac{\sqrt{\frac{1}{n-1}\sum_{j=1}^{n}\left(z_{ij} - \frac{1}{n}\sum_{j=1}^{n} z_{ij}\right)^2}}{\frac{1}{n}\sum_{j=1}^{n} z_{ij}}$$

The numerator in equation of forward linkage refers to the i^{th} row sum of the Leontief inverse. Mathematically, this suffers from two defects. First, while the inverse elements of a given column used in the backward linage are additive, the elements of a given row are not so. Secondly, the greater the number of sectors into which an economy is divided, the sum of inverse coefficient elements in a given row is likely to be greater, while the column sum is independent of the number of sectors. High forward linkage occurs when the output of a sector is used by many other sectors as inputs, but an erroneous conclusion may arise if a small sector j relies heavily on sector i for inputs in a large inter-industry table. That will lead to a biased index of forward linkages of i.

To overcome the above mentioned defects, Bulmer-Thomas (1982) measures the forward linkages from the 'output inverse' as distinct from the traditional Leontief 'input inverse' by taking clue from the supply-driven input-output model of Ghosh (1958). Briefly, the 'input inverse' is based on a matrix of technical input coefficients (i.e., intermediate inputs as a share of a total input including value added), while the 'output inverse' uses technical output coefficients (i.e., intermediate sales as a share of total sales including final demand). Now, the formula for Bulmer-Thomas's forward linkage and its coefficient of variation are defined as:

$$Y_i = \frac{\frac{1}{n}\sum_{j=1}^{n} w_{ij}}{\frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}} \quad \text{and} \quad V_i = \frac{\sqrt{\frac{1}{n-1}\sum_{j=1}^{n}\left(w_{ij} - \frac{1}{n}\sum_{j=1}^{n} w_{ij}\right)^2}}{\frac{1}{n}\sum_{j=1}^{n} w_{ij}}$$

where $W = (I-B)^{-1}$, $B = X_{ij} / X_i$. X_{ij} is the output of sector i used in sector j as input and X_i is the total output of sector i. B is known as 'output coefficient matrix' and shows the proportions that each industry i sells to every other industry j out of its total output. The entries of 'output inverse matrix' reveals the direct and indirect sales that sector j must encourage to every other sector i to meet the exogenous demand. This seems akin to the true spirit of the conception of forward linkage, as this represents "the increase in output of all using industries rather than an increase in output of the (one) supplying industry" (Bulmer-Thomas, 1982).

Hence, in the present analysis, we have used Rasmussen methodology to measure backward linkage and Bulmer-Thomas approach to measure forward linkage of different sectors of Odisha

economy. The potential importance of a sector in generating growth depends on these two linkages. This has led to explore the notion of key sector. Once the key sectors are identified, it is suggested that these sectors be given priority in investment allocation and industrial promotion strategy. A sector is considered as a key sector if it has high backward and high forward linkages with low coefficient of variations. To examine this in the state of Odisha, we have used the methodology adopted by Diamond (1975). This involves a three step procedure: first, sectors are arranged in descending order of their linkage indices; then, there is a need to order the sectors in ascending order of their coefficient of variations; and, finally, the average of these two rankings are ordered (the largest first, to obtain the final ranking of the sector in the hierarchy of linkage indices). This is equivalent to assign equal weight to high linkage indices and low coefficient of variation for specification of key sector.

An increase in demand for output of a sector not only increases its production, employment and income, but also the demand for raw materials required by this sector. This sparks off a chain of demand in other sectors with concomitant increase in demand, income and employment as well. In an input-output framework, 'Multiplier' describes this aspect of production process. It measures the total repercussions in terms of adjustments in output, employment and income generated by a given change in the final demand vector (Saxena, 1987). Hence, to quantify the economic impact of increase in output of any one sector we have estimated 'Output Multiplier' and 'Income Multiplier' following Richardson's (1972) methodology. The output multiplier is measured by the ratio between the change in direct and indirect output to the change in direct output for one extra unit of final demand in a given sector. This is obtained from Leontief Inverse Matrix. Output multiplier is calculated by the formula: $O_j = \sum a^*_{ij}$, where a^*_{ij} is the element of $(I-A)^{-1}$. Likewise, the income multiplier is the ratio of the change in direct and indirect income to the change in direct income due to a one unit increase in final use in a given sector. Income multiplier is estimated by the formula, $\sum a^*_{ij} h_i$, where a^*_{ij} represents the elements of the Leontief inverse matrix and h_i is the entry in the row vector of household (value added) coefficients.

Section IV: Data and Empirical Results

Data

To analyse the structure and inter-sectoral dependence of Odisha economy we have used the input-output table prepared by Chadha, Saluja & Sivamani (2020) for the reference year 2015-16. Based on the data available at the Directorate of Economics and Statistics, Government of Odisha, they have prepared the table by segregating the Odisha economy into 76 sectors. Under primary sector, 8 categories belong to Agriculture, 10 to Mining and one each to Animal Husbandry, Forestry & Logging, Fishing. The manufacturing activities are sub divided into 32 categories. Tertiary activities include sub sector one each to Construction, Electricity, Water Supply, Storage & Warehousing, Communication, Trade, Hotel & Restaurant, Financial Service & Insurance, Ownership of dwellings, Education & Research, Medical & Health, Legal Services, Computer Related Services, Other Business Services, Renting of Machinery & Equipment, Other Services and Public Administration and five different Transport Services. However, for analytical purpose we have condensed the table into 25 sectors. The sectoraisation scheme that we have adopted covers 3 Agricultural Sector, 5 Industrial Sector, 13 service sector and one sector each of Animal Husbandry, Forestry, Fishing and Mining.

Empirical Results

Structure of Odisha Economy

Chenery-Watanabe (C-W) Statistics pertaining to Odisha economy are presented in Table 2. The C-W analysis concludes that the intermediate manufacturing sector, which has high forward and high backward linkage with top priority in production structure comprises Cereals, Animal Husbandry, Mining, Forest-based Industries, Petroleum Products, Other Industries, Electricity & Water Supply, Transport Services, Storage & Warehousing, and Communication Services. These 10 sectors contribute 44.60 per cent and 35.71 per cent of total output and Gross Value Added (GVA), respectively. Five sectors, viz., Agro based Industries, Iron Industries, Construction, Hotel & Restaurant and Medical & Health produces 27.06 per cent of total output and 16.28 per cent of GVA. These sectors demonstrate high backward and low forward linkage. Pulses, Trade, Financial & Insurance Services and Other Services exhibit low backward and high forward linkages, whose contributions are 15.45 per cent and 23.17 per cent of total output and GVA, respectively. Six other sectors, namely, Other Agricultural Products, Forestry, Fishing, Ownership of Dwelling, Education & Research and Computer Services display low backward and low forward linkages. These sectors are termed as final-primary category that comprises only 24.84 per cent of GVA and 12.89 per cent of total output.

