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## ABSTRACT

### **Multidimensional Poverty Analysis: Looking for a Middle Ground<sup>\*</sup>**

Widespread agreement that poverty is a multifaceted phenomenon, encompassing deprivations along multiple dimensions, clashes with often vociferous disagreement about how best to measure these deprivations. Drawing on the recent literature, this short note proposes three methodological alternatives to the false dichotomy between scalar indices of multidimensional poverty, on the one hand, and a “dashboard” approach that looks only at marginal distributions, on the other. These alternatives include simple Venn diagrams of the overlap of deprivations across dimensions, multivariate stochastic dominance analysis, and the analysis of copula functions, which capture the extent of interdependency across dimensions. Examples from the literature on both developing and developed countries are provided.

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Over the last ten years or so, interest in multidimensional poverty measurement has been growing steadily. Since the pioneering works of Bourguignon and Chakravarty (2003) and Tsui (2002), a number of approaches have been proposed to measure or analyze deprivation in more than one dimension. This burgeoning literature now includes Alkire and Foster (2011a), Chakravarty, Deutsch and Silber (2008), Deutsch and Silber (2005), Duclos, Sahn and Younger (2006) and Maasoumi and Lugo (2008), among others.

Multidimensional poverty analysis has also ventured forth from purely academic discussion and into the broader policy debate, both within a number of countries and internationally. In December 2009, for example, Mexico's National Council for the Evaluation of Social Policy (CONEVAL) adopted a multidimensional index as the country's official poverty measure.<sup>1</sup> In 2011, the Government of Colombia followed suit by adopting a poverty reduction strategy focused on five separate dimensions, and relying on a variant of the Alkire and Foster (2011a) approach for quantifying progress. Internationally, the Multidimensional Poverty Index (MPI) of Alkire and Santos (2010), which was reported for over 100 countries in the UNDP's *Human Development Report 2010*, has also gained prominence.

The driving force behind this rising popularity is the broad acknowledgment that poverty is about more than just low incomes. Low consumption and inadequate living standards lie at the heart of what most people understand by the word "poverty", to be sure. But the associations conjured up by that term also include aspects of poor health, a shortened lifespan, limited access to education, knowledge and information, and powerlessness in various domains. Poor people themselves will often allude to non-income dimensions as crucial to their perception of their own hardships. The following quote, from a person from Georgia, illustrates the point: "Poverty is lack of freedom, enslaved by crushing daily burden, by depression and fear of what the future will bring" (quoted in Narayan et al., 2000, p. 37). It is now quite common for poverty analysts - whether from academia, the World Bank or other agencies - to face enquiries about how best to summarize information on "multidimensional poverty" in a particular country.

Yet, the various new multidimensional poverty indices have not been universally welcomed. Serious criticism of these indices centers on the manner in which information on deprivations is aggregated across dimensions. One powerful critique is that the weights used to aggregate across dimensions lack the intrinsic meaning associated with prices, which are used to add the components of consumption expenditure (or, implicitly, its dual, the incomes used to finance

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<sup>1</sup> The Executive Secretary of CONEVAL, Dr. Gonzalo Hernández Licona, is quoted as having said: "Mexico is proud to be the first country in the world to measure poverty, not narrowly on economic grounds alone, but to take full account of crucial social components of poverty such as quality of housing and access to healthcare and food, which are all too often neglected by established poverty measures". See <http://www.ophi.org.uk/launch-of-mexico%E2%80%99s-new-poverty-measure/>

consumption). Under the law of one price, and given relatively weak assumptions on preferences, relative prices are equal to the rate at which consumers themselves – regardless of their income levels and allowing for different utility functions – are willing to trade one such component (e.g. bread) for another (e.g. a bicycle).

There are, of course, a number of reasons why prices may not be ideal welfare weights in practice. These range from the existence of externalities to the fact that price data is often geographically coarse, so that much actual price variation in space is missing from the information available to the researcher. Nevertheless, as Ravallion (2011, p.247) argues:

“It is widely agreed that prices can be missing for some goods and deceptive for others. There are continuing challenges facing applied economists in addressing these problems. However, it is one thing to recognize that markets or prices are missing or imperfect, and quite another to ignore them in welfare and poverty measurement. There is a peculiar inconsistency in the literature on multidimensional indices of poverty whereby prices are regarded as an unreliable guide to the tradeoffs, and are largely ignored, while the actual weights being assumed in lieu of prices are not made explicit in the same space as prices.”

