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WELFARE COMPARISONS WITH MULTIDIMENSIONAL WELL-BEING INDICATORS: AN INDIAN ILLUSTRATION

Udaya S Mishra
Vachaspati Shukla

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ABSTRACT

Problem of making welfare comparisons between populations with multidimensional discrete well-being indicators are well known. Application of a weighting scheme remains a convenient alternative for aggregating across dimensions but not without the limitation of subjectivity in the principle of weighting. Further dichotomous well-being indicators pose another complexity in comparison as regard counting 'how many' and 'which ones' at the same time. This paper attempts a welfare comparison of population where only ordinal information is available at the micro level in terms of multi-dimensional discrete well-being indicators. This does not involve any assumption either regarding strength of preference for each dimension or regarding the desirability of changes between levels within or across dimensions or the complementarities/substitutability between the dimensions. To carry out such a comparison, we adopt the concept of multidimensional first order dominance that enables us to make comparison across time and between populations based on a series of binary or multi-levelled ordinal welfare indicators. This concept is applied to the data on Household basic amenities obtained in the NSSO rounds and comparison is made across Indian states. Such a comparison offers a contrast to the welfare comparison made in terms of the deprivation prevalence across dimensions as well as its temporal changes.

Keywords: Dominance, Inter-dependence, Multidimensional Deprivation

JEL Classification: I31, I38, I30

1. Introduction

The 'basic human needs' approach to development that stresses on providing basic material needs to people (Hicks and Streeten 1979; Goldstein 1985; UNRISD 1970), has undoubtedly generated a legitimate space for assessment of multidimensional index of well being. Some of the recent and important contributions in this area includes, Anand and Sen (1997), Tsui (2002), Atkinson (2003), Alkire and Foster (2007), Jayaraj and Subramanian (2010). In general multidimensional index is estimated as the weighted index of a list of 'basic human needs'.

Alkire and Foster (2007)-the motivating idea behind the Oxford Poverty & Human Development Initiative's (OPHI) multidimensional poverty index- suggested a weighted index of deprivation in some specific dimensions of welfare in computing the multidimensional poverty index. However, this method considers independent reading of each indicator which often hides the extent of deprivation that exists among the households. For example, there might be households deprived in one dimension, two dimensions, three dimensions and zero dimension which do not receive due consideration in this approach. In an attempt to resolve this problem Jayaraj and Subramanian (2010), following the Chakravarty and D' Ambrosio (2006) approach, suggest a head count approach of counting deprivation in a limited set of dimensions wherein a distribution of household/individuals according to number of deprivation emerges. Such a distribution offers a deprivation profile eligible for comparison and aggregation but overlooking varying combinations of deprivation within the same count of deprivation.

The existing approaches of comprehending multidimensional deprivation have a limitation of ignoring not only the varying combination of deprivation, but also the possible inter-dependence between them. In other words, deprivation across all domains are equated as regard their ill-being implication. Since each dimension of 'basic human needs' has its own characteristics and differential impact on the welfare of people, it may not be appropriate to make a welfare comparison on the basis of an aggregate index and draw policy inputs. To resolve this problem and provide a meaningful comparison, we adopt the concept of multidimensional first order dominance that enables us to make comparison across time and between populations based on a series of binary or multi-levelled ordinal welfare indicators. Unlike the Jayaraj and Subramanian (2010), present approach not only accounts the number of dimensions in which individual/household is deprived but specificity of combination of indicators as well. For the purpose of an illustration, it is applied to data from India collected by National Sample Survey Organisation (NSSO), Government of India, under schedule 1.2 (housing condition). For the sake of simplicity three indicators; access to toilet facility, drinking water and electricity has been selected. It limits itself to comparing the information obtained in two rounds (58^{th} and 69^{th}) of National sample surveys. The analysis limits itself to rural India.

As a prelude, this exercise begins with an analysis of India's progress in three stated dimensions of 'basic human needs'. Section three of the paper comprehends the phenomenon of deprivation considering the share of fully privileged and completely deprived households. Fourth section of the paper examines the extent of possible interdependence between pairs of these indicators, and the fifth section proposes an alternative approach of counting deprivation accounting for varying combination within a given count of deprivation and compares the well-being among the different populations. Last section of the paper makes some concluding observations.

2. Progress in Three basic Indicators of Well-being

In order to monitor the extent of deprivation in Indian households as regard basic amenities, three selected indicators namely; availability of drinking water, use of electricity as a primary source of lighting and availability of toilet facility have been considered. The availability of water is defined on the basis of the distance travelled to collect water. The present analysis considers the proportion of households having availability of water 'within the premises' as a privilege on account of this dimension. The households having toilet either for exclusive use, or share the same toilet with one or more households have been counted as privileged as regard access to toilet facility. Similarly access to electricity is qualified on the basis of its use as a primary source of energy for lighting by the households. Going by Table 1, it is revealing that the rural disadvantage persists, and as a result, the overall progress is marginal. But in any case, the scene of deprivation when contrasted against universality is ill-placed except for electricity in urban households. The achievements in all three indicators are varied during the study period.