Table 2: Classification of Sectors as per C-W Forward and Backward Linkages in Odisha

	Sector No.	Sector Name	U_j	W_i
1.	Intermediate Manufacture (II) : High backward & High forward (44.60 Per cent of total output & 35.71 per cent GVA)			
	1	Cereals	0.528	0.774
	4	Animal Husbandry	0.486	0.635
	7	Mining	0.530	0.771
	9	Forest Based Industries	0.572	0.997
	10	Petroleum Products	0.736	0.610
	12	Other Industries	0.738	0.902
	14	Electricity & Water Supply	0.611	0.491
	15	Transport Services	0.479	0.788
	16	Storage and Warehousing	0.560	0.726
	17	Communication Services	0.530	0.521
2.	Final Manufacture (III) : High backward and Low forward (27.06 Per cent of total output & 16.28 per cent GVA)			
	8	Agro Based Industries	0.843	0.167
	11	Iron Industries	0.699	0.443
	13	Construction	0.594	0.153
	19	Hotel & Restaurant	0.658	0.370
	23	Medical & Health	0.458	0.002
3.	Intermediate primary production (I) : Low backward & High forward (15.45 Per cent of total output & 23.17 per cent GVA)			
	2	Pulses	0.658	0.729
	18	Trade	0.380	0.643
	20	Financial & Insurance Services	0.239	0.797
	25	Other Services	0.301	0.582

	Sector No.	Sector Name	U_j	W_i
4.	Final Primary production (IV) : Low backward & low forward (12.89 Per cent of total output & 24.84 per cent GVA)			
	3	Other Agricultural Products	0.104	0.293
	5	Forestry	0.152	0.305
	6	Fishing	0.140	0.075
	21	Ownership of Dwellings	0.034	0.000
	22	Education & Research	0.302	0.037
	24	Computer Services	0.338	0.023

Notes: Uj and Wi refer to Chenery-Watabe Backward Linkage and Forward Linkage, respectively.

Source: Computed by the author; original data taken from Chadha et al. (2020)

Above analysis clearly points out that most of the producing sectors in Odisha are coming under 'Intermediate Manufacturing' category, which is a noteworthy feature as these sectors have more value added capacity and a few sectors are coming under 'Final Primary' segment, where production is not having any round about method of production.

Linkage Analysis and Specification of Key Sector

The linkage indices along with the coefficient of variations of Odisha are shown in Table 3. Column 3 through 5 display the Backward Linkage, Coefficient of Variation and Rank of different sectors of Odisha as calculated under Rasmussen methodology. Analogously, Column 6 through 8 represent the Forward Linkage, Coefficient of Variation and Rank of different sectors of Odisha as calculated under Bulmer-Thomas framework. Last Column exhibits the identified key sectors of the State. It is clear from the table that 14 sectors have backward linkage of more than one. The list is headed by Agro-based Industries and it is followed by Petroleum Products, Construction and Electricity & Water Supply. Likewise, 12 sectors have forward linkage of more than one. Forest Based Industries group tops the list of forward linkage, followed by Transport Services, Mining, and Financial & Insurance Services.

The linkage analysis of Odisha reveals that, out of six sub-sectors under the primary category, only Cereal has both high forward and high backward linkages, whereas Pulses and Animal Husbandry sectors have high forward but low backward linkages, and all other sectors have low forward and low backward linkages. The continuation of traditional method of production process and absence of the processing of these products in the state economy might be responsible for low backward and low forward linkages, respectively. Almost all the industrial sectors including Mining depict high forward and high backward linkages. This is undoubtedly a welcoming feature for the economy. As far as service sector is concerned, three sectors, viz., Transport Services, Storage & Warehousing, and Communication Services exhibit high forward and high backward linkages.

The result of our analysis discloses that nine sectors have registered above-average linkages—both forward and backward. That is, both the forward and backward linkages have numerical values of more than one. These sectors are termed as key sectors. The sectors are: Cereals, Mining, Forest Based Industries, Petroleum Products, Other Industries, Electricity & Water Supply, Transport Services, Storage & Warehousing, and Communication Services. Hence, while framing policy, Government of Odisha should take steps for promotion of these sectors/industries to improve the growth potentiality of the State economy.

Table 3: Linkage Indices of Odisha Economy

Sector No.	Sector Name	Y_j (BL)	$CV_j = V_j$	Rank	Y_i (FL)	$CV_i = V_i$	Rank	Key Sector
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Cereals	1.041	2.590	14	1.100	2.739	13	√
2	Pulses	0.847	2.972	17	1.091	2.480	12	
3	Other Agricultural Products	0.603	4.218	24	0.774	3.223	16	
4	Animal Husbandry	0.905	2.854	16	1.073	2.340	11	
5	Forestry	0.677	3.663	22	0.745	3.352	18	
6	Fishing	0.639	3.953	23	0.549	4.562	21	
7	Mining	1.188	2.569	8	1.432	2.163	2	√
8	Agro Based Industries	1.326	2.058	1	0.659	3.963	20	
9	Forest Based Industries	1.160	2.661	12	1.772	1.769	1	√
10	Petroleum Products	1.378	2.342	2	1.232	2.322	7	√
11	Iron Industries	1.361	2.556	6	0.991	3.397	16	
12	Other Industries	1.413	2.650	7	1.606	2.352	5	√
13	Construction	1.168	2.225	3	0.678	3.687	19	
14	Electricity & Water Supply	1.174	2.268	3	1.102	2.407	10	√
15	Transport Services	1.041	2.522	11	1.380	1.923	2	√
16	Storage and Warehousing	1.133	2.180	5	1.193	2.206	5	√
17	Communication Services	1.083	2.596	13	1.074	2.583	13	√
18	Trade	0.926	2.840	15	1.193	2.211	8	
19	Hotel & Restaurant	1.106	2.394	9	0.902	2.696	15	
20	Financial & Insurance Services	0.751	3.376	21	1.315	1.887	2	
21	Ownership of Dwellings	0.537	4.641	25	0.493	5.000	25	
22	Education & Research	0.784	3.195	19	0.526	4.750	22	
23	Medical & Health	1.118	2.512	9	0.494	4.993	24	
24	Computer Services	0.831	2.963	17	0.515	4.780	23	
25	Other Services	0.812	3.207	19	1.112	2.330	9	

Notes: Y_j, V_j, Y_i and V_i represent Rasmussen Backward Linkage, Coefficient of Variation of Y_j, Bulmer-Thomas Forward Linkage and Coefficient of Variation of Y_i, respectively.

Source: Computed by the author; original data taken from Chadha et al. (2020).