### 1. *What is the disagreement about?*

Some of the debate between proponents and skeptics of multidimensional poverty measurement was featured in the Forum Section of the June 2011 issue of the *Journal of Economic Inequality* (e.g. Alkire and Foster, 2011b; Ravallion, 2011; Lustig, 2011). Those articles actually suggest strong agreement on at least one basic point: “poverty is multidimensional” (Ravallion, 2011, p.236). No one seems to dispute that deprivations exist in multiple domains, and are often correlated. And that, therefore, considering information on those various dimensions, rather than only on incomes or consumption expenditures, is likely to be useful for designing policies to effectively combat poverty.

The disagreement is about how best to *measure* this multidimensional poverty – i.e. how best to convey information about the extent of these various deprivations in a way that is useful for analysts and policy makers. Some, like Alkire and Foster (2011a) and Maasoumi and Lugo (2008), have proposed scalar indices that seek to combine, in a single number, information from those various dimensions. A key advantage of such scalar indices is that they generate a complete ordering of countries, regions or individuals, even when the rankings disagree across individual dimensions. The Multidimensional Poverty Index - or the Human Development Index, in the space of attainments - attracts a good deal international attention in large part because it

ranks countries according to how well they perform on various dimensions through a simple summarizing tool.

Ravallion (2011), on the other hand, suggests a ‘dashboard approach’, whereby “we may need to focus our efforts and resources on developing the best possible *distinct* measures of the various dimensions of poverty [...] aiming for a credible set of ‘multiple indices’ rather than a single ‘multidimensional index’” (Ravallion, 2011, p.13; our emphasis.) An important limitation of multidimensional indices, as noted earlier, is that they require the use of relative weights for each dimension, which are generally chosen somewhat arbitrarily by the analyst. Other analysts, policy-makers and the general public may well disagree with these specific weights and, instead of imposing a specific weighting system, the dashboard approach allows the user to place greater or less importance to any particular dimension, as he or she desires.

## 2. *Is there a policy-relevant middle ground for multidimensional poverty analysis?*

In this short note, we argue that this (admittedly stylized characterization of the) debate – single index versus a ‘dashboard’ – is a false dichotomy. Essentially, multidimensional poverty analysis is interesting because the joint distribution of achievements contains more information than its marginal distributions. The dependency structure in a joint distribution – e.g. how closely correlated different achievements (or deprivations) are – can affect how we assess poverty in a society, or compare it across time periods, even given identical margins. A dashboard that reported on poverty indices for each dimension separately would miss this aspect of the joint distribution.

This point was made eloquently by Duclos, Sahn and Younger (2006). In one instance, these authors compare the joint distributions of two dimensions of health (nutrition and survival probabilities) in Cameroon and Madagascar, and find that *both* marginal distributions in Cameroon first-order dominate the corresponding marginal distributions in Madagascar. But there was no dominance of the *joint* distribution. In this example, a dashboard approach would conclude that poverty was unambiguously greater in Madagascar, while a truly multidimensional assessment – i.e. one that took the correlations into account – would conclude that no clear ranking was possible.

This arises because the correlation between the two dimensions may differ substantially from one place to another, so that the cumulative concentration of deprivations could make overall poverty ‘worse’ in a place that has ‘better’ marginal distributions. Or, as Duclos et al. put it: “It is possible for a set of univariate analyses done independently for each dimension of well-being to conclude that poverty in A is lower than poverty in B while a multivariate analysis concludes the opposite, and vice-versa. The key to these possibilities is the interaction of the various

dimensions of well-being in the poverty measure and their correlation in the sampled populations.” (Duclos, Sahn and Younger, 2006, p.945)

In the remainder of this note, we briefly describe three alternative empirical approaches for the analysis of the dependency structure in joint distributions. All three illustrations are drawn from the recent literature, and we make no claim to originality in this note. Each is more suitable to a specific purpose, but all focus on interactions among the dimensions, so the menu of options may be useful to analysts.