Table 1 : Proportion of Households Access to Basic Facilities in India

Year	Water		Electricity		Toilet	
	Rural	Urban	Rural	Urban	Rural	Urban
58th (2002)	37.2	70.3	53	91.6	20	73.1
69th (2012)	46.1	76. 8	80	97.9	39	85.5

Source: Estimated from NSS 58th and 69th round survey on Housing Condition and Amenities.

Like many other welfare indicators these indicators also present a clear regional divide. The regional disparities are more prevalent in rural areas than in urban areas because of better performance in urban areas (see Table A, & B in Appendix). In 2012 the proportion of household

with access to drinking water was 46.1 per cent in rural areas which vary from 17. 3 per cent in Jharkhand to more than 80 per cent in Punjab while in the same year 76.8 per cent of urban households have access to drinking water. In most of the states more than 70 per cent of urban households have access to drinking water except; Chhattisgarh, Jharkhand, Tamil Nadu and West Bengal. In the case of electricity, regional disparity is not of a grave concern in the urban areas as all the states have more than 90 per cent access to electricity except Bihar but the same cannot be said for rural areas. In rural areas 80.0 per cent of the household have access to electricity which is far lower than urban areas and varies widely from 46.7 per cent in Bihar to nearly 100 per cent in Punjab, Himachal Pradesh & Haryana. Rural areas have fared very poorly in the case of toilet facility. In 2012 only 40.6 per cent rural household have access to toilet facility with a wide variation ranging between 9.5 per cent in Jharkhand to 97 per cent in Kerala. Poor performance of the rural areas in access to toilet facility could also be associated with the fact that only three states Punjab, Assam and Kerala have more than 60 per cent access to toilet facility. Although the problem is not that serious in urban areas with more than 91.2 per cent access to toilet facility, still it is far from the universal access as many states still have less than 90 per cent access; Chhattisgarh, Bihar, Orissa, Jharkhand, Rajasthan, Madhya Pradesh, Tamil Nadu and Uttar Pradesh.

3. Analysis of Fully Privileged and Completely Deprived

Independent reading of progress in each of these individual dimensions often hides the extent of deprivation that exists among the households. For example, there might be the households deprived in one dimension, two dimensions, three dimensions and zero dimension. Following this, a summary well-being assessment accounting for all the three dimensions together pose a challenge given the numerous combinations of deprivations that emerge involving the three dimensions in discussion. One unambiguous way of assessing the well-being of the households in this context is to identify those, accessed/deprived along

with the corresponding levels of deprivation in all attributes. However, a comparison of the level of full accomplishment (i.e. deprivation in none) *vis-a-vis* no accomplishment (i.e. deprived in all) could offer a reasonable understanding of the distribution of deprivation at large. Therefore here we consider the households with access to all three basic facilities- water, electricity and toilet as against the households deprived in all three basic facilities-water, electricity and toilet. This will entail a comparison of well-being according to the all privileged and all deprived. Further, comparison of such extreme may well offer a hint of inequality in terms of households deprived per every privileged one but miss out on those with varying combination of deprivation.

Attempting a comparison of the extremes of full privilege and full deprivation, it can be seen that there is an improvement in the share of households with all privilege and a decline in the share of households with full deprivation in the rural sector (See Table 2). The extent of improvement in full privilege is much less when compared with the decline in share of full deprivation. Such an observation may be satisfying but they only account for less than one third of the rural Indian households and the rest witness varying combinations of this deprivation. The share of full privileged households increased from a level of 10.6 per cent in 2002 to 19.6 per cent in 2012. On the other hand, proportion of households deprived of all these facilities declined from 29.7 per cent in 2002 to 10.8 per cent in 2012.

Although there is a similar pattern of change observed across all the states as regard the extent of all privileged and all-deprived, there remains a wide variation in its magnitude across states (Table 2). The state of Kerala enjoyed 69.5 per cent of households with access to all these facilities as against a meagre 1.4 per cent of households being deprived of all these facilities. On the other extreme, rural areas of Jharkhand and Odisha have lowest achievement (4.6 per cent and 5.7 per cent respectively) in these facilities and highest deprivation (33.2 per cent and 22.5 per cent

respectively). Overall access to these facilities in rural areas present a very grim picture of India's development story as in twelve states less than 30 per cent of households have access to all these facilities and only three states Kerala, Punjab and Assam stand out with more than 50 per cent of households without deprivation in any of these dimensions.

