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A new thinking on measurement**

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Multidimensional poverty: A new thinking on measurement

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Abstract*

Amartya Sen's (1985,1987, 1999) seminal work on functioning and capabilities has been the most influential in defining poverty in a multidimensional framework. It is now widely accepted that poverty is best seen in terms of capability deprivation that people suffer in many facets of life. In this paper, we make the distinction between poverty and capability deprivation. Poverty must arise when the essential capability failure is caused by inadequate command over resources through markets, public provision, or other non-market channels. The main message coming out of this paper is that by examining capability deprivation alone, we cannot always identify poor persons.

All multidimensional poverty indices developed in the literature, including the UNDP's (2020) global multidimensional poverty index, reported for 110 countries, and Alkire and Foster's (2011) counting multidimensional poverty index, adopted by Mexico, Colombia, Philippines, and India, have only focused on capability deprivation, ignoring the insufficiency of means available to individuals. An assumption is made that all persons who suffer capability deprivation are poor, which does not hold in the real world. Defining poverty from the capability perspective cannot be done independently of income or available resources to individuals. We have argued that the multidimensional poverty indices as developed in the literature do not measure multidimensional poverty. We offer a new method to measure multidimensional poverty, which takes account of the insufficiency of means available to individuals. We have also drawn the policy implications of our proposed approach.

Key Words: Multidimensional poverty, capability deprivation, outputs and outcomes, insufficiency of means, policy implications
JEL Codes: I3.I32.D63.O3

*The usual disclaimers apply

Introduction

There are two distinct issues in the measurement of poverty, as Sen (1976) pointed out. First is identifying the poor; the poverty line is a practical method of identifying the poor. More than a century ago, Seebohm Rowntree (1901) provided a systematic way of defining the poor. He defined families in primary poverty if their total earnings are insufficient to obtain the "minimum necessities of merely physical efficiency."

First, he estimated the minimum money costs for food, satisfying the average nutritional need for families of different sizes. Then, he added the rent paid and specific minimum amounts for clothing, fuel, and sundries to arrive at the poverty line of a family of a given size to these costs. The poverty line is the total cost of maintaining the minimum necessities of merely physical efficiency. A family is classified as poor if its total income from all sources is less than its poverty line.

Once the poverty line is determined, the second problem is to determine an aggregate index to measure the degree of poverty suffered by those whose income or consumption falls below the poverty line. Sen (1981) called it the biological approach. This approach may also be called the nutritional approach because its main focus is on defining the poor as those who cannot meet their minimum nutritional needs. We call it the basic needs approach; a

family is poor if they cannot meet the socially accepted minimum needs including basic food and non-food needs [Hicks and Streeten (1979)]. In Rowntree's poverty approach, basic needs include access to nutritious food, adequate clothing, fuel, housing, and sundries. This concept of basic needs, however, has changed substantially over time; societies now require that every person should have access to basic services, particularly in health, education, and social security.

In the literature, Rowntree's approach is referred to as a unidimensional approach because it is based on the resources people command, commonly measured by monetary income or consumption. The income provides entitlement to people to consumption of various goods and services and can play a vital role in reducing poverty. However, Alkire and others (2015) pointed out that there are arguments in Sen (1985, 1987, 1999) that are against measuring poverty by the resources alone. These arguments led to a shift from a unidimensional approach to a multidimensional approach to measuring poverty.

The 2000 World Bank Development Report (WDR) defined "poverty as the pronounced deprivation in well-being." This definition raises many questions: How is well-being defined? What are the elements necessary to ensure a decent level of well-being? These questions are not by any means easy to answer. The economic literature in the 1970s and 1980s advanced many

approaches to describe well-being; vital are basic needs, economic growth, quality of life, utility, welfare, and happiness. These approaches do not provide a unifying framework to define well-being.

Sen's (1985, 1987, 1999) conceptualization of well-being is the most comprehensive in the literature. He developed the idea of "functionings and capabilities." Functioning is an achievement, and capability is the ability to achieve. According to him, functionings are directly related to what kind of life people lead. In contrast, capabilities are connected with people's freedom to choose the life they lead, which is their functioning. According to Sen, people's well-being must be concerned with what people can or cannot do or can be or cannot be. Thus, Sen's idea of well-being revolves around people and the extent of their freedom to achieve the functionings they value. Well-being is, therefore, a multidimensional concept defined in terms of capabilities people enjoy in many facets of life.

The World Bank's definition of poverty is based on capability deprivation, under which a person is defined as poor if they face failure of some basic capabilities. The entire literature on multidimensional poverty revolves around this definition.² It is a

² See Atkinson (2003), Bourguignon and Chakravarty (2003), Tsui (2002), Datta, Pattanaik, Yongssheng, and Xu (2003), Alkire and Foster (2007,2011, 2011a), Alkire and Santos (2010,2014), Chakravarty, Deutchs

powerful definition widely accepted because it captures the deprivations that people suffer in many facets of life. However, a pertinent question arises: can we describe poverty purely in terms of capability deprivation?

In this paper, we make a distinction between poverty and capability deprivation. Poverty must arise when the essential capability failure is caused by inadequate command over resources through markets, public provision, or other non-market channels. By examining capability deprivation alone, we cannot always identify poor persons. We argue that well-known multidimensional poverty measures proposed in the literature do not measure multidimensional poverty because they are focused on capturing capability deprivations suffered by the population. They assume that all persons who suffer deprivation are poor. Poverty should be concerned with the deprivations that are caused by the insufficiency of resources people possess. Thus, we emphasize the cause of deprivation, which is fundamental in measuring multidimensional poverty, whereas the entire literature is focused on measuring the overall deprivation suffered by the population.

Following this line of arguments, we make a distinction between outputs and outcomes; outputs are directly impacted by the people's entitlements either by their resources or the resources

and Silber (2005), Duclos, Sahn, and Younger (2006), and Maasoumi and Lugo (2008), among others.

provided by the government and government policies, whereas, outcomes are people's ultimate achievements. The government policies to reduce poverty directly impact outputs, which have an impact on outcomes. Government interventions have no direct impact on outcomes. We, therefore, argue that poverty should be measured based on outputs while the population's overall well-being should be measured by outcomes.

In this paper, we offer a radically different method to measure multidimensional poverty, which takes into account of insufficiency of means available to individuals, to achieve essential capabilities.