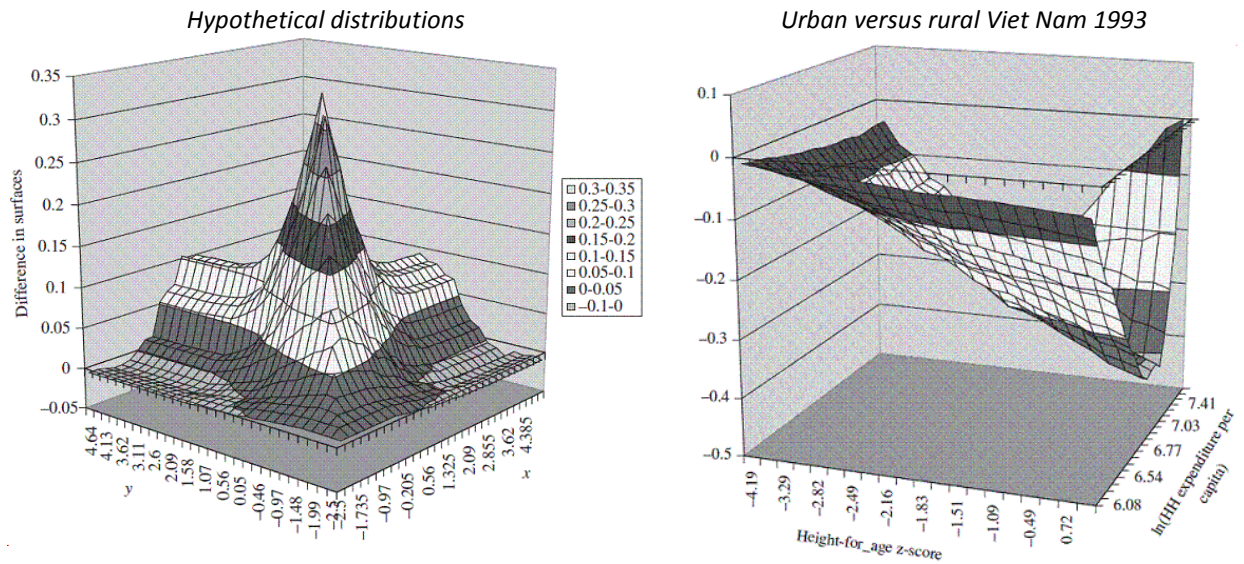
The first approach is the set of **multivariate stochastic dominance techniques** proposed by Duclos et al. (2006), which enable poverty analysts to investigate joint distributions of multiple deprivations without making the specific assumptions about trade-offs that rightly worry Ravallion (2011). And if the correlation between deprivations matters – as surely it must – then this approach must be regarded as superior to the dashboard approach, which considers only the marginal distributions.

Multivariate stochastic dominance compares two multidimensional distributions to ascertain whether one distribution dominates the other (i.e. lies always above or always below) for all reasonable poverty frontiers. If this is the case, then one could conclude that poverty in, say, A is always higher (or lower) than in B, for all additive poverty indices. Below we reproduce two examples given in Duclos et al. (2006). These graphs represent the bi-dimensional dominance surfaces, i.e. the difference between two joint distributions.

The graph on the left of figure 1 represents the difference in the surfaces of two hypothetical distributions. In this case, “[a]lthough differences in the univariate dominance curves in both dimensions clearly cross the origin (at the extreme left and right of the Figure), there is a significant interior section where the first surface is entirely above the second.” (Duclos et al. 2006, p. 954). In other words, there is intersection dominance without marginal dominance.

The graph on the right of Figure 1 depicts the dominance surface comparing rural and urban children in Vietnam in two dimensions: household expenditure per capita and height-for age z scores. This case indicates that over almost the entire range of expenditures and stunting, rural children are poorer than their urban counterparts. And the dominance is found for all reasonable poverty lines, so that “rural children are poorer than urban ones is valid for almost any intersection, union or intermediate poverty frontier.” (Duclos et al. 2006, page 959)

Figure 1. Differences in dominance surfaces.



Source: Viet Nam LSMS, 1993.

Source: Reprinted from Duclos, Jean-Yves, David Sahn and Stephen Younger (2006): “Robust multidimensional poverty comparisons”, *Economic Journal* **116** (514): 943-968.

It is true, of course, that multivariate stochastic dominance analysis tends to be of limited use when the number of dimensions or margins is large. In these cases, a natural alternative seldom discussed involves complementing the dashboard approach with a **direct representation of the dependency structure**. In poverty studies, the degree of interdependence can be presented in terms of the extent of the overlap between individuals identified as deprived under the different criteria. For instance, if poverty were defined by three dimensions (such as education, health, and income), the dependency can be illustrated – at least in part – by the proportion of individuals that are deprived in all three dimensions, those that are deprived in (different) pairs of dimensions, or only in one. Atkinson and Lugo (2010) provide such an example for the case of Tanzania.