Table 2: Proportion of Households Privileged in three Basic Facilities in rural India

States	2012		2002	
	All three	None of these	All three	None of these
Andhra Pradesh	18.9	1.4	12.4	19.1
Assam	54.4	5.4	14.1	22.6
Bihar	12.9	17.3	3.3	41
Chhattisgarh	7.5	10.9	5.9	42.9
Gujarat	30.7	3.5	16.8	13.5
Haryana	47.9	0.3	11.5	10.8
Himachal Pradesh	35.7	0.1	14.7	1.6
J& K	33.3	4.1	21.1	2.3
Jharkhand	4.6	33.2	6.7	63.1
Karnataka	15.1	3.8	10.4	14.1
Kerala	69.5	1.4	54.1	5.7
Madhya Pradesh	7.5	14.8	3.2	28.6
Maharashtra	20.4	5.2	8.1	20.2
Odisha	5.7	22.5	3.6	62.5
Punjab	58.2	0.5	43.5	1.4
Rajasthan	14.0	13.7	6.3	44.1
Tamil Nadu	14.4	2.2	6.3	18.1
Uttarakhand	41.7	2.6	22.8	30.1
Uttar Pradesh	12.7	20.8	6	37.5
West Bengal	14.7	10.0	7.3	47
India	**19.6**	**10.8**	**10.6**	**29.7**

Source: Estimated from NSS 58th and 69th round survey on Housing Condition and Amenities.

It is clear from the above analysis that regional disparities in the progress of these indicators can be analysed from both the sides, privileged/ deprived in all. Given that progress can be verified with the ratio of both privileged in all and deprived in all, the computed ratio, indicates the number of deprived for every privileged household, has improved significantly during the 2002 – 2012 (Table 3). The notable fact is that faster improvement occurred in the backward states; Bihar, Chhattisgarh, Odisha, Madhya Pradesh, Rajasthan, West Bengal, Uttar Pradesh. However, the ratio is still higher in these states than the others indicating higher inequalities in these states.

Table 3: Ratio of all-Privileged and all-Deprived in Three Basic Amenities for Rural India

States	2012	2002	States	2012	2002
Andhra Pradesh	0.07	1.54	Madhya Pradesh	1.99	8.94
Assam	0.10	1.60	Maharashtra	0.25	2.49
Bihar	1.35	12.42	Odisha	3.97	17.36
Chhattisgarh	1.45	7.27	Punjab	0.01	0.03
Gujarat	0.11	0.80	Rajasthan	0.98	7.00
Haryana	0.01	0.94	Tamil Nadu	0.15	2.87
Himachal Pradesh	0.00	0.11	Uttarakhand	0.06	1.32
J& K	0.12	0.11	Uttar Pradesh	1.63	6.25
Jharkhand	7.20	9.42	West Bengal	0.68	6.44
Karnataka	0.25	1.36	**India**	0.55	2.80
Kerala	0.02	0.11			

Source: Computed from NSS' 58th and 69th round survey of Housing Condition and Amenities Survey of India.

4. Interdependency among the Indicators

Independent reading of progress in each of these individual dimensions often hides the kind of interdependence that may exist

between them. While there is progress in all dimensions with varying degrees, the prospect of universality is largely dependent on prioritising that dimension which bears greater conditionality with others. The independent assessment of all these indicators is meant for social observers and policy makers to infer on well-being owing to each of the attributes. But an attempt is made here towards assessing the extent of interdependency among the various indicators in consideration. In order to analyse the interdependence between pairs of indicators, three pairs emerge namely; Electricity *vs.* Water (EW), Water *vs.* Toilet (WT) and Toilet *vs.* Electricity (TE). The score 0 is given for the deprived households and 1 for the privileged households. The sum of the proportion of the households having the similar scores [(1, 1) and (0, 0)] is considered as representing interdependency. It reveals the highest interdependence between water and toilet (WT) (Table 4). In 2012, this interdependence between the WT has come down to 63.7 per cent from that of 68.8 per cent in 2002.

The state wise analysis of interdependence offers a mixed pattern. Interdependence has increased for some states and decreased for others during 2002 –2012. It is true for all the three pairs. For WT it increased for the five states while increased for others. In the case of EW it decreased for ten states, and in case of TE it decreased for eleven states. The comparison of interdependence between all three pairs across states reveals the fact that 'TW 'has the highest interdependence in all the states except; Assam, Bihar, Haryana, Himachal Pradesh, Kerala, Punjab, Uttarakhand and Uttar Pradesh.

5. An Alternative Approach to Compare the Well-being among Different Population: First Order Dominance

Unlike the uni-dimensional approach of assessing welfare, in multidimensional assessment of welfare, deprivation and achievement is not the mirror image of each other. For instance, 39.0 per cent households with access to toilet facility imply that 61 per cent of