2. Identification and Aggregation in Multidimensional Context

In a unidimensional poverty measurement, we identify the poor using a poverty line, which is the income level that meets people's basic needs. Once we have identified who the poor are, we aggregate the degree of poverty people suffer into an aggregate index of poverty. The aggregate index of poverty informs what percentage of poor are in society and how much intensity of poverty people suffer; how poor are the poor? The well-known examples of aggregate poverty measures are Sen's (1976) poverty

measure and Foster, Greer, and Thorbecke's (1984), popularly known as the FGT class of poverty measures.³

In the multidimensional context, people suffer deprivation in many dimensions, so in identifying the poor and measuring the intensity of aggregate deprivation, we need to account for multidimensional deprivations. That means that the multidimensional approach provides a holistic definition of social deprivation, providing a comprehensive picture of people's sufferings in many facets of life. That has led to a widespread consensus that poverty is a multidimensional concept, and should only be seen as capability deprivation, Sen (1993, 1997, 1999). This is a misunderstood view of poverty. It measures social deprivation with no regard to what are the causes of capability failures. Poverty refers to capability deprivation when they are caused by people's inadequate command over resources. We will elaborate on this point in Section 4 of this paper.

Many countries have now abandoned assessing poverty based on income or consumption per capita or per equivalent adult. Emphasis has shifted to multidimensional poverty. The multidimensional poverty index (MPI) developed by Alkire and Santos (2010) has been reported for over 110 countries through the UNDP's 2010 Human Development Report. Mexico in 2009

³ Kakwani (1980) developed a general class of poverty measure of which Sen's poverty measure is a particular case.

adopted a multidimensional index as the country's official poverty measure. Subsequently, Columbia adopted its poverty reduction strategy using the Alkire and Foster (2011b) approach.

India has a long history of measuring poverty, even long before its independence. In 1901, Dadabhai Naoroji published a book titled "Poverty and Un-British Rule" which marked the earliest attempt to measure poverty in India. He estimated the poverty line based on the cost of a subsistent diet. Subsequently, in 1938, the pre-independence National Planning Committee estimated poverty based on the minimum standard of living prevalent at that time. In the post-independence period, India's political leaders had an even greater concern to alleviate poverty. India was probably the first country to establish a consumption expenditure-based large-scale National Sample Survey (NSS) to estimate and monitor poverty over time. Many expert groups worked on poverty estimation and developed calorie-based poverty lines.

In 2023, Niti Aayog, India's main policy-making body, developed a National Multidimensional Poverty Index (NMPI) for India which enabled the estimation of multidimensional poverty at the national, state, and district levels.⁴ This study was a large undertaking, attracting the enormous attention of all stakeholders involved in poverty alleviation policies. The (NMPI) has been widely applauded and accepted. India has moved away from

⁴ NITI Aayog (2023)

income-expenditure poverty, considered narrow as a unidimensional approach to a multidimensional approach, which captures the deprivation people suffer in many dimensions.

The Philippines is another major country that has adopted multidimensional poverty. In the Philippines, the National Economic and Development Authority (NEDA) is the main policy-making body responsible for poverty alleviation policies. Arsenio Balisakan, now Secretary of the NEDA wrote a paper in 2011, titled “What has really happened to poverty in the Philippines? New measures, evidence, and policy implications”. This paper provides a thorough analysis of multidimensional poverty in the Philippines, using the methodology followed by the global MPI.

As pointed out, multidimensional poverty is a holistic approach to measuring poverty, capturing deprivations in many dimensions, it poses many complex measurement issues in the operational sense. Although the literature on multidimensional poverty has made considerable progress in identifying the poor and developing multifaceted poverty indices, too many challenges are left to consider. Thorebeck (2008) has highlighted some of the unresolved issues. A principal problem has been that the multidimensional poverty measurement requires many arbitrary assumptions that lead to an arbitrary degree of poverty. This paper critically reviews unresolved issues in the next section. We argue

that many complexities are arising because the entire literature is focused on capturing capability deprivation, in general, ignoring the causes of deprivation. We offer a new thinking on poverty measurement, proposing an alternative analysis of multidimensional poverty, the measurement of which needs a lesser degree of arbitrariness.

3. Unresolved Issues

Essential Capabilities

The first step in measuring multidimensional poverty is to specify a set of essential capabilities that everyone in society must enjoy. The number of socially desirable essential capabilities is called the dimensions of poverty. The basic needs approach may be considered narrow because it focuses on the consumption of goods and services that are essential to meet people's basic needs. The capability approach is broader, encompassing many human activities, beyond meeting basic needs. For instance, if a person feels deprived because they suffer a serious illness; they are miserable because of the breakdown of their marriage or they are isolated from society, which are capability failures. They are not the failure of basic needs.

Poverty is multifaceted, reflecting the deprivation people suffer in many facets of life. How many dimensions are sufficient to capture the multidimensional aspects of poverty adequately? Should we have a universal list of capabilities for all countries or should developing countries have a list of essential capabilities that are different from those of developed countries?

Alkire (2008) has made a valuable contribution to how to choose dimensions. She listed five practical methods of selecting dimensions. However, the application of these methods is not straightforward. The researchers need to make explicit their reason for making a particular choice. How have they taken account of society's priorities? Should the developing countries have a different or the same list of basic capabilities as the developed countries? How many dimensions are sufficient to capture the multidimensional aspects of poverty adequately? Alkire's analysis provides no clear-cut answers to these questions.

This issue, however, sparked a sharp exchange between Nussbaum (2003) and Sen (2004). Sen, being the architect of the capability approach, has not committed to a particular list of capabilities. He does not provide any guidelines on how we select capabilities to analyze poverty, suggesting that the selection of capabilities must be done by the people through democratic processes and social choice procedures [Robeyns (2005)]. Nussbaum (2003), on the other hand, has a strong critique of Sen, arguing that the relevance

of the capability approach must require Sen to endorse one specific and well-defined list of capabilities. She has proposed a list of ten “central human capabilities”, based on the principle that everyone must be entitled to these capabilities. These capabilities are so broad that they cannot be readily applied to real-world data to measure multidimensional poverty.

It is not surprising that no consensus has emerged from the debate on the specific list of capabilities. People’s life journey begins at birth and ends at death. During this journey, people suffer so many deprivations that it is almost impossible to keep track of them. Let us take an example of the health dimension. People suffer deprivation from numerous diseases, some of which are known and some are unknown. People face death due to numerous causes, which, many times are not even diagnosed. It is almost impossible to capture the total deprivation people suffer. Most academic papers calculate multidimensional poverty using two or three attributes [Bourguignon and Chakravarty (2003), Alkire and Foster (2011)]. The UNDP’s global multidimensional poverty index, however, has ten indicators, the entire health deprivation is captured only by one attribute, namely, the infant mortality rate. The global (MPI), utilized by more than 110 countries, hardly captures the deprivations people suffer in the real world. It is a partial index of social deprivation.

Another challenge in choosing essential capabilities is that they change over time because of innovations like digitalization (artificial intelligence), and advancement in communication and transport. For instance, cell phones have become a necessity to function in society. A person who is unable to afford a cell phone suffers deprivation because they cannot function in society without it.