Table 1 below (reproducing Table 5 in Atkinson and Lugo, 2010) presents information on deprivations in three dimensions of well-being measured at the household level, and the extent of overlap between them. The dimensions chosen are school attendance of children between 5 and 16 years old, access to safe sources of drinking water (piped or protected), and an indicator of ownership of durable assets. These indicators are closely related to the goals set by the government in the Tanzanian National Strategy (MKUKUTA), and are obtained at the household level from the Household Budget Surveys. The example shows that:

“Between 2001 and 2007, school attendance and availability of durable assets have improved significantly, whereas access to protected sources of drinking



water has deteriorated. Despite the latter, the combined effect is to reduce the proportion of Tanzanians who suffer from any of the three forms of deprivation: this has fallen from 90 per cent to 80 per cent. Equally there has been a fall in the proportion deprived on all 3 dimensions: from 19 per cent to 10 per cent. At the same time, there has been an increase in one category of the deprived: those lacking only access to water.” (Atkinson and Lugo, 2010, p. 15).

**Table 1. Deprivations in schooling, access to protected water and durable assets in Tanzania**

Proportion of the individuals living in households ...	2001	2007
<b>School deprived: at least one child 5-16 years old not in school</b>	55.2	34.5
<b>Assets deprived: no car and fewer than on "small asset"</b>	66.6	47.4
<b>Water deprived: no access to piped or protected source of drinking water</b>	45.8	50.7
<b>Distributions of individuals</b>		
Not deprived in school, water or assets	10.3	20.1
Only school deprived	8.9	7.5
Only water deprived	4.7	14.4
Only assets deprived	17.3	15.1
School and water deprived	9.5	10.7
Water and assets deprived	12.5	15.9
School and assets deprived	17.6	6.6
School, water and assets deprived	19.1	9.8

Source: HBS 2001 and 2007. Reproduced from Atkinson and Lugo (2010), "Growth, poverty and distribution in Tanzania". International Growth Centre, Working Paper 10/0831. November. Page 15.

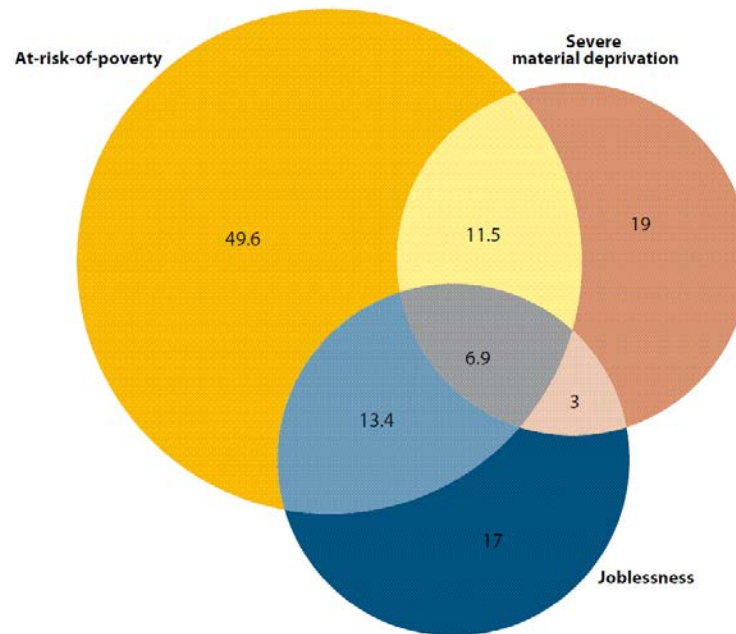
Note: small assets include television, radio, telephone (including mobile phones), refrigerator bicycle, and motorcycle.

The implication of these results for assessing the progress of the country between the two years is clear: “If it were decided that access to water were the sole concern, then deprivation would have increased from 46 per cent in 2001 to 51 per cent in 2007. [...] [If instead, one wanted to] assess overall performance simply in terms of the proportion deprived on all dimensions [...] this proportion has fallen, indicating definite progress.” (Atkinson and Lugo, 2010, p. 15)

An effective way of presenting this kind of information on the degree of overlap across dimension-specific deprivations diagrammatically is through Venn diagrams, as Atkinson et al (2010) do for the European Union-27 countries. The larger the overlap between deprivations, the greater is the extent of interdependence. Figure 2 below (reprinted from Atkinson et al, 2010) shows the number of people that are at risk of poverty (EU definition), the number of people that are materially deprived, and the number of people aged 0-59 living in ‘jobless’

households.<sup>2</sup> Data come from EU-SILC surveys. The authors note that: “A little over 80 million people live in households at risk of poverty, a further 40 million live in households that are not at risk of poverty but are defined as jobless and/or materially deprived”. Indeed, “well over two-thirds are identified under only one of the criteria”. This example suggests that, in this particular context, policies that are directed exclusively towards one of the indicators may fail to reduce the degree of deprivation of a large proportion of households. The authors conclude that not only is it important to monitor the three indicators, but that understanding the degree of overlap will also help shape policies to address these shortfalls.