Multiplier Analysis

Sector wise output and income multipliers in Odisha economy are displayed in Table 4. The study reveals that the largest output multiplier (2.827) is recorded by 'Other Industries', followed by Petroleum Products (2.757), Iron Industries (2.722), Agro-based Industries (2.653) and Mining (2.377). As far as income multiplier is concerned, Agro-based Industrial sector tops the rank (5.402), followed by Iron Industries (4.791), Petroleum Products (4.462), 'Other Industries' (4.046) and Hotel & Restaurant (2.949). Other sectors that are displaying both high output and high income multiplier are Construction, Electricity & Water Supply and Forest-based Industries. Hence, the results of multiplier analysis suggest the need for strengthening government effort for industrialisation, in general, and agro-based and mineral-based industries, in particular.

Table 4: Multiplier Indices of Odisha Economy

Sector No.	Sector Name	Output Multiplier		Income Multiplier	
		Value	Rank	Value	Rank
1	Cereals	2.083	14	1.977	12
2	Pulses	1.694	17	1.519	17
3	Other Agricultural Products	1.206	24	1.111	24
4	Animal Husbandry	1.811	16	1.884	14
5	Forestry	1.354	22	1.167	22
6	Fishing	1.279	23	1.159	23
7	Mining	2.377	5	2.056	11
8	Agro Based Industries	2.653	4	5.402	1
9	Forest Based Industries	2.320	8	2.276	8
10	Petroleum Products	2.757	2	4.462	3
11	Iron Industries	2.722	3	4.791	2
12	Other Industries	2.827	1	4.046	4
13	Construction	2.337	7	2.449	7
14	Electricity & Water Supply	2.348	6	2.490	6
15	Transport Services	2.083	13	1.903	13
16	Storage and Warehousing	2.268	9	2.181	9
17	Communication Services	2.166	12	2.113	10
18	Trade	1.852	15	1.580	16
19	Hotel & Restaurant	2.212	11	2.949	5
20	Financial & Insurance Services	1.503	21	1.302	21
21	Ownership of Dwellings	1.075	25	1.033	25
22	Education & Research	1.569	20	1.418	20
23	Medical & Health	2.237	10	1.776	15
24	Computer Services	1.663	18	1.495	18
25	Other Services	1.626	19	1.422	19

Source: Computed by the author; original data taken from Chadha et al. (2020).

Section V: Conclusion

Empirical analysis reveals that 71.66 per cent of gross output of the state economy belongs to manufacturing production category, either intermediate or final. The declining trend of the primary sector to a level of 28.34 per cent of gross output signifies the fact that there is a remarkable change in the structure of production process in Odisha. The conclusion emerging from linkage analysis depicts importance of the manufacturing sector in the state economy. Primary sector, in general, records low backward linkage. This may be due to continuation of traditional technique of production. However, agriculture sector generates high forward linkage. The study indicates existence of potentiality in mining sector having high backward as well as forward linkages. Multiplier analysis suggests the need for strengthening industries, in general, and agro and mineral based industries, in particular. To sum up, Mining and Mineral Based industries, Cereal Production and Agro Based Industries, Petroleum Products and Transport and Communication Services should be given importance in policy formulation to strengthen the Odisha economy. To be very specific, Rice Husking and Sugar Industry within the food processing category and Iron & Steel, Aluminium, Ancillary & Downstream Industries within the mineral based category should be given priority. In Odisha, efforts have been initiated to start several industries under the 'Make in Odisha Conclave' programme. In two editions of the conclave held in 2016 and 2018, 286 investment proposals worth

Rs. 6.33 lakh crore across 17 diversified sectors were received. Of them, 86 projects are in progress and only 11 projects have started production (Government of Odisha, 2021: 153). Hence, this tardy growth needs proper attention to exploit the opportunity of progress of the State.

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DETERMINANTS OF PUBLIC HEALTHCARE SPENDING IN ODISHA: A TIME-SERIES ANALYSIS

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Abstract: This paper presents the time series analysis of public healthcare spending in Odisha, one of the poorest states in India, using data from 1961-62 to 2019-20. The determinants of public healthcare spending are examined through the application of Autoregressive Distributed Lag (ARDL) model. The order of integration of time series variables is tested by utilizing ADF and PP models and to test the existence of cointegrating relationship between the variables the ARDL bounds-testing procedure has been adopted. The findings show that Gross State Domestic Product (GSDP), population below 15 years of age, population above 65 years and urban population are the significant determinants of public healthcare spending in Odisha in the long run. With the growth of GSDP and population below 15 years, there is increase in healthcare expenditure; while with the growth of population above 65 and urban population, there is decrease in healthcare expenditure in the state. The long run income elasticity of 1.37 indicates that expenditure on public healthcare increases more than proportionately with the increase in income. But the very low share of healthcare spending in GSDP indicates that the allocation for healthcare is still not adequate and there is a need for restructuring of expenditure to release more funds for priority areas.

Keywords: Public healthcare expenditure, Time-series analysis, ARDL bounds test, Odisha

Introduction

Health is an important aspect of economic development. When health improves, the country can produce more output with any given combination of skills, physical capital and technological knowledge. Improvement in healthcare facilities may happen through adequate healthcare expenditure. Healthcare expenditure is considered as a crucial component for improving health conditions of a region. Thus, boosting healthcare expenditure should be the priority for a developing country. To understand sustainability in healthcare spending, it is important to examine the various factors determining the growth in healthcare expenditure. This will help decision-makers in managing healthcare spending. The need for government intervention in healthcare spending is particularly urgent in the State of Odisha in India, where the incidence of poverty is very high. Through adequate healthcare expenditure, human capabilities can be enhanced and the standard of living can be improved.

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Public healthcare expenditure accounts for a small share in total expenditure in Odisha. Health sector requires a significant growth through sustained interventions from both government and non-government organizations. However, the government expenditure on health sector is not satisfactory. Health expenditure remained at around 1 per cent of GSDP from 1996-97 to 2006-07 in Odisha. As a percentage of total State spending, it has declined in actual terms from 4.66 per cent in 1996-97 to 3.98 per cent in 2005-06. This decline was particularly evident after 2000-01 when the State government introduced a number of fiscal consolidation measures to arrest the fiscal crisis arising from a mismatch between revenue receipts and revenue expenditure (Sahoo and Madheswaran, 2014) and probably due to the introduction of the Central government funded National Rural Health Mission (NRHM) scheme. This poor funding brings about informal payments and increased out-of-pocket expenditure to access quality healthcare. Moreover, the user fees introduced for tertiary care (diagnostics, special accommodation and transportation) since 1991 comprise a huge share in the total healthcare expenditure. All these factors have been leading to an increase in the level of distress of the people of Odisha.

The health status of Odisha has improved in recent years but healthcare spending should be adequate to maintain growth and to prepare for unforeseen circumstances. It has been seen that the infant mortality rate (IMR) which was 51 in Odisha in the year 2013 has decreased to 38 in 2019, but still remained high compared to the all India average (30) as per the SRS (2019) Report. The Maternal Mortality Ratio (MMR) in Odisha slowly fell down from 168 in 2015-17 to 150 in 2016-18 (SRS, 2019), but remained higher than the all India average, i.e., 113. The birth rate in the state is 18.0 against the national average of 19.7 in 2013. The death rate of Odisha which was 8.4 in 2013 decreased to 7.1 in 2019 against the national average of 6.0 in 2019 due to the development of science and medical services (Rural Health Statistics, 2021).