To sum up, it is challenging to determine the basic capabilities, without which we cannot measure multidimensional poverty.

Deprivation Cutoffs

Suppose we have succeeded in selecting m dimensions, where $m \geq 2$, and there are n persons in the population whose deprivation we want to measure. Suppose from household surveys, we have information about each person's achievement levels, x_{ij} , interpreted as the achievement of the i th person in the j th dimension; implying that the higher the value of x_{ij} , the greater the i^{th} person's well-being in the j^{th} dimension.

A person suffers deprivation in the j^{th} dimension if their achievement is short of the socially accepted minimum level of achievement in the j^{th} dimension. Suppose society has determined that z_j is the minimum level of achievement every person must enjoy in the j th dimension or capability, called the deprivation

cutoff. To be able to compare the poverty levels of all persons, the deprivation cutoff must be the same for everyone. We identify the i th person as deprived of the j th capability if $x_{ij} < z_j$, and not deprived if $x_{ij} \geq z_j$.

The measurement of multidimensional poverty requires a deprivation cutoff for every dimension. But, can deprivation cutoff for various dimensions be meaningfully determined? The literature has not seriously dealt with this issue. In the unidimensional approach, we know that the construction of the poverty line, even in income space, is a complex undertaking. The new model of the poverty line developed by Kakwani (2011) helped justify poverty thresholds for food and non-food poverty lines using the consumer theory. However, the determination of poverty thresholds for various diverse dimensions can indeed be challenging.

However, no methods exist to construct deprivation cutoffs for the essential capabilities to identify the poor in different poverty dimensions. For example, it is not apparent how one can place a threshold for life expectancy at birth or infant survival rate. Can one say that the survival of 700 infants out of 1000 infants born is an appropriate minimum acceptable norm? It is impossible to arrive at a social consensus on such a norm if we try to determine it democratically. Is four years of education sufficient to be able to function in society? The answer is that we do not know what is

the correct answer. The fact remains that there is no methodology to determine the deprivation thresholds in a meaningful way in a multidimensional poverty framework. The fact is that all papers published on multidimensional poverty have determined thresholds on a complete ad hoc basis.

Dashboard vs Single Indices of Poverty

Once we have identified who is deprived in various dimensions, the next step is to determine what percentage of the population is poor and how poor are the poor, meaning what is the degree of poverty suffered by the population. Nora Lustig (2011) points out a sharp disagreement on whether various dimensions of poverty and well-being can be meaningfully aggregated into a single multidimensional poverty index. She has even questioned whether aggregating dimensions of poverty and well-being is useful or even sensible.

The Journal of Economic Inequality had a forum in a special issue in 2011 that featured discussions on how best to measure the deprivations people suffer in many dimensions. The three outstanding scholars contributed papers to resolve this issue: Ravallion, Ferreira, Alkire, and Foster. Ravallion suggested a ‘dashboard approach’ whereby we measure deprivation separately for each poverty dimension, instead of combining deprivations in a single scalar metric. Using a dashboard approach, we can easily assess the performance in the deprivation of various poverty

dimensions. Such an assessment can help policymakers identify policies to reduce poverty. Suppose, for instance, the health dimension is not performing well in achieving some health outcomes, we desire, we can target the health sector to improve its performance so that we achieve better health come.

The dashboard approach, however, has also two limitations. First, it does not inform what is the overall incidence of poverty and how the country is performing in poverty reduction. Secondly, the dashboard approach is based on marginal distributions, so it does not take into account the joint distribution of various dimensions. The single index, however, takes into account the joint distribution of deprivations (interactions) of different dimensions.

Duclos, Sahn, and Younger (2006) empirically demonstrated that in poverty evaluation, the joint distribution of deprivations between the dimensions does matter. The dependency structure in a joint distribution implies that there is a correlation between deprivations in different dimensions; how close this correlation is will impact the poverty comparisons. Hence, the single indices of multidimensional poverty have been favored in the literature.

There is, however, a disagreement between Ravallion (2011) and Ferreira (2011). Ravallion believes that a single index of poverty based on so many ad hoc assumptions can never be a sufficient metric of multidimensional poverty, whereas, Ferreira believes that because the joint distribution of deprivations contains more

information the multivariate single poverty index is preferred. This controversy was not resolved by the Forum.

Trade-offs between dimensions

When we aggregate deprivations in different dimensions into a single index, we cannot rule out the interaction between different dimensions. If dimensions are substitutes, it implies that a person can trade off a deprivation in one dimension with another. For instance, can one accept a trade say between one year of education with two months of their extra longevity? Such trade-offs will be odd; no person in real life will accept such a trade-off.

Such trade-offs, however, are inevitable when estimating aggregate indices of poverty. The single indices of poverty explicitly assume a degree of trade-off. In practical situations, we cannot estimate the degree of trade-off using real-world data. The degree of trade-off is assumed on an ad hoc basis. For instance, in their seminal paper, Bourguignon and Chakravarty (2003) capture the trade-offs between income and education by the parameter θ , in the poverty function P_{α}^{θ} , θ taking value 1 implies perfect substitutability; the higher the value of θ , the lesser the degree of substitution. They presented the multidimensional poverty estimates using alternative values of θ . That implies we are ignorant of the appropriate value of θ , so we cannot arrive at an accurate poverty measure, which has enormous policy implications.

Economists do talk about substitutes and complements, but they talk in the context of commodities. It makes perfect sense if a person substitutes coffee for tea when the coffee price goes up. However, in the case of multidimensional deprivations, dimensional substitutions (trade-offs) will make little sense, and ordinary people will have difficulty in accepting such tradeoffs.

Deprivation Weights

Suppose there are two persons A and B; A is illiterate, and unable to function in society, whereas B is diagnosed with cancer. They suffer from very different kinds of deprivation. Surely, we cannot say that the degree of suffering of both persons is the same. Can we quantify the deprivation suffered by each person? Is A suffering more deprivation than B or vice versa, and by how much? Can such interpersonal comparisons be captured? An obvious answer is that we do not know the answer to such questions. We cannot estimate a social deprivation index without quantifying the degree of deprivations in different dimensions. So, a vector $w = (w_1, w_2, \dots, w_m)$ denotes the deprivation scores to indicate the relative degree of deprivation suffered by the people in different dimensions. The sum of weights must add up to 1. These weights reflect the relative importance given to the deprivations in different dimensions; the higher the weight, the greater the degree of deprivation.

These weights play a crucial role in the Alkire and Foster (2011a) methodology for identifying the poor and measuring a social deprivation index. How can we determine these weights? The answer is that there exists no objective method to determine these weights. The researchers have resorted to determining the weights on an ad hoc basis, but Alkire and Foster (2011a) argue that these weights are not predetermined, they are flexible and can be altered depending on the purpose. What they are saying is that ad-hocness is a virtue, providing flexibility. We do not subscribe to this view. The ad hoc weights will lead to ad hoc poverty indices.