Table 4: Interdependence of the Indicators in Rural India

State	2012			2002		
	E *vs.* W	W *vs.* T	T *vs.* E	E *vs.* W	W *vs.* T	T *vs.* E
Andhra Pradesh	41.8	62.8	36.1	47.2	75.6	40.2
Assam	69.7	74.5	75.5	55.9	61.3	56.2
Bihar	53.6	44.1	62.6	49.0	51.2	88.6
Chhattisgarh	28.4	79.6	29.0	56.6	87.4	53.7
Gujarat	60.9	67.0	40.4	55.9	67.5	37.3
Haryana	72.0	60.2	64.3	45.3	65.4	33.9
Himachal Pradesh	53.8	58.3	59.6	40.5	67.3	24.7
Jammu & Kashmir	52.9	68.1	53.8	53.7	52.9	40.3
Jharkhand	47.9	83.9	43.9	76.9	82.6	80.1
Karnataka	38.6	70.3	28.9	36.7	76.5	35.9
Kerala	74.8	73.7	93.2	71.4	70.7	77.4
Madhya Pradesh	34.0	80.3	30.2	43.2	82.6	37.8
Maharashtra	51.4	62.2	37.6	46.8	74.9	35.0
Orissa	41.2	79.9	35.2	72.6	82.7	76.8
Punjab	85.3	66.2	65.9	83.4	56.4	50.1
Rajasthan	51.0	67.1	37.2	63.0	76.9	60.9
Tamil Nadu	33.4	70.0	29.9	33.6	81.3	33.9
Uttarakhand	57.2	64.4	67.0	70.6	69.5	65.8
Uttar Pradesh	58.6	51.7	56.6	55.2	53.5	78.4
West Bengal	38.5	63.0	47.7	65.2	66.4	76.9
India	49.6	63.7	47.3	53.5	68.8	58.2

Source: Computed from NSS' 58th and 65th round survey of Housing Condition and Amenities in India.

households are deprived of toilet facility. However, in multidimensional assessment attempted here, if 52 per cent households have accessed to all three basic facilities, it does not mean that rest of the households are deprived of all these facilities. It happens because the two extremes of being deprived in all, and deprived in none, constitute only a share of

households with the rest of others being deprived with various combinations of dimensions of deprivation.

In a bid to provide a meaningful well-being comparison among different population or same population at different point of time Jayaraj and Subramanian (2010) suggested the following formula for computing the Multidimensional Achievement/deprivation index wherein headcount indices can be sensitised to the "range" of deprivation experienced by an individual/household.

$$H^* = \sum_{j=1}^{K} \left(\frac{j}{K} \right) H_j$$

Where H_j is the proportion of population that is privileged in exactly *j* dimension (j = 0,1, 2….. K). K is the total number of dimensions considered for analysis.

For an illustration, following the above formula, MHI (Multidimensional Head Count Index) for achievement is estimated for rural India at two points of time, 2002 and 2012. The MHI is found to be 36.7 per cent for 2002 and 52.7 per cent for 2012, which clearly reveals an increase in the multi-dimensional head count of achievement (Table 5).

Table 5: Multi-dimensional Headcount Achievement: Rural India

Number of dimensions in which Achievement occurs	Head Count Ratio of Achievement	
	2002	2012
0	29.7	10.8
1	40.8	39.9
2	18.8	29.7
3	10.6	19.6
MHI	36.7	52.7

Source: Estimated from NSS 58th and 65th round survey on Housing Condition and Amenities.

This undoubtedly is a very simple and convincing method to assess the multi-dimensional achievements in any society and analyzing its progress thereof. However, this method captures how many achievements well enough without differentiating across varied combinations of such achievements within a given count of the same. Such a limitation not only equates ill-fare of each domain of achievement but also combinations of achievement within a given count of achievement. The main limitation of this method is its silence regarding the specificity of the indicators/combination. As can be observed from Table 5, achievement in '0' dimension represents all deprived as against achievement in three dimensions represent all privileged. Achievement in 1 or two dimensions does not reveal which one or combination of which two dimensions. Hence, the MHI derived above is insensitive to dimension of combinations of achievement. Given this limitation Table 6 describes all possible combinations of achievement/deprivation which exhibits a differential rate of change in varied combinations of achievement/deprivation over time.

Table 6 : Proportion of Households across Well-fare Combination in Rural India

Water	Electricity	Toilet	2002	2012
0	0	0	29.7	10.8
0	0	1	1.9	0.9
0	1	0	26.0	32.1
0	1	1	5.0	10.1
1	0	0	12.9	6.9
1	0	1	2.5	1.3
1	1	0	11.3	18.3
1	1	1	10.6	19.6

Source: Estimated from NSS 58th and 65th round survey on Housing Condition and Amenities.

In order to obtain a robust picture of the welfare gain among households, all possible combinations of deprivation/achievement need to be considered for the analysis. In the present case of three indicators, there can be eight possible combinations of indicators to represents variation in well-being. All these possible combinations have been presented in the Table 6. The outcomes of the indicators of well-being are presented in the digital form. It assumes the value '1' for the achievement and'0' for the deprivation. As such, first combination represents the deprivation with respect to all indicators and last combination represents the achievement with respect to all the indicators. Apart from these two extreme combinations, there are six other combinations out of which three combinations represent the deprivation in one indicator and another three represent deprivation in two indicators. (See Table C & D in Appendix for a State wise picture)

The prior discussion conveys the need for an appropriate method to make a robust comparison of welfare across various group of population. To accomplish this, we draw upon a concept known in the literature as multidimensional first order dominance (Arndt et al. 2012). This concept allows us to make welfare comparisons among various groups of populations on the basis of a series of ordinal welfare indicators. It is also known as the usual (stochastic) order in the stochastic dominance literature. In the case of two population distributions, one distribution first order dominates another if one could hypothetically move from one population distribution to the other by iteratively shifting population mass in the direction from better outcomes to worse outcomes. Thus, whenever we are able to observe first order dominance between two population distributions, the dominating population is unambiguously 'better off'.