The public healthcare system in Odisha plays a dominant role in delivering healthcare services, whereas the private sector has a limited role and is mostly found in urban areas of the state. According to Rout et al. (2016a) during the last three decades, medical and healthcare facilities in the state have increased. By the end of March 2020, the government healthcare system in the state comprises 1701 medical institutions and 6688 sub-centres (Govt. of Odisha, 2022a). However, there is lack of adequate number of doctors in the state with the doctor-population ratio in the public healthcare system to be 1:1943 (2021) against the WHO guidelines of 1:1000. Even though there has been an increase in the recruitment of doctors after the introduction of National Health Mission in 2005, many doctors did not join village hospitals due to lack of facilities in rural areas.

Considering the above health scenario in the state, an attempt is made here to study the determinants of healthcare expenditure in the state, so that policy suggestions can be made for restructuring healthcare spending policy. After a brief review of literature, the paper presents the trends in healthcare spending in Odisha followed by the materials and methods used in the study and the results and discussion in the following.

Review of Literature

A number of studies have been carried out on the determinants of public healthcare expenditure by Newhouse (1977), Jowett (1999), Gbesemete and Gertham (1992), Carrin and Politi (1995), Marmot (2002) and Rahman (2008), which highlighted a strong and positive relationship between per capita income and healthcare expenditure. Their common observation is that the per capita income significantly influenced healthcare expenditure. Barros (1998) examined positive effects of health on economic development and suggested a strong and robust effect of health in explaining

per capita income differences. Mehrotra et al. (2003) identified a special set of factors like the aging population, the cost of dying, technology, physician incomes, administrative costs, prescribed drugs, managed care and the underfunding of public health. They observed that the above factors influenced healthcare expenditure in USA but to a lesser degree than often imagined. Cantarero (2005) analysed the determinants of public healthcare expenditure in Spain. He found that the ageing population was the most important in determining the volume of regional healthcare expenditure, while other factors like the regional income and the relative structural characteristics of the supply variables were less important. Elmi and Sadeghi (2012) found income as the basic measurement of economic growth. Bedir (2016) found a uni-directional causality running from per capita GDP to healthcare expenditure in Europe and Middle East African and Asian countries and concluded that income is a measuring rod of healthcare spending for economic growth.

In a study on equity in healthcare spending using multivariate analysis, Dwivedi and Pradhan (2017) found that the out-of-pocket expenditure on healthcare services is more among the population residing in urban areas with high economic status and belonging to non-Muslim and non-scheduled tribe, whereas Thomas et al. (2015) stated political will and a committed policy making with enhanced fiscal space results in promoting equity in healthcare spending. In comparing significance of income and education on health expenditure, Sen and Rout (2007) found that influence of income is significant whereas education is insignificant on healthcare expenditure. They further added that at life risk stage, the spending becomes elastic irrespective of the level of income which they termed as High Life Risk Path (HLRP).

Haakenstad et al. (2022), through a cross sectional study in Odisha, put the state under category of high catastrophic health expenditure (CHE) despite of numerous facilities available as reported. They also found the dependency of population towards private sector specially to procure drugs which if eliminated would reduce the CHE by 56%. Longanathan et al. (2017) in their study in Wardha district of Maharashtra found the people with no healthcare facilities in their villages had higher CHE.

According to Rout et al. (2016b), the out-of-pocket expenditure on surgical condition is about 1.7 times more than that of non-surgical condition. Also, the non-medical expenditure in the case of patients undergoing surgery is higher as the period of stay is more. Government may look into designing the financial strategy to protect the interest of all the section of the society. Rout (2010) in another study on public health expenditure in Odisha stated that the spending of government in healthcare falls short of budget estimates every year and further suggested improving the transparency and management practice.

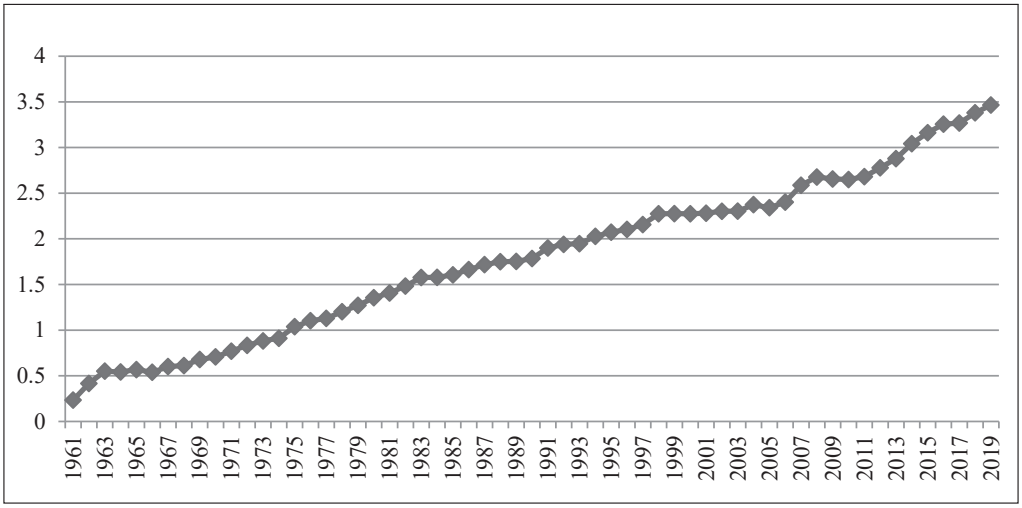
Bhat and Jain (2004) in their study among 14 major Indian states found that the public healthcare expenditure in real term was increasing for all states under study, except for Odisha, Gujarat, Assam and Uttar Pradesh where the per capita public healthcare expenditure as percentage of per capita GSDP showed a declining trend. Rahman (2008) found that healthcare was not a luxury good as the income elasticity of public expenditure was 0.47. Rout (2011) in her study found that healthcare spending in the state is determined by rise in per capita income, growth of population, literacy rate and per capita resource transfer from the centre. Similarly, in a study by Subbalakshmi et al. (2012), per capita GSDP and literacy rate were found to be significant and positively associated with per capita healthcare expenditure.