Pattnaik and Xu (2018) have made an important observation that “ Even in a given society, however, there may be different distinct culturally identifiable groups, which may have different sets of weights for the dimensions; this is true, especially in the case of very diverse societies such as in India”. Cultural groups are a part of society and if they have different sets of weights, Pattnaik and Xu raised the question of what set of weights should apply to society as a whole. We attempt to answer this question as follows.

There are two possible approaches. One is that we calculate the weighted average of the set of weights of each cultural group which we then use to calculate the social deprivation index. Secondly, we use different sets of weights for different cultural groups to estimate their social deprivation indices. Then aggregate them to arrive at a super social deprivation index for the society. Both

approaches are cumbersome, However, we prefer the first approach. We offer the following explanation.

Given the differences in deprivation weight structure, it is unlikely to be able to compare the poverty status of various social groups. For instance, suppose there are two persons one belonging to group 1 and another to group 2, and both are suffering from the same disease, say cancer. If these two persons get a different degree of importance reflected by their weights, surely we can not make a social deprivation comparison of the two groups. It will not be methodologically correct to make such comparisons. We need to apply the same deprivation weights to each social group. That means that we need to determine one set of deprivation weights for all cultural groups.

Suppose in a country, we want to compare the deprivation suffered by rural and urban populations. The rural population is generally poorer than the urban population. In some countries, the rural-urban gap in living conditions is astonishingly high. So in the policy debates, the issue of poverty comparisons keeps surfacing. A pertinent question arises: can we compare the poverty between the two from a multidimensional perspective?

The two populations have different needs, and therefore, the importance given to deprivation in different dimensions will also be different. That means that weights given to deprivation in different dimensions will also be different. Given these differences,

can we estimate social deprivation indices, which enable comparison of the incidence of multidimensional rural and urban poverty? The answer is that we can not assess whether the poverty gap is narrowing or widening.

Dual Deprivation Cutoffs

Alkire and Foster (2011a, 2011b) have made a significant contribution to the measurement of multidimensional poverty. Their methodology has been widely accepted and applauded. Their poverty indices are derived using the dual cutoffs, which are of critical importance. Given the popularity of the dual cutoffs, it is appropriate to review them.

Suppose x_{ij} is the achievement of the i th person in the j th dimension, j varies from 1 to m , m being the number of dimensions. z_j is the minimum level of achievement every person must enjoy in the j th dimension or capability, which is the first deprivation cutoff. Let p_{ij} be the probability of the i^{th} person being deprived in the j^{th} dimension, which is given by

$$p_{ij} = 1, \text{ if } x_{ij} < z_j \\ = 0, \text{ otherwise.}$$

Suppose w_{ij} is the deprivation score of the i th person in the j^{th} dimension, which is given by

$$w_{ij} = p_{ij} w_j$$

where w_j is the deprivation score for the j th indicator, which is the same for all persons. The total deprivation score of the i^{th} person will be given by

$$w_i = \sum_{j=1}^m p_{ij} w_j$$

The second cutoff is called the poverty cutoff. The probability of the i th person being identified as poor is defined by q_i given by

$$q_i = 1 \text{ if } w_i > 1/3 \\ = 0, \text{ otherwise}$$

which gives the number of multidimensional poor as

$$q = \sum_{i=1}^n q_i$$

Only the poor suffer the deprivation and the non-poor do not. Suppose n is the number of persons in the population, then the per capita deprivation score of the population is given by

$$M_0 = \frac{1}{n} \sum_{i=1}^q w_i = \frac{1}{n} \sum_{i=1}^q p_{ij} w_j$$

which is the Alkire-Foster proposed multidimensional poverty index.

The headcount ratio, H , is the proportion of multidimensional poor persons in the population:

$$H = \frac{q}{n},$$

n is the total number of persons. The average intensity of poverty suffered by the poor is given by

$$A = \frac{\sum_{i=1}^q w_i}{q}$$

It can be easily seen that $M_0 = HA$, which is similar to the poverty gap ratio in unidimensional poverty. M_0 can be calculated for both cardinal and ordinal measures of individuals' achievements. If the variables are all cardinal, the Alkire and Foster methodology allows us to derive the generalized FGT measures of poverty, which informs the depth and severity of poverty in a multidimensional setting. A general class of multidimensional FGT measures can be denoted by M_α , where α is the aversion parameter. When $\alpha=1$, we measure the multidimensional poverty gap ratio, and when $\alpha=2$, we measure the severity of multidimensional poverty.⁵

The M_α class of poverty measures have attractive properties as emphasized by Alkire and Foster (2011). The change in M_0 can be explained by two factors: one due to a change in the headcount ratio H, indicating the prevalence of poverty in the population, and A indicating the intensity (breadth) of poverty among the poor. However, the most attractive feature of the M_α class of poverty

⁵ Pattanaik and Xu (2018) have provided a critical review of the Alkire and Foster's (2011,2015) method of estimating multidimensional poverty. They have shown that when individual dimensional deprivations are cardinally measurable, the identification of the poor is not always possible.

measures is their decomposability property. This property is of great value in analyzing poverty alleviation policies. A large number of multidimensional poverty indices have been developed to satisfy certain desirable axioms such as decomposability. The main problem with these measures is that their estimation is based on ad hoc weights, which cannot be meaningfully justified.

Ad hoc Assumptions

Unfortunately, multidimensional literature has ignored the fundamental issues of ad hoc assumptions that are made in the construction of multidimensional indices. For instance, the M_α class of poverty measures assumes the poverty cut-off of over 1/3, which is a perfect ad hoc number. One can reduce the incidence of poverty just by increasing this cut-off. Surprisingly, many countries have adopted the M_α class of poverty indices without questioning the ad hoc assumptions. We have highlighted in this section so many unresolved issues in the multidimensional measurement. The message coming out of the analysis is that the aggregating dimensions of deprivations with so many ad hoc assumptions can only result in arbitrary measures of poverty. The poverty alleviation policies based on such measures will also be arbitrary. We concur with Nora Lustig (2011) that deprivations in various dimensions of poverty cannot be meaningfully aggregated into a single multidimensional poverty index. Still, the popularity of these indices has enhanced. The UNDP adopted and reported

for more than 110 countries. What should we do about it? In the remaining sections of this paper, we will attempt to address this issue.

4. Poverty and Capability Deprivation

In practice, the basic needs approach is extensively used to measure poverty. This approach, championed by Rowntree in 1901, identifies the poor if they suffer deprivation because of their inability to consume essential goods and services they require for their living. We have called it the basic needs approach. People can suffer deprivation in many other aspects of life beyond those defined as basic needs, even if they possess adequate resources (for example, ill health or lack of education). The conceptual distinction between deprivation of this kind and that primarily resulting from inadequate income to meet their basic needs is of fundamental importance.