Continuing with the idea of 'multidimensional first order dominance' an attempt to compare the welfare across different distribution is done by plotting the cumulative share of privileged households against the privileged scores. The privileged scores refer to the number of development indicators in which households are privileged. Following

this, households deprived in all dimensions will receive a score of 0 as against the households privileged in all the three dimension having a score of 3. However, these scores cannot be treated as random variables as they do not associate with unique probabilities and in turn we cannot obtain an expected score of privilege. In an effort to resolve this issue, we make an attempt to differentiate privilege score within the same number of privilege but different combinations as illustrated above. Such differentiation is made under a premise of conceptualising deprivation/privilege conditioned by negative externality of prevalence of various combinations. For instance, being deprived in one dimension should ideally be assigned a value of 1 which is differentiated with a $Score = 1 - S_i$ where S_i is the prevalence share of a particular combination of single dimension deprivation. Similarly a $Score = 2 - S_i$ is computed for all possible combinations with deprivation in two dimensions. For the purpose of illustration, privileged scores and cumulative share of privileged households is computed for the rural sector for the year 2012 (Table 7).

Table 7: Computation of Privileged Score and Cumulative Share of Privileged Population for rural sector in 2012

Indicators	Share(S_i)	Privileged Score	Cumulative Share of Privileged Population(S_i)
0	0.108	0.000	0.108
Only T	0.009	0.991	0.117
Only E	0.321	0.679	0.438
Only W	0.069	0.931	0.507
Only WE	0.183	1.817	0.690
Only ET	0.101	1.899	0.791
Only WT	0.013	1.987	0.804
All	0.196	3.000	1.000

Source: Same as Table 6

Using the above count of deprivation and its associated prevalence, a multidimensional achievement index can be computed by the following formula;

$$H^{**} = \sum_{j} \left(\frac{P_j}{K} \right) H_j$$

Here H_j is the proportion of population for j_{th} combination. P_j is the privilege s core for j_{th} combination and K is the number of dimensions considered. H^{**} is the new Multi-dimensional Head Count Achievement Index.

Table 8 : Multidimensional Achievement Index in Rural India Across State

States	2012	2002
Andhra Pradesh	0.494	0.351
Assam	0.754	0.425
Bihar	0.403	0.183
Chhattisgarh	0.283	0.204
Gujarat	0.574	0.428
Haryana	0.752	0.397
Himachal Pradesh	0.664	0.425
Jammu & Kashmir	0.599	0.552
Jharkhand	0.222	0.188
Karnataka	0.414	0.326
Kerala	0.860	0.752
Madhya Pradesh	0.279	0.215
Maharashtra	0.505	0.313
Orissa	0.261	0.165
Punjab	0.805	0.704
Rajasthan	0.411	0.252
Tamil Nadu	0.410	0.259
Uttarakhand	0.683	0.438
Uttar Pradesh	0.403	0.254
West Bengal	0.444	0.259
India	0.476	0.334

Source: Estimated from NSS 58th and 65th round survey on Housing Condition and Amenities.

This is computed for rural areas of Indian states for two periods of time as presented in Table 8. The same is computed across social groups as well to observe the state of improvement in keeping with the efforts towards inclusion (Table 9). While there is a wider differential in the levels of achievements made by various states, there is a significant gap in such achievement among group of states which stand out in terms of deprivation in these basic amenities. Given the improvement observed across the board, the scale of improvement is quite different in keeping with the base levels. Undoubtedly, there are distinct states like Haryana and Assam which have made remarkable progress as regard achievement in these three basic amenities. Assessing the similar progress across social groups, there seems to be some degree of exclusion as the 'others' improved their achievement scores faster than other social groups. (See the Table E in Appendix) for the distribution of welfare outcomes across social groups.

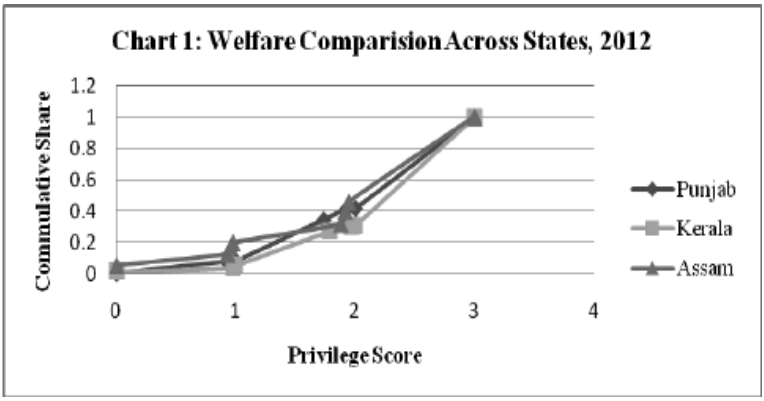
Table 9 : Multidimensional Achievement Index in Rural India Across Social Group

Social Groups	2012	2002
ST	0.300	0.225
SC	0.383	0.253
OBC	0.479	0.328
OTHERS	0.628	0.450

Source: Estimated from NSS 58th and 69th round survey on Housing Condition and Amenities.