Trends in Public Healthcare Spending in Odisha

The per capita healthcare expenditure and GSDP in Odisha shows increasing trends during 1961-62

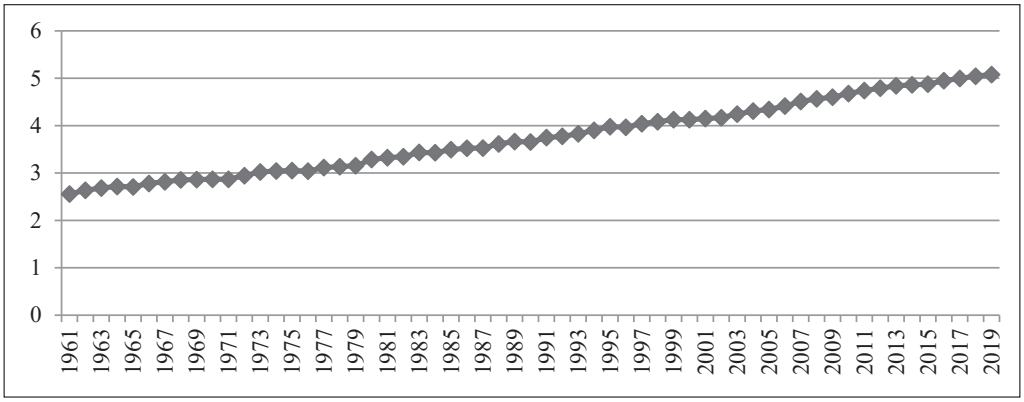
to 2019-20 (Figures 1 and 2). Initially the per capita healthcare expenditure grows slowly which had further increased after 2005-06. It has a significant rising trend but with fluctuation during 1961-62 to 2019-20. On the other hand, per capita GSDP in the state has shown an increasing trend with rapid growth after 2002-03. The growth of per capita GSDP showing consistently increasing trend over the years; while the growth of per capita healthcare spending with fluctuations presenting inadequacy towards health sector upliftment.

Figure 1: Trends in Per Capita Healthcare Spending (at Current Price) in Odisha



Source: Odisha Budgets

Figure 2: Trends in Per Capita GSDP (at Current Price) in Odisha



Source: Odisha Budgets

The per capita healthcare expenditure has grown at the annual compound rate of 4.08 per cent during 1961-62 to 2019-20, which is higher than the growth of per capita GSDP (2.52 per cent) during the period. The overall time period can be divided into three periods: first period from 1961-

62 to 1991-92 (i.e., the period prior to economic reform); second period from 1991-92 to 2005-06 (i.e., the period between economic reform and introduction of National Health Mission which may be termed as economic reform period); and third period from 2005-06 to 2019-20 (i.e., the National Health Mission period). The annual average growth of per capita healthcare expenditure in Odisha, which was growing around 4.58 per cent prior to economic reform, decelerated during economic reform (1.64 per cent) and made a spurt after the introduction of National Health Mission (13.39 per cent). At the same time, there is increasing growth of per capita GSDP in the economic reform period and thereafter. The healthcare expenditure as a ratio of GSDP has a negative growth during the reform period (-1.43 per cent) and increased rapidly after the National Health Mission (7.11 per cent). This shows that there was compression of healthcare expenditure during the period of economic reform.

Even though there is appreciable growth in public healthcare expenditure in Odisha during 1961-62 to 2019-20, the share of public healthcare expenditure in GSDP is found to be negligible. As per the Odisha budget documents, only 0.47 per cent of GSDP was spent on public healthcare in Odisha during 1961-62, which increased to 2.43 per cent during 2019-20. The share of healthcare spending crossed the figure of one per cent after 1976-77. But again, it decreased to 0.99 per cent during 2005-06 and revamped to 1.19 during 2007. Still fluctuations were found over the years which create a dismal picture to the spending pattern. Hence, healthcare has not been a priority sector in Odisha. Odisha being an economically poor state with poor health status of the people, there is an urgent need for government intervention towards spending in healthcare. Through sufficient expenditure on social priority areas like healthcare spending, human capabilities can be enhanced and the standard of living can be improved.

Materials and Methods

Data

As the study aims to find out the determinants of public healthcare expenditures in Odisha, the government healthcare expenditure data has been collected from the finance accounts of Govt. of Odisha. The healthcare expenditure data have been collected over the period from 1961-62 to 2019-20. The demand variables like different age group of population (below 15 and above 65 years) and urbanisation, and supply variables like per capita GSDP have been collected to find the determinants of per capita public healthcare expenditure.

Methods

To examine the factors determining public healthcare expenditure in Odisha, autoregressive distributed lag (ARDL) model has been used. As it is a time series analysis there is the possibility of the variables being non-stationary and hence there is the chance of spurious regression. Hence, the stationarity of the time series variables is tested with the help of Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) models. If the variables are integrated of order I(0) or I(1), then we can proceed to test for cointegration. In order to test the existence of cointegrating relationship between the variables, we have adopted the ARDL bounds-testing procedure proposed by Pesaran and Shin (1999) which was subsequently generalized by Pesaran et al. (2001).

The ARDL bounds test representation used here is as follows:

$$\Delta LHE_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta LHE_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta LGSDP_{t-i} + \sum_{i=0}^{p} \alpha_{3i} \Delta LAGE15_{t-i}$$

$$+\sum_{i=0}^{q}\alpha_{4i}\Delta LAGE65_{t-i}+\sum_{i=0}^{r}\alpha_{5i}\Delta LUP_{t-i}+\beta_1 LHE_{t-1}+\beta_2 LGSDP_{t-1}$$

$$+\beta_3 LAGE15_{t-1}+\beta_4 LAGE65_{t-1}+\beta_5 LUP_{t-1}+\eta DUM+u_t \quad (1)$$

where HE is per capita healthcare expenditure, GSDP is per capita gross state domestic product, AGE15 is the share of population below 15 years of age, AGE65 is the share of population above 65 years of age, UP is the share of urban population, L is logarithm, α_0 is the drift component and u_t is a white noise error process. DUM is the dummy variable assigned, following the structural breakpoint of the dependent variable. While the expressions with the summation sign indicate the short-run dynamics of the model with α_i short-run coefficients, the expressions with β_i represent the long-run relationship.

The long run relationship of the variables is tested through a joint Wald F-test for the significance of lagged level coefficients. The null hypothesis of this test can be formulated as $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$. The F-statistic is compared with the lower and upper critical bounds provided in the ARDL model to take cointegration decision. The upper bound assumes the series are I(1), while the lower bound assumes the series to be I(0). When the estimated F-statistic is greater than the upper bound, there is cointegration of the variables, while there exists no cointegration of the variables if F-statistic falls below the lower bound.

The per capita healthcare expenditure is expected to be positively related with per capita GSDP. GSDP helps to improve the level of affordability to access various healthcare services over the period of time. Per capita GSDP is a significant factor responsible for the growth of public healthcare expenditure via the increase in government revenue (Khan et al., 2016).

There is expectation of positive relationship of per capita healthcare expenditure with the share of population below 15 years and the share of population above 65 years. It is expected that with the increase in the population below 15 years and above 65 years, there is increase in per capita healthcare expenditure. According to OECD (2022) the working age group population is considered as 15-64 years of age. They are supposed to be more independent than the population below 15 years and above 65 years. Implication of the policies and resource funding should be made to better off the condition of this dependent age group. Both these age groups have strong influence over per capita healthcare expenditure (Khan et al., 2016). According to the WHO (2020), there is strong influence of elderly population over per capita healthcare expenditure in the long-run as it is found that elderly population are availing more healthcare services than the youth. They are more prone towards public healthcare services to get rid of various chronic diseases, cardiovascular diseases, diabetes, etc. So, it is imperative to increase the healthcare expenditure with growing elderly population (Nordin et al., 2015 and Li et al., 2020).