The higher the person's income, the greater their command over commodities. The entitlements to the consumption of commodities, including services, provide people with the means to lead a better life. However, entitlements of commodities (also services) are only a means to an end. People can suffer acute deprivations in many aspects of life, even if they possess all the means. Thus, we cannot define poverty in terms of means people have. According to Sen (2009), poverty must incorporate capability failures, leading to deprivations in many dimensions of well-being.

Thus, “the capability approach is a serious departure from concentrating on the means of living to the actual opportunities of living” [Alkire, Foster, Seth, and Santos (2015)]. The multidimensional poverty literature has overwhelmingly accepted this view, and, therefore, all multidimensional poverty indices have been developed based on capability failures faced by the people.

One critical question arises: Can one describe poverty purely as capability deprivation? Suppose the richest person in the country suffers from an incurable disease, which prevents him from being functional, suffering immensely. That would indeed be a case of severe capability deprivation. Yet, it would be odd to call the richest person in the country "poor." The multidimensional poverty literature has entirely ignored this aspect of poverty.

Suppose a religious person A keeps fast one day a week, as a result, she suffers malnutrition, largely caused by her religious belief. Another person B suffers from malnutrition because she cannot afford to buy the required amount of food. Both persons are suffering capability deprivation, we cannot call A as poor because she is suffering because of her religious belief, whereas B is surely poor because she does not have the means to buy an adequate amount of food. Poverty occurs only if capability deprivation is caused by a lack of a person's means.

Many income-rich persons suffer or even die from obesity because they have poor lifestyles, eating too much rich food and doing no

exercise. We can not call such persons poor even if they severely suffer deprivation from obesity-related diseases such as diabetes, high cholesterol, etc.

Recently, King Charles of Great Britain was diagnosed with cancer, causing enormous suffering and going through painful treatment. Surely, we cannot call him the poor, even if he is suffering immensely. On the other hand, if an ordinary person suffers from a chronic disease such as cancer, and does not have the means to get treatments, they will surely be considered poor.

In the measurement of poverty, one needs to make a distinction between poverty and capability deprivation in general. Whereas a host of factors may cause capability deprivation, poverty must only be concerned with the inadequacy of command over resources needed to generate socially determined basic capabilities. A person may suffer capability deprivation but may not always be poor.

Defining poverty from the capability perspective cannot be done independently of income or available resources to individuals. The capability to function, we should be concerned with, can be caused by many factors. However if individuals' dysfunctionality occurs because of a lack of available resources to individuals, such individuals are poor. The richest person has ample resources but may still suffer acute capability deprivation and cannot be called poor.

Command over resources and their achievements cannot be separated, but at the same, it must be recognized that the link between them is far from simple. Individuals have different needs and, therefore, differ concerning their ability to convert their incomes from all resources into capabilities to function. Thus, different individuals will require different resources to achieve basic capabilities.

This argument does not imply that our focus should entirely be on capability failures. A person should be identified as poor only if they suffer capability deprivation because of their inadequate resources. Let us take a hypothetical example: a person has suddenly suffered a stroke, and their life can be saved if they receive urgent treatment. However, if they do not have the means to access medical services, their death will be a capability failure caused of their inadequate resources. That would be a situation of acute poverty. Such situations are very common in the real world. However, if a rich man is struck with a stroke, but possesses all the means, we do not call them poor but call it their bad luck.

Governments can play a crucial role in providing health and education services, particularly to those who have low incomes. Well-targeted government programs can have a significant effect in reducing capability failures. Social programs can play a crucial role in reducing multidimensional poverty.

5. Outputs and Outcomes

Multidimensional poverty is concerned with the failure of basic capabilities. We distinguish two kinds of capability indicators: outputs and outcomes. For instance, access to health care services such as prevention, diagnosis, treatment, and management of illnesses are outputs, whereas life expectancy is an outcome. Similarly, access to education for all; implies that all school-age children can attend school irrespective of their families' economic circumstances are outputs. What they learn at school such as becoming literate or completing primary, secondary, or tertiary grades are outcomes; impacted by several factors which may include parents' education and occupation.

People's economic resources (means) directly impact the outputs through their income resources or the resources and services provided by governments through social programs. Outputs, however, should be generated so that they have maximum impact on outcomes.

The life expectancy at birth is derived from the mortality rates in different age groups. The mortality rates are influenced by several health-related individual factors including genes specific to individuals, age, access to health care, lifestyle, and many other factors, not readily predictable. Individual means can help to achieve better health outcomes, but they alone are not sufficient. There will be numerous factors other than means that impact the

outcomes. All mortality indicators can be regarded as outcomes. Age is one of the crucial factors that impact people's mortality, still, there is no one-to-one relationship between age and occurrence of death.

A critical question arises as to whether one should measure multidimensional poverty by outputs or outcomes. The literature has not addressed this issue. It may be intuitively attractive to use outcomes because they are the ultimate achievements of any society. If the society's objective is to monitor the overall progress in well-being, it would be appropriate to use outcomes, particularly if we are looking at the long-term performance of countries or societies in achieving well-being.

In contrast, multidimensional poverty occurs when individuals suffer ill-being due to their inadequate entitlement to resources to enjoy essential capabilities. The resources entitle people to generate outputs that enhance their capabilities, particularly those with low incomes.

World Bank defined poverty as the pronounced deprivation of well-being. This definition does not consider why people are suffering pronounced deprivation. For instance, if a person is suffering deprivation because she is unable to see a doctor when sick because she must buy food for her children. This is a capability failure caused due to the low level of income. We call it output deprivation. Let us take another example of a millionaire who is

suffering from knee pain because of severe arthritis, which is an outcome caused by many individual factors. This capability failure will be an outcome. If he underwent a total knee replacement because he had the means to do so, that would be an output. If he did not have the means to go for this operation, we call him suffering from poverty.

Thus, we distinguish between outcome and output deprivation. Outcome deprivation is caused by numerous individual factors which may also include the lack of income. Poverty is the main cause of output deprivation, whereas outcome deprivation can be caused by many unknown or unpredictable factors. We have a little control over them. Thus, poverty must be measured by outputs.

Outputs should be designed so that persons have food security, are adequately clothed, and sheltered, and have adequate amenities such as electricity, drinking water, sanitation, and transport. In addition, they should have access to all basic health services to avoid preventable morbidity and death. Their school-age children should also have access to quality education to be at least literate when becoming adults.