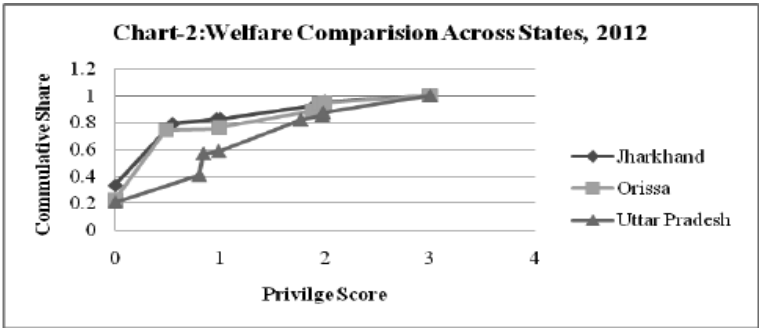
Following this aggregate analysis, an attempt is made towards illustrating "Multidimensional First Order Dominance" to claim the differential achievement by characteristics, across regions and over time. A display of the welfare distribution among the richest states with the highest share of households privileged in all the indicators compares the states in order of dominance (Chart-1). It indicates that despite a similar level of deprivation in all, they vary in terms of deprivations

across combinations with the varying privileged scores. In this regard all the states dominates over Kerala which not only has the least deprivation, but depicts a cumulative pattern that is better compared with other states.



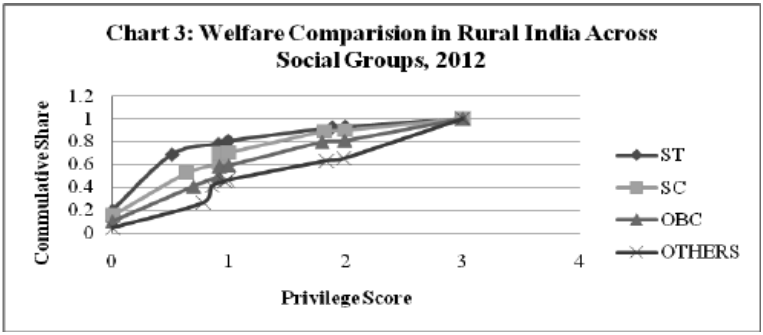
Source: Computed from NSS 69th round Survey on Housing Condition and Amenities

Making such comparison of dominance across poor states, we find Uttar Pradesh dominates Jharkhand and Orissa. Uttar Pradesh advantage is not only in terms of the levels of deprivation in none but also across all combinations hence the gap between Uttar Pradesh and these other two states could be considered genuine as against the marginal difference between Jharkhand and Orissa (See Chart 2).



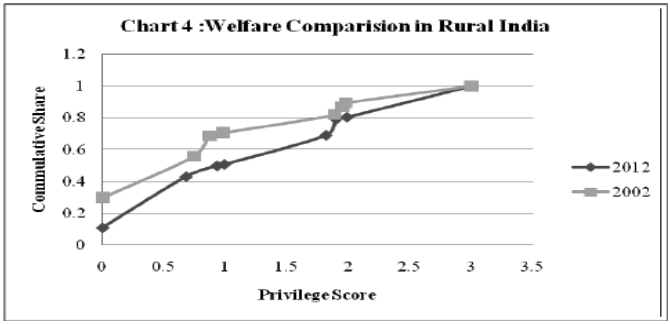
Source: Computed from NSS 69th round Survey on Housing Condition and Amenities

Considering a similar exercise across social groups, we find a clear dominance conveying the departure in the index value being realistic (See Chart-3). Also, these dominance graphs depicts the departures in magnitudes of deprivation as indicated by the index of deprivation otherwise (see the Table E).



Source: Computed from NSS 69th round Survey on Housing Condition and Amenities

A time trend comparison of this deprivation for rural India might simply be an improvement from 0.334 to 0.476 but the distinct dominance of 2002 over 2012 confirms an improvement that is across all combinations of deprivation. The other significant feature that needs to be noted from this comparison is in terms of dominance in combinations with none, one and two deprivations (See Chart-4).



Source: Computed from NSS 58th and 69th round Survey on Housing Condition and Amenities

6. Conclusion

The exposition in this paper is two-fold, one concerned with match and mis-match in the temporal pattern of deprivation across a set of dimensions, and the other, to recognise the inter-dependence between dimensions that shape the varying combinations of deprivation. Carrying out a three-dimensional deprivation analysis over time, this exercise unfolds the distributional quotient of individual deprivation/privilege and in the process uncovers the inherent contradictions as regard disqualifying dominance in trend comparison. Such an exercise across population group and residence categories not only informs on the divide in deprivation across groups but also presents the distributional facet of combinations of deprivation.

Going beyond the conventional method of one-dimensional head count ratio and multiple deprivation of deprived in all and deprived in none, the present study displays the dynamics of possible combination of deprivation. The present approach accounts for all possible dimensions of deprivation; deprived in one dimension, two dimensions, three dimensions and none. It is necessarily an improvement over existing methods of assessing multiple deprivations at least on account of differentiating varying combinations of deprivation and recognising the potential inter-dependence between them.