Per capita healthcare expenditure is expected to be positively associated with the increase in the share of urban population. That is, with the increase in urbanization there is the possibility of increase in healthcare expenditure, as urbanization brings some healthcare issues which are required to be tackled by allocating greater healthcare expenditure. Expenditure on urban population contributes to better sanitation, improved cleanliness and higher average income in urban areas. Better healthcare service is defined through greater accessibility and availability of healthcare services. Also, the awareness of urban population towards healthcare service is greater compared to rural population (Rout, 2010).

The ARDL version of error correction model can be expressed as follows:

$$\Delta LHE_t = \alpha_0 + \sum_{i=1}^{m-1} \alpha_{1i} \Delta LHE_{t-i} + \sum_{i=0}^{n-1} \alpha_{2i} \Delta LGSDP_{t-i} + \sum_{i=0}^{p-1} \alpha_{3i} \Delta LAGE15_{t-i}$$

$$+ \sum_{i=0}^{q-1} \alpha_{4i} \Delta LAGE65_{t-i} + \sum_{i=0}^{r-1} \alpha_{5i} \Delta LUP_{t-i} + \alpha_6 DUM + \delta ECT_{t-1} + w_t \quad (2)$$

where, ECT stands for the error correction term and δ represents the speed of adjustment towards the long run equilibrium. It shows how quickly variables converge to equilibrium and it should have a statistically significant coefficient with a negative sign.

The study has used a number of tests for the efficiency of the model. In order to test the serial correlation, the Breusch-Godfrey LM test is used. The heteroscedasticity and normality tests are done by using ARCH test and Jarque-Bera normality test, respectively. The cumulative sum of recursive residuals (CUSUM) and CUSUM sum of squares of recursive residuals test are used to examine the stability of the coefficients.

Results and Discussion

To find the determinants of public healthcare expenditure in Odisha, both demand variables like age-wise population and urbanization and supply variable like GSDP have been used. Since it is a time-series analysis, the order of integration of the variables is tested by applying ADF and PP test. The tests show that urban population is integrated of order I(0), while per capita healthcare expenditure (HE), per capita GSDP, population below 15 years (Age15) and population above 65 years (Age 65) are integrated of order I(1) (Table 1).

Table 1: Unit root Test Results in Levels and after First Differencing

Variable	ADF		Philips- Perron (PP)	
	Level	First difference	Level	First difference
LHE	0.367380	-6.327427*	0.337488	-6.298353*
LGSDP	0.895021	-8.862432*	1.192369	-8.983756*
LAGE15	-2.522194	-3.973816*	-3.012259**	-3.884440*
LAGE65	-1.265494	-4.820824*	-1.418176	-4.851746*
LUP	-10.03112*	-	-6.998521*	-

Notes: * and ** indicate rejection of null hypotheses at 1% and 5% levels of significance, respectively.
Source: Authors' calculation

Since the variables are integrated of order I (0) and I (1), ARDL bounds testing procedure is applied to find out the long run relationship of the variables. ARDL bounds-testing procedure for cointegration is also favoured, because it has better finite sample properties and thus outperforms the Engle Two-Step and the Johansen procedures in small samples (Pesaran et al., 2001). Its estimates are robust even in the presence of endogenity, whereas the Engle Two-Step and Johansen procedures are biased under such circumstance.

The result of the ARDL bounds test shows that the estimated F-value of 8.47 is higher than upper bound critical values of 4.15 at 1 percent level (Table 2). This result therefore confirms the existence of cointegration (or long run relationship) of healthcare expenditure with GSDP, age15, age65 and urban population.

Table 2: ARDL Bounds Test for Co-integration (Lag Order: 1, 4, 0, 0, 2, 3)

Dependent variable	Function			F-statistic
LHE	LHE (LGSDP, LAGE15, LAGE65, LUP, DUM)			8.47*
Asymptotical values for	1%	1%	5%	5%
unrestricted intercept and no trend	I(0)	I(1)	I(0)	I(1)
	3.06	4.15	2.39	3.38

Note: * indicates significant at 1% level.
Source: Authors' calculation

The empirical findings of the determinants of healthcare spending are presented in Table 3. It can be observed that there is significant positive influence of per capita GSDP on government healthcare spending. This indicates that increase in per capita GSDP leads to increase in government expenditure in health care. This could be due to the fact that government revenue collection goes up with the rise in GSDP (NCDS, 2013), which might have induced the State Government to spend more money for healthcare. Therefore, the State Government should take necessary measures to augment the level of GSDP at faster rates, so that healthcare expenditure further increases.

Table 3: Long Run Relationship Using ARDL Model (Lag Order: 1, 4, 0, 0, 2, 3)

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	-4.177352*	0.789052	-5.294138	0.0000
LGSDP	1.366139*	0.103107	13.24969	0.0000
LAGE15	1.858794*	0.434518	4.277830	0.0001
LAGE65	-0.414648*	0.051689	-8.021899	0.0000
LUP	-1.460083**	0.601485	-2.427464	0.0199
DUM	-0.091164	0.054504	-1.672616	0.1024

Notes: HE is dependent variable. * and ** indicate significant at 1% and 5% levels, respectively.
Source: Authors' calculation

It is also observed that population below 15 years has significant positive relationship with healthcare spending (Table 3). This shows that with the increase in population below 15 years there is an increase in healthcare expenditure. The Government has taken various measures including several vaccination programmes, among others, for the infants and children for which the infant and child mortality rates have been reduced drastically (Government of Odisha, 2022b). This has boosted healthcare spending for the population below 15 years. However, the present health status of Odisha's infants and children is not satisfactory. The desired health status set by the national policy 2017 is still miles away for Odisha (CYSD, 2019). The major contributors to the high infant and child mortality rates are the extremely low levels of health sector investments and the associated quality of care (Pradhan and Arokiasamy, 2006). Hence, the state needs to spend more money for the healthcare of the population below 15 years.

As regards the population above 65 years, the result is unexpected. There is significant negative relationship between population above 65 years and public healthcare spending (Table 3). Let us now interpret the result. There is now a tendency that elderly people (including a section of the poor), who are health-wise vulnerable, tend to access private healthcare services rather than public healthcare. The reason is that public healthcare services are not satisfactory; timely and adequate services are often not available in public hospitals (Chauhan, 2015). This is the reason why public

health care expenditure goes down with the increase in above-65 population group. However, the morbidity rate of elderly people is higher in the state, which demands more spending for the healthcare of the elderly people (Government of Odisha, 2019). The Government should therefore spend more money to improve the public healthcare services so that the poor and elderly people start depending on the public healthcare services again.