Outputs impact outcomes such as mortality rates, literacy rate, life expectancy at birth, or capabilities to function in society. Government policies cannot directly impact outcomes because they are caused by a host of individual factors over which the government has no control. However, the government can initiate

interventions to generate outputs that impact outcomes. However, we can evaluate government policies, which generate outputs, by their impact on outcomes.

It is revealing to compare the health systems of the USA and Australia. The USA incurs per capita health expenditure that is almost twice that of Australia, still, its life expectancy at birth is about five years lower than that of Australia. That means that the delivery of health services in Australia achieves better outcomes at half the cost. Thus, efficiency and equity in generating outputs are profoundly important. That will also have an impact on alleviating multidimensional poverty.

In the analysis of multidimensional poverty, it will be more meaningful if all dimensions of poverty are outputs. If dimensions of poverty are a mixture of both outputs and outcomes, any aggregation of various dimensions of poverty will lead to a meaningless poverty measure.

6. How should we measure multidimensional poverty?

All multidimensional poverty indices, proposed in the literature, have only focused on measuring capability deprivation, ignoring the insufficiency of means available to individuals; a critical requirement of poverty measurement. Our view of poverty is that people can suffer deprivation without being poor. As pointed out a millionaire can suffer acute deprivation in some poverty

dimensions, but it would be odd to call a millionaire as poor. The way multidimensional poverty is measured, such situations are unavoidable.

Alkire has made the most outstanding contributions in defining and measuring multidimensional poverty.⁶ In response to our view of poverty made in 2006, she asserted that “The problem with defining poverty, according to its cause is not only that it is difficult to establish causality, but it also may not be necessary: basic capabilities can be expanded by public action regardless of causality”.⁷ She is making three points: (1) it is difficult to establish causality, (2) causality is unnecessary, and (3) public action can directly impact the basic capability approach regardless of causality. She is wrong on all three counts. Let us explain.

First, take a hypothetical example of a person struck with cancer. They suffer immensely if they can not get access to medical services that are available in the country. Thus access to medical services can reduce capability deprivation. To access medical services, one requires means either out of pocket or subsidies provided by the government. If they do not have the means to access medical services, they can suffer acute deprivation. That is

⁶ Her book jointly published in (2015) with Foster, Seth, Santos, Roche, and Ballon, titled *Multidimensional Poverty and Measurement*, is a significant contribution to multidimensional poverty

⁷ See Alkire (2006), *Poverty in Focus*, the UNDP International Poverty Centre, Brazil.

our idea of causality, which is not difficult to establish. Secondly, access to medical services is essential to reduce capability deprivation, so we cannot say that causality is unnecessary. Thirdly, a public action for a cancer patient is to provide medical services to them, which essentially requires the means they must possess.

The first step in measuring multidimensional poverty is to specify some basic capabilities, that everyone should be entitled to enjoy. We define a person as poor if they are unable to enjoy the following four capabilities.

1. Food security
2. Health security
3. Education Security
4. Security of basic living

If persons have adequate means, they will not suffer such insecurities. These are broad categories of basic capabilities, which we regard as closely related to poverty. There are many other capabilities such as protection from crimes, access to the judiciary, access to the labor market, protection from natural disasters, etc. We have not considered them to be included because they are relatively less essential for poverty measurement.

These four basic capabilities are outputs, measured in income space, the per capita average costs of which can be estimated from household expenditure surveys, government statistics, or the prices of goods and services sold in the market. These costs are the out-

of-pocket expenditures born by individuals to achieve these basic capabilities. We call them poverty cutoffs. They do not require ad hoc dual cutoffs for individual capability deprivation and can be estimated from various data sources. The government can subsidize some of these costs through social welfare programs, which the individuals do not have to bear. Hence public actions have a direct impact on improving people's security in the four deprivations, thus reducing poverty.

Persons are identified as poor if their per capita income is less than the sum of the four poverty cutoffs. A detailed discussion of how to estimate the poverty cutoffs to achieve each of these securities is provided in the following sections.

7. Food Security

Food is a basic necessity for all human beings. An extreme form of food insecurity occurs when people are not sure if and when their next meal will come when they do not possess the means to buy the food that they want to eat. That means people suffer hunger, which we regard as an extreme form of poverty. However, a common form of poverty happens when people are unable to purchase food that meets their nutritional requirements, which can prevent malnutrition. This kind of food insecurity is similar to the 2009 World Submit on food insecurity.

Maintaining good health requires a balanced diet that provides people with a sufficient intake of calories, protein, fat, and carbohydrates. The food poverty line is the monetary cost of a balanced diet. A family's means can be measured by per capita income, denoted by y_i , and z_f is the family's food poverty line; the cost of a food bundle that enables the family to consume a balanced diet that meets the nutritional needs of all its members. We identify a family to be food secure if $y_i \geq z_f$ all times. We identify the family to be poor if it is not food secure.⁸

We have to be specific about what a balanced diet for a family of a given size is, and how to estimate its monetary cost. Kakwani and Son (2016) defined the average balanced diet of a family as one that provides 2100 kilo calories per person per day of which 60-70% is obtained from carbohydrates, 15 to 30 % from fats, and 10-15% from proteins.⁹ Poor families generally consume the food basket that contains a large proportion of carbohydrates because it is cheaper, but they run the risk of being malnourished. It is,

⁸ It is possible that some times, a family may not have sufficient income to be food secure, but has savings, which they can use to have food security.

⁹ The families can vary in size and composition so the individual member's cost of balance food basket will vary. This is the cost of average per capita balanced food basket for a family, which may not exactly provide food security to the family with different size and composition. However, it is possible to estimate the cost of a balanced diet for families of different size and composition, which can easily address to meet the nutritional needs of the families of different size and composition.

therefore, essential that all family have sufficient means so that all their members can consume a balanced diet at all times.

Kakwani and Son (2016) have provided a methodology for estimating a family's per capita cost of a balanced diet. It is not essential to reproduce this methodology in this paper. The measurement of food security on its own is an important development goal, we have utilized it as a component of multidimensional poverty.

Suppose hypothetically, there is a society where all persons can consume a balanced diet so that no person suffers food insecurity. That does not imply that no person in the society suffers malnutrition. The nutritional status of a person, as pointed out by Osmani (1992), is almost always the outcome of complex interactions between nutritional intake and many other factors such as the incidence of diseases affecting appetite, and absorption. The nutrient requirements of individuals vary from person to person even for the same age, sex, and individual activity levels [Kakwani (1992)]. Hence, malnutrition is an outcome, whereas access to a balanced diet is an output. If a society enjoys food security, its incidence of malnutrition will be much reduced. We cannot have a policy that has a direct impact on reducing malnutrition, but we can have a policy that provides people with the capability to consume a balanced diet which eventually reduces malnutrition suffered by the people.