U. S. Mishra *is Professor at the Centre for Development Studies,Thiruvananthapuram. His research interests include measurement issues in health and equity focus in evaluating of outcomes*

email: mishra@cds.ac.in

Vachaspati Shukla *is PhD Scholar at the Centre for Development Studies, Thiruvananthapuram.*

email: vachas10d@cds.ac.in
vachaspatishukla@gmail.com

Table A : Proportion of Households Having Access to Three Basic Amenities in Rural India

State	Water		Electricity		Toilet	
	2012	2002	2012	2002	2012	2002
Andhra Pradesh	40.6	30.4	98.3	78.1	45.7	19.1
Assam	79.1	59.1	70.8	24.6	86.3	54.3
Bihar	71.7	55.8	46.7	9.7	27.2	9
Chhattisgarh	17.3	17.3	87.8	52.1	23.3	8.3
Gujarat	57.6	45.9	95.9	82.2	41.3	20.5
Haryana	71.7	35.4	99.6	85.9	74.6	22.3
Himachal Pradesh	53.8	39	99.8	98.3	74.3	23
Jammu & Kashmir	49.3	52.7	95.5	96.3	55.7	36.9
Jharkhand	18.6	24.4	62.6	25.1	9.5	9.6
Karnataka	35.7	25.1	95.3	82.5	29.2	19.4
Kerala	73.5	67	96.7	75.5	97.2	87
Madhya Pradesh	19.4	17.9	84.4	67.9	21	5.9
Maharashtra	46.8	28.2	93.4	77.6	46	13.5
Orissa	19.1	18.7	75.2	28.6	18.7	6.1
Punjab	84.7	84.4	99.3	95.7	77.8	47
Rajasthan	39.6	27.2	83.2	44.8	27	11.8
Tamil Nadu	31.4	16.5	97.3	80.3	33.6	14.8
Uttarakhand	54.6	45.7	96.4	56.3	80.3	34.5
Uttar Pradesh	58.1	54	55.7	24.3	24.7	11.1
West Bengal	30.1	29.9	81.8	25.7	60.3	26.6
India	**46.1**	**37.3**	**80**	**53**	**40.6**	**20.1**

Source: Computed from NSS 58th and 69th round Survey on Housing Condition and Amenities.

Table B: Proportions of Households Having Access to Three Basic Amenities in Urban India

State	Water		Electricity		Toilet	
	2012	2002	2012	2002	2012	2002
Andhra Pradesh	77.8	56.2	99.3	93.7	91.9	75
Assam	92.2	87.9	98.9	86.8	99.7	91.6
Bihar	85.6	79.3	89.2	66	79.2	60.1
Chhattisgarh	61.9	60.1	99.1	86.5	75.1	48.5
Gujarat	84.1	87.9	98.9	95.9	93.8	87.3
Haryana	87.3	84.4	99.3	97.7	98.6	84.2
Himachal Pradesh	94.4	90.5	99.7	99.8	95.7	76.4
Jammu & Kashmir	88.2	90.2	99.9	99.5	94	77.2
Jharkhand	65.9	58.5	94.4	86.5	82.3	60.6
Karnataka	81.9	65.2	99.5	94.9	91	75.7
Kerala	81.9	76.6	98.7	90.4	98.8	95.1
Madhya Pradesh	70.8	57.6	99.4	92	86	63.7
Maharashtra	87.4	77.1	99.1	95.9	93.1	58
Orissa	72.2	61.8	97.3	86.6	81.8	56
Punjab	90.1	93.5	99.7	98	93.8	88.1
Rajasthan	83	77	98.4	87.1	85.8	66.9
Tamil Nadu	64.7	55.3	98.8	93.7	87.8	72.5
Uttarakhand	85.8	87.6	99.1	98	98.4	82.2
Uttar Pradesh	77.6	80.8	92.4	86.3	89.3	76.6
West Bengal	49	50.8	96.8	83.7	94.6	79.4
India	76.8	70.3	97.9	91.6	91.2	73

Source: Computed from NSS 58th and 69th round Survey on Housing Condition and Amenities.

Table C: Proportions of Households by Combination of Welfare Indicators in Rural India 2012