Similarly, urban population shows a significant negative relationship with public healthcare spending (Table 3). This is because urban population (including a section of the poor) prefers to access private healthcare rather than public healthcare services (Dilip and Duggal, 2004; Government of India, 2013; and Kumar et al., 2016). The Government should spend more money to improve the urban public healthcare services.

Table 4: Short Run Dynamics (Lag Order: 1, 4, 0, 0, 2, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGSDP)	0.053701	0.112311	0.478144	0.6352
D(LGSDP(-1))	-0.567705	0.135698	-4.183584	0.0002
D(LGSDP(-2))	-0.338287	0.116306	-2.908603	0.0060
D(LGSDP(-3))	0.233380	0.111061	2.101373	0.0421
D(LUP)	3.009652	1.149478	2.618277	0.0125
D(LUP(-1))	3.097721	1.154537	2.683086	0.0106
D(DUMMY)	-0.021467	0.029245	-0.734035	0.4673
D(DUMMY(-1))	0.153381	0.030074	5.100153	0.0000
D(DUMMY(-2))	0.131893	0.032075	4.112072	0.0002
CointEq(-1)*	-0.496080	0.059970	-8.272092	0.0000
R-squared	0.688066	Mean dependent var	0.053156	
Adjusted R-squared	0.625679	S.D. dependent var	0.046380	
S.E. of regression	0.028376	Akaike info criterion	-4.123586	
Sum squared resid	0.036234	Schwarz criterion	-3.758617	
Log likelihood	123.3986	Hannan-Quinn criter.	-3.982449	
Durbin-Watson stat	1.828434			

Source: Authors' calculation

Table 4 shows that the coefficient of error correction term (ECT) is negative and significant at 1% level. The estimated coefficient of -0.50 of the error correction term suggests that the system corrects its previous period's disequilibrium from long run by 50 per cent in a year. The strong significance of the ECT supports co-integration and suggests the existence of a long-run equilibrium relationship between the variables.

The results of diagnostic tests for the efficiency of the model are presented in Table 5. The tests suggest that there is no serial correlation in the error term. The model passes the Jarque-Bera normality tests, signifying that the errors are normally distributed. Moreover, the ARCH test denotes that the errors are homoskedastic and independent of regressors.

Table 5: Diagnostics Tests

Test statistics	LM Tests	F Tests
Breusch-Godfrey Serial Correlation	CHSQ (2) = 1.460016 [0.4819]	F (2,37) = 0.504488 [0.6079]
Heteroscedasticity (ARCH)	CHSQ (1) = 0.292998 [0.5883]	F (1,52) = 0.283685 [0.5966]
Jarque-Bera Normality	0.030579 [0.984827]	NA

Note: Figures in square brackets are p values.
Source: Authors' calculation

Figure 3: CUSUM Test

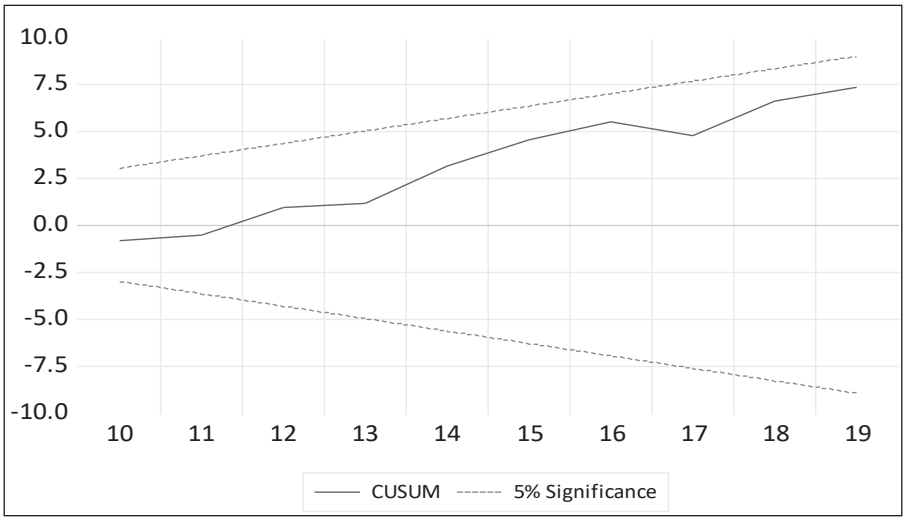
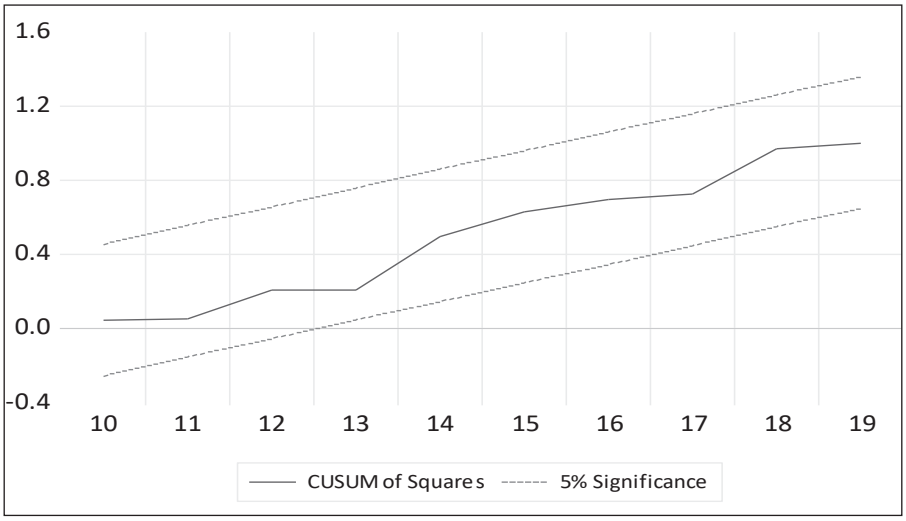


Figure 4: CUSUM of Squares Test



The model is also found to be stable over the period of estimation, as the CUSUM (Figure 3) and CUSUM of Squares (Figure 4) test statistics remain within the critical bounds at 5 per cent level of significance. Hence, the stable estimates could be used by the policy makers to predict the healthcare expenditure in Odisha.

Conclusions

From the above findings, it can be concluded that Odisha is lagging behind the national average in most of the health indicators, suggesting for more investment in health sector in order to enhance human capabilities and standard of living. The share of public healthcare spending in GSDP is very insignificant. Therefore, there is an urgent need for government intervention in healthcare spending in the state.