The UNDP's global multidimensional poverty index (MPI) uses the body mass index (BMI) as an indicator of undernutrition but this indicator is not necessarily caused by the people's lack of means. The low BMI may be caused due to anorexia, a disease of eating disorder, which can be prevalent among rich persons. The BMI depends on an individual's metabolism, which varies across individuals. Thus, the undernutrition measured by the low BMI may be regarded as an outcome; not suitable for measuring poverty.

8. Health Security

Throughout the world, inequity in health delivery services is noticeable, particularly in the developing countries. Millions of people suffer from preventable illnesses such as infectious and chronic diseases, and also death. They suffer because they are poor and do not have access to adequate medical services.

We define a person as health secure if they have all-time access to all basic health services. Health insurance is a means of accessing health services. Some countries have universal health care where the government provides basic health care to all its citizens according to their health needs. That implies that the minimum basic medical care should be provided to every individual irrespective of their economic circumstances. Thus, the supply of services to individuals should only depend on their individuals' medical needs. When medical services are provided universally, the

link-up with people's needs is more direct. The difficult problem of identifying needs to some extent reduced. Equitable universal health services can entirely alleviate health poverty.

The lack of universal coverage means that some populations do not get the medical care they need. Many studies have shown that government health services benefit the well-off more than the poor who generally have greater health needs. Almost all developing countries have severe budget constraints that they are unable to maintain even the minimum quality of service. Many governments also charge user fees for the services they provide. Many poor are unable to pay these fees so they skip utilizing the government facilities, and suffer from avoidable morbidity, even death. Thus, health poverty can remain forever in developing countries.

The private sector also plays a crucial role in providing health services to the people who can pay for the medical services. People buy health insurance to get access to medical services, which are generally of better quality than government services. The main motive of private health providers is to maximize their profits with no concern for the welfare of the people. That means the people who have greater needs for health services will be required to pay more to access the services. Thus, the poor who have greater needs can be excluded from accessing services provided by the private sector.

The health cost of a family can be determined by three factors: (1) insurance cost, (2) out-of-pocket cost, and (3) cost of drugs. When a family buys health insurance, it is guaranteed basic access to medical services, which includes consultation with general practitioners, and specialists, medical procedures, surgery, pathological tests, and x-rays (MRI). In practical situations, insurance does not cover all the costs, particularly dental services. So some out-of-pocket costs are also incurred. The costs of drugs can be significant and are borne by the individuals. Suppose z_h is the total per capita cost born by a family, which is the health poverty cutoff, so the family is identified as health secure if the total per capita income of the family is higher than the family's poverty cutoffs at all-time. A family is identified as poor if it is not health secure. This is the practical definition of health poverty.

This practical definition is not followed by the UNDP's global MPI. A family is identified as health-poor if any child has died in the family in the last five years. How can just this indicator capture all the health-related deprivations people suffer? People suffer from numerous deceases, which include chronic diseases such as diabetes, cancer, heart attack, strokes, depression, dementia, etc. In the last years of life, the elderly go through enormous suffering. The elderly become fragile, and cannot function on their own. Some of them require intensive care. If they do not have the means to receive the care they need, they are severely poor. These are the real poverty issues, which multidimensional poverty literature has

completely ignored. The global MPI is completely disconnected from the real poverty issues in the real world.

9. Education Security

Equitable access to education is inextricably linked with alleviating poverty. Education helps lift people out of poverty by developing skills necessary to improve their employability and productivity. All children in the school-age groups must attend school, irrespective of their family's economic circumstances. We define families enjoying education security if they have the means to afford to educate all their school-age children at all times. Families are identified as education-poor if they do not enjoy education security. In many developing countries, some children are not attending school because they are engaged in labor activities to economically support their families. This is a consequence of poverty, for which children suffer immense deprivation.

The families incur substantial costs to support the education of their children. The costs vary according to the children's level of education: primary, secondary, and tertiary. These costs include school fees, private tuition, books, notebooks, pencils, pens, computers, school uniform iPads, school lunches, and other school supplies. Suppose a family's per capita income is y_i , and z_e is its total per capita cost of educating all children, then we identify

the family as education secure if $y_i \geq z_e$ all time. The family is education-poor if it does not enjoy the education security.

All school-age children have a fundamental right to be educated. If a family is unable to educate their children because they cannot afford all the costs, it is the government's responsibility to financially support such families. The Bolsa Familia (BFP) is Brazil's flagship social protection program and has become the most popular conditional cash transfer program (CCT) in the world. This is a cash transfer program in which payment of transfers are made to poor (needy) families conditional upon the families' ensuring their children's school attendance and regular health checkups. This program has a dual role: first, it provides the needed economic support to the poor, and second, it reduces poverty in the long run by providing incentives to the poor families to educate their children and requiring them to do health checks of their infants.

Social programs such as the CCT program are outputs, which have been extensively evaluated using impact evaluation techniques. These evaluations have found that the CCT programs contribute to a significant reduction in monetary and education poverty. They also improve education outcomes such as literacy, educational attainment, etc.

The main objective of education is that children learn enough to be able to function in society. Digitalization is spreading so rapidly in every country, that those who are left behind will suffer deprivation if they are unable to keep up with the technological changes, which are impacting almost everyone. Education now plays a much more crucial role in people's lives than ever before. The quality of schooling is now of critical importance. Children whose families do not have the means to get quality education will suffer immensely in their lives. Rich families have the means to provide quality education to their children through the private school system. The children of poor families can miss out even on essential educational opportunities. The gap between the poor and rich will continue to widen in the future. The government has to play an important role in improving the quality of education in public schools. The quality of education is critical in ensuring that no child drops out of school. Families also have a role in the education of their children, if they are poor, and not educated, their children will suffer. They cannot provide their children with modern learning tools such as computers. In the estimation of education poverty, we must take account of these issues.

10. Security of Basic Living

Poverty is closely related to how people live, and if their basic needs are met. In the olden days, people were concerned about three basic needs: food, shelter, and clothing. In the current times,

basic needs have considerably expanded. Even for basic living, people require many more goods and services. People cannot function in society with only food, shelter, and clothing.

The global MPI has the following six indicators of deprivation in basic living:

1. Electricity: The household has no electricity.
2. Sanitation: The household's sanitation has not improved.
3. Water: The household does not have access to safe drinking water.
4. Floor: The household has dirt, sand, or dung floors.
5. Cooking fuel: The household cooks with dung, wood, or carbon.
6. The household does not own one of the following assets: radio, TV, telephone, bicycle, motorbike, refrigerator, and does not own a car or truck.

These indicators of basic living are relevant only for rural and remote areas. For instance, in urban metropolitan areas, there will hardly be any households, that would not have electricity and sanitation with dirt, sand, and dung floor. There will rarely be any household in the urban areas that would cook with dung and wood. The people suffering from these six deprivations would be considered poor when we compare their living conditions with those residing in urban areas. However, a pertinent question arises: can people with such poor living conditions function in their

society? The answer is probably yes because almost all rural residents have more or less similar living conditions, so they can function without feeling much deprivation. If we are measuring overall deprivation in living conditions in a country, these six indicators will not be appropriate.