	(0,0,0)	(0,0,1)	(0,1,0)	(0,1,1)	(1,0,0)	(1,0,1)	(1,1,0)	(1,1,1)
Andhra Pradesh	1.4	0.0	42.4	15.5	0.2	0.0	21.4	18.9
Assam	5.4	4.5	2.6	8.4	7.3	12.1	5.4	54.4
Bihar	17.3	0.2	9.5	1.2	31.1	4.5	23.1	12.9
Chhattisgarh	10.9	0.7	60.8	10.2	0.3	0.3	9.2	7.5
Gujarat	3.5	0.2	32.9	5.8	0.5	0.0	26.6	30.7
Haryana	0.3	0.0	12.0	16.0	0.1	0.0	23.8	47.9
Himachal Pradesh	0.1	0.0	22.4	23.7	0.0	0.1	18.0	35.7
Jammu & Kashmir	4.1	0.0	30.7	16.0	0.4	0.1	15.5	33.3
Jharkhand	33.2	0.1	45.6	2.4	3.6	0.4	10.0	4.6
Karnataka	3.8	0.0	51.3	9.2	0.8	0.1	19.7	15.1
Kerala	1.4	0.9	2.4	21.8	0.5	0.5	3.0	69.5
Madhya Pradesh	14.8	0.3	58.0	7.5	0.5	0.0	11.4	7.5
Maharashtra	5.2	0.4	36.4	11.2	0.8	0.2	25.4	20.4
Orissa	22.5	0.9	51.6	5.8	1.2	0.1	12.1	5.7
Punjab	0.5	0.1	7.5	7.2	0.0	0.0	26.5	58.2
Rajasthan	13.7	0.4	39.3	7.0	2.5	0.2	23.0	14.0
Tamil Nadu	2.2	0.1	53.3	12.9	0.3	0.0	16.6	14.4
Uttarakhand	2.6	0.5	20.1	22.2	0.5	0.0	12.4	41.7
Uttar Pradesh	20.8	1.6	16.2	3.2	19.9	2.0	23.5	12.7
West Bengal	10.0	3.3	36.4	20.1	3.0	1.9	10.5	14.7
India	10.8	0.9	32.1	10.1	6.9	1.3	18.3	19.6

Source: Computed from NSS 69th round Survey on Housing Condition and Amenities.

Table D: Proportions of Households by Combination of Welfare Indicators in Rural India 2002

State	(0,0,0)	(0,0,1)	(0,1,0)	(0,1,1)	(1,0,0)	(1,0,1)	(1,1,0)	(1,1,1)
Andhra Pradesh	19.1	0.2	43.9	6.3	2.4	0.2	15.4	12.4
Assam	22.6	13.6	1.4	3.4	16.1	23.2	5.6	14.1
Bihar	41.0	0.7	2.2	0.3	43.9	4.7	3.9	3.3
Chhattisgarh	42.9	1.3	38	0.40	4.4	0.6	6.4	5.9
Gujarat	13.5	0.3	37	3.2	3.8	0.2	25.2	16.8
Haryana	10.8	1.2	43.1	9.5	2.1	0.0	21.8	11.5
Himachal Pradesh	1.6	0.0	51.1	8.3	0.1	0.0	24.2	14.7
Jammu & Kashmir	2.3	0.0	29.3	15.6	1.2	0.2	30.2	21.1
Jharkhand	63.1	0.7	11.3	0.7	9.7	1.5	6.4	6.7
Karnataka	14.1	0.4	51.9	8.5	2.8	0.1	11.7	10.4
Kerala	5.7	8.8	2.7	15.9	1.8	8.3	2.9	54.1
Madhya Pradesh	28.6	0.1	50.8	2.6	3.4	0.0	11.3	3.2
Maharashtra	20.2	0.3	46.4	4.9	1.8	0.1	18.1	8.1
Orissa	62.5	0.1	16.4	2.2	8.5	0.2	6.4	3.6
Punjab	1.4	0.2	11.1	2.9	2.2	0.4	38.3	43.5
Rajasthan	44.1	1.4	24.9	2.4	8.1	1.6	11.2	6.3
Tamil Nadu	18.1	0.3	56.9	8.2	1.3	0.0	8.9	6.3
Uttarakhand	30.1	4.2	14.5	5.5	7.4	2.0	13.4	22.8
Uttar Pradesh	37.5	1.0	6.7	0.9	33.9	3.3	10.7	6.0
West Bengal	47.0	7.8	8	7.3	15.3	4.1	3.2	7.3
India	29.7	2.0	26	5.0	12.9	2.5	11.3	10.6

Source: Computed from NSS 58th round Survey on Housing Condition and Amenities.

Table E: Proportion of households by Combination of welfare Indicators in Rural India across social groups

	Welfare Indicators		Proportion of Households							
Water	Electricity	Toilet	ST		SC		OBC		Others	
			2002	2012	2002	2012	2002	2012	2002	2012
0	0	0	48	19.4	39.1	15.2	27.2	9.9	18.6	4.3
0	0	1	1.4	1.0	1.8	1.0	1.4	0.6	3.2	1.4
0	1	0	27.3	49.0	26.4	36.9	27.7	30.7	22.7	22.1
1	0	0	5.8	1.8	13.1	8.3	15.6	9.2	11.2	4.0
0	1	1	2.7	9.3	3.7	8.8	4.7	8.5	7.6	14.5
1	0	1	1.9	0.7	1.7	0.9	2.1	1.3	3.9	2.0
1	1	0	6.2	11.8	8.9	18.7	12.2	20.5	13.8	16.9
1	1	1	6.6	6.9	5.2	10.1	9.2	19.2	18.8	34.8

Source: Computed from NSS 58th and 69th round Survey on Housing Condition and Amenities.

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