**Figure 2. Multiple indicators from the Europe 2020 target. Figures for EU-27 in million of persons**



Source: EU-SILC, Eurostat-CEPS/INSTEAD calculations. Reprinted from Atkinson, A. B., E. Marlier, F. Monastigne, and A. Reinstadler (2010) 'Income poverty and income inequality', in *Income and Living Conditions in Europe*, Atkinson and Marlier (eds), Eurostat, page 127.

When the objective is to evaluate well-being rather than deprivations, representing interdependencies between dimensions is less straightforward, and some “lateral thinking”

<sup>2</sup> Persons “at risk of poverty” are defined as those who have an equivalized disposable income below 60 % of the national median equivalized disposable income, after social transfers. Material deprivation covers indicators relating either to economic strain or to the ownership of durables. Severely materially deprived persons cannot afford at least four of the following: to pay rent or utility bills; to keep their home adequately warm; to pay unexpected expenses; to eat meat, fish or a protein equivalent every second day; a week holiday away from home; a car; a washing machine; a color TV; or a telephone. Finally, a ‘jobless household’ is one where none of the members aged 18-59 are working or where members aged 18-59 have very limited work attachment.

(Atkinson, 2011) might be called for. Sklar's Theorem, from the statistics literature, tells us that any joint distribution function can be decomposed into the marginal distribution functions of each dimension (corresponding to the dashboard approach), and a **copula function**, which captures the information of the degree of interdependency between the dimensions. Copulas, which are the third approach we want to highlight, have already been used to study the relationship between health and income (Decancq 2009, Quinn 2007). Formally, the copula function is the joint distribution function of  $n$  vectors whose elements are the *relative position* of every individual in each of the  $n$  dimensions of well-being. As in the case of the margins, once the copula function is constructed, one could perform a stochastic dominance analysis to assess whether the degree of interdependency between the components has changed in an unambiguous way. In addition, and in the same way that information on unidimensional inequality can be summarized by an index (such as the Gini coefficient or the mean log deviation), measures of rank correlation allow us to order distributions unambiguously in terms of their degree of interdependency (Decancq, 2009).

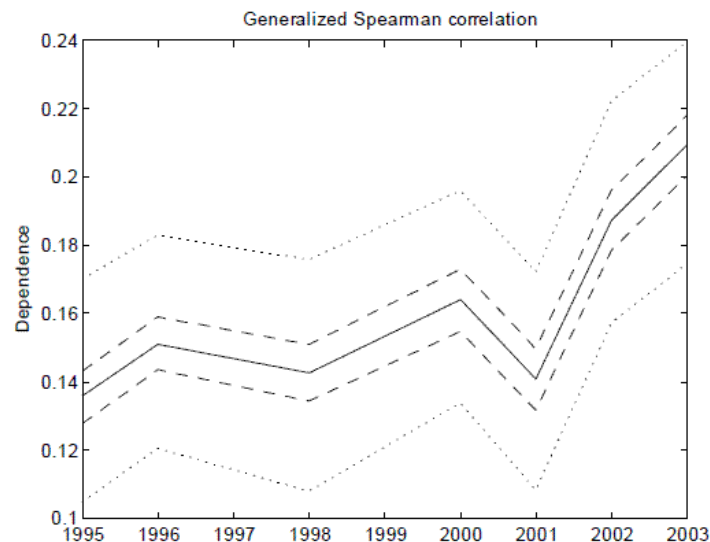
As an example, we reproduce from Decancq (2009) a graph showing the evolution of the Spearman correlation coefficient, a commonly used measure of rank correlation, in Russia between 1995 and 2003 (Figure 3). The author considers three dimensions: standard of living, health, and schooling, represented respectively by household income, self-assessed health, and years of schooling as primary ranking variables (another three variables are used as secondary ranking variables in case of ties). By way of context, the Russian Human Development Index increased from the beginning to end of the period, albeit with a deterioration around the 1998 financial crises.

In this figure, the dashed line represents the 95% confidence interval obtained by Monte Carlo simulations, while the dotted line represents an alternative computation of the same confidence interval, by bootstrapping. The figure illustrates that the degree of dependence across these three dimensions of well-being has been increasing throughout most of the period: as the average well-being was rising, so was the degree of interdependency