In the construction of the global MPI, each of these indicators is given a weight of 5.6, which means that if a poor household owns a radio or a car, its poverty is reduced by 5.6%. The impact on household poverty is the same whether they own an old radio, which they do not even use, or a car. Owning a radio has also the same impact on poverty as having access to electricity or drinking water. Assigning ad hoc weights, which give importance to various indicators, intuitively would not be acceptable to ordinary people. The ownership of these assets can not be of equal importance to the people.

Many essential expenditures of basic living are missing from the global MPI. These are transport and communication, clothing and shoes, laundry and cleaning, energy consumption, toilet accessories, baby care, personal effects, rent for a basic shelter, etc. Household expenditure surveys provide these expenditures incurred by households. These surveys also provide the age and sex of each person within households, from where we can estimate the basic needs of each person. Aggregating each person's needs, we calculate the per capita expenditure of each household or

family. That will be the poverty line for basic living. If we denote it by z_l , then we identify a family or household enjoying security in basic living if $y_i \geq z_l$, for all time. A family is identified as poor in basic living if it does not enjoy security in basic living

11. Multidimensional Poverty and Public Policies

The literature on multidimensional poverty has focused on measuring capability deprivation suffered by people in various poverty dimensions. To be precise, the focus had been on developing single indices of poverty in a multidimensional setting. These indices inform how much the overall capability deprivation suffered by the people, is and how we measure the performance over time of capability deprivation in a society or country. The literature has made significant breakthroughs in generalizing the traditional unidimensional poverty measures to capture the multidimensional deprivations.

The literature views multidimensional poverty as the failure of some basic capabilities. This view of poverty is a significant departure from the income approach, which advocates increasing the incomes of those who are below the poverty line. The capability approach is measured in the well-being space, in which people's income (means) does not play any role. The focus is mainly on capturing the overall deprivation people suffer in many facets of life.

Suppose we have found from such an analysis that society has suffered acute deprivation in health-related illnesses. Then what do we do with this information? What policies should we have to reduce the deprivation? An obvious answer is that we should assess the efficiency and equity of the delivery of health services. Efficiency means that the health sector has qualified health providers and essential equipment to be able to cure the population suffering from chronic diseases. Equity is more concerned with access to health services, meaning that services are so expensive that the poor do not have the means to utilize them. Thus, lack of means contributes to capability failure.

We need to understand the causes of capability failure before we jump into formulating policies to reduce it. The entire literature on multidimensional poverty is focused on capturing the general capability deprivation suffered by the population. Everyone, the poor or the rich can suffer deprivation, but poverty must be concerned with deprivation that is caused by the lack of means. As noted earlier, the king of England has been diagnosed with cancer, suffering acute deprivation, but it would be odd to call him poor.

To reduce or even eliminate multidimensional poverty, we need to assess the efficiency and equity of various services available in the country. To improve equity of services, our policy should be to provide means to the poor so that they access health services, basic education, and basic living or prevent them from suffering hunger.

Many counties have safety net programs to provide the poor with social means to prevent them from suffering acute deprivation and vulnerability. School lunch programs are designed to reduce undernutrition among the children attending school.

12. Concluding Remarks

The Nobel laureate Amartya Sen's seminal work on functioning and capability has been the most influential in defining poverty in a multidimensional framework.

It is now widely accepted that poverty is best described in terms of capability failures that people suffer in many facets of life. In this paper, we have critically evaluated this approach, reviewing all the unresolved issues in its measurement.

In the last three decades, we have witnessed a blossoming of research on multidimensional poverty. Although the literature has made considerable progress in identifying the poor and developing multifaceted poverty indices, too many challenges have remained unresolved. A principal problem has been that the multidimensional poverty measurement requires many arbitrary assumptions that lead to an arbitrary degree of poverty. The poverty alleviation policies based on such measures will also be arbitrary.

Our analysis of unresolved issues has led us to concur with Nora Lustig (2011) that deprivations in various dimensions of poverty can not be meaningfully aggregated into a single multidimensional poverty index. Still, the popularity of single indices of poverty has enhanced. The multidimensional poverty index (MPI) developed by Alkire and Foster (2011, 2011a) has been reported for over 110 countries through the UNDP's 2010 Human Development Report. Mexico in 2009 adopted a multidimensional index as the country's official poverty measure. Subsequently, Columbia adopted its poverty reduction strategy. More recently, India has officially adopted the MPI as a poverty monitoring tool.

Our analysis in this paper concludes that many complexities in the measurement of multidimensional poverty are arising because the entire literature is focused on capturing capability deprivation, in general, ignoring the causes of deprivation. We make the distinction between poverty and capability deprivation. Poverty must arise when the essential capability failure is caused by inadequate command over resources through markets, public provision, or other non-market channels. The main message coming out of this paper is that by examining capability deprivation alone, we cannot always identify poor persons.

We argue that well-known multidimensional poverty measures proposed in the literature do not measure multidimensional poverty because they are focused on capturing capability

deprivations suffered by the population. They assume that all persons who suffer deprivation are poor. Poverty should be concerned with the deprivations that are caused by the insufficiency of resources people possess. Thus, we emphasize the cause of deprivation, which is fundamental in measuring multidimensional poverty, whereas the entire literature is focused on measuring the overall deprivation suffered by the population.

Following this line of arguments, we make a distinction between outputs and outcomes; outputs are directly impacted by the people's entitlements either by their resources or the resources provided by the government and government policies, whereas, outcomes are people's ultimate achievements. We argue that poverty should be measured based on outputs while the population's overall well-being should be measured by outcomes. The literature on multidimensional poverty measurement has completely ignored the distinction between means and ends.

In this paper, we offer a radically different method to measure multidimensional poverty, which takes into account of insufficiency of means available to individuals, to achieve essential capabilities. We have identified four basic capability failures that the poor with insufficient means can suffer: (i) food security, (ii) health security, (iii) education security, and (iv) security of basic living. If persons have adequate means, they will not suffer such insecurities. These are broad categories of basic capabilities, which

we regard as closely related to poverty. We can measure poverty in each dimension without assigning ad hoc weights to each dimension.

Costs of achieving these securities can be estimated from household expenditure surveys, government statistics, or the prices of goods and services sold in the market. These costs are the out-of-pocket expenditures born by families to achieve these basic capabilities. The government can subsidize some of these costs through social welfare programs, which the individuals do not have to bear. Hence public actions have a direct impact on improving people's security in the four deprivations, thus reducing poverty.

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