The time-series analysis of data over the period 1961-62 to 2019-20 revealed that per capita GSDP, share of population below 15 years, share of population above 65 years and share of urban population are significant determinants of the growth of per capita public healthcare spending in Odisha in the long-run. With the growth of GSDP and population below 15 years, there is increase in healthcare expenditure; while with the growth of population above 65 years and urban population, there is decrease in healthcare expenditure in the state. The healthcare in the state can be considered as a 'luxury good' as the income elasticity (1.37) is more than unity. This shows that Wagner's hypothesis holds good, meaning that public healthcare expenditure (HE) increases at a faster rate than the increase in income (GSDP). However, due to low share of public healthcare expenditure in GSDP, health status in the state is not satisfactory compared to the all India level. The share is well short of 6 per cent of income as recommended by the ICSSR and the ICMR panel (ICSSR and ICMR, 1981). Hence, there is a need to restructure the pattern of government spending so that more funds could be released to priority sector like healthcare. The state government needs to invest greater funds for the healthcare of the elderly and increasing urban population, who have not received much attention so far. Further, proper utilization of healthcare services should be executed through transparent and efficient approach. Greater efforts are needed to improve the standard of health indicators such as infant mortality rate, maternal mortality rate, institutional delivery, etc.

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BOOK REVIEW

Regional Disparities in India **by Ajit Kumar Singh, Mittal Publications, New Delhi, 2021, ISBN 9789390692002, pp. 542, price Rs.950/-**

Regional development has been an important issue for discussion after the great depression of the 1930s. Economic policies of many countries based on the dominating, at that time, theories of growth poles and core and peripheries have led to a relatively long period of stable economic growth. These policies were realized by centralized localization decisions and by providing economic incentives to potential investors in order to encourage them to establish their new companies in less developed regions (Benko, 1993: 42). It is in this context that the book *Regional Disparities in India* by Ajit Kumar Singh gains relevance in the literature.

The book is a collection of 31 papers relating to regional disparities and regional planning published earlier in various books and journals during the period from 1969 to 2018. The articles/ chapters have been reprinted in the book. Of the total 31 papers, two papers were published as early as in 1969; 17 papers were published during the pre-reform period; and 14 papers were published during the post reform period. A range of issues have been discussed in the book. The book is divided into three parts. Part one deals with inter-state disparities in India. Part two deals with regional disparities in Uttar Pradesh and part three deals with issues relating to regional planning in India.

Data included in almost all chapters seems old and, therefore, the stories of the recent advancements are missing. References are missing in some chapters. The points like policy objectives in terms of balanced regional development, accelerating the growth rate, distribution of income and resources, etc. are well elaborated. Methodologies employed in the chapters are adequate. For the comparison of different states of India in terms of fiscal transfer, a few more indicators of economic growth, in addition to the gross state domestic product (GSDP) and trends in production, could have been included. One of the chapters that discusses the state-wise industrial disparities also discusses the human capital aspect in connection to regional development. However, this required more elaborated discussion on the issue. In the same manner, some chapters on other parameters of social disparities could have been included. Overall, the book is an important contribution to studies relating to regional development except the fact that a good number of articles (now chapters) appeared in different outlets a few decades ago.

Several efforts have been made during the planning process to narrow the levels of regional disparities. A chapter of the book argues that the persistence of regional disparities is attributed to the piecemeal approach. Indian planning has its roots in colonial subjugation during the British rule. The process of industrialisation during the British period propelled the regional disparities. Even at the time of independence, the concentration of manufacturing industry in selected regions and lack of backward and forward linkages resulted in failure of bouncing the growth in the surrounding areas. The author concludes that the pattern of development adopted during the post-independence period was a continuum of the distorted and uneven pattern of regional development inherited from the British regime.

Chapter 1 deals with the theoretical approaches to regional development and discusses the regional disparities across the world. The paper in the last section discusses the regional disparities in India. Many theoretical approaches developed by Myrdal, Hirschman, Richardson, Douglass

S. North (Export base theory), Colin Clark et. al. (sectoral growth theory) and Rostow (stages of growth theory), among others, have been discussed. The paper (now chapter) was originally published in 1981. However, there are some gaps in the book so far as the development theories are concerned.

In the recent times, there have been some important developments in the theory of regional growth. For instance, the bottom-up growth theory has been integrated with the endogenous growth theories. They have highlighted the role of endogenous potentials of a region. Such potentials have to be realised in the best possible way to create full employment accompanied by high productivity of other production factors (Stawasz, 2004).

There is also a growing interest in the concept of post-developmentalism. These theories are heterogeneous in nature as modern, linear, cumulative and neutral approach to knowledge is criticized. According to the proponents of post-developmentalism, the only way for poor nations to catch up with the most developed countries is to imitate their culture, institutions and economic structure. However, this strategy is criticised on the ground that rural regions will be less competitive than urban areas, and hence the rural regions will be poorer than the urban areas. This is because the industrial sector is relatively more productive than the agriculture sector (Cavalcanti 2007: 89-90). The theories of post-developmentalism emphasize the need for searching new determinants and measures of economic development which will be consistent with the regions' social determinants. The greatest value of these theories is contained in the indication of the role of cultural factors as important stimuli for development.

There are other theories such as the theory of sustainable development that looks at the economic processes—from the perspective of consequences—it can cause in the future. It is postulated to manage the development in a way that will preserve proper relations between production factors and will increase the quality of living of present generations without limiting this possibility for the future.

The regional development theory has its roots in early location theory. The theory was developed in Europe after the Second World War. Regional development theory mainly consists of balanced development theory and unbalanced development theory. According to the balanced development theory, the production elements of the interregional flow, i.e. regional economic development levels, will tend to balance, so that productive force and investment should be allocated to each region in equilibrium and the balanced development of regional economies can be realized. On the other hand, unbalanced development theory argues that the regional development gap will not shrink; on the contrary, it will expand.

Other theories include "growth pole" as developed by Francois Perroux, "cumulative causation model" explained by Karl Gunnar Myrdal and "Gradient elapse theory" of R. Vernon. According to the growth pole theory, some leading industries or innovative capacities of enterprises or industries are concentrated in a specific region or large city with the regional capital and technology being highly concentrated; and thus, growth pole is formed. The growth pole can produce strong radiation effects on the adjacent areas of growth pole. The opinion of "cumulative causation model" is that the natural role of market forces in any time will increase domestic and international inequality as long as the overall level of development is low. The Industry Cluster Theory of Michael Porter explains that some interconnected companies, suppliers, related industries and specialized institutions come together in a group in a particular region and form effective market competition, regional agglomeration effect, scale effect and external effect according to the regional cluster.

Also, the regional sustainable development theory was developed with the worsening of

the global environment. Albert Schmid pointed out in 1995 that it is very important for regional development planning based on the possibility and the necessity of sustainable development to formulate regional development goal in accordance with the inherent characteristics of the region and pay attention to the natural environment.

These are some recent theoretical developments in the literature on regional development as explained above but the discussion of these theories and empirical analysis in the regional development contexts is missing in the book. It is also not clear as to why only the regional development issues of only one state, i.e. Uttar Pradesh, have been taken up in the book. Overall, it is an interesting book that provides a deep insight into the issues and facts about the regional development in India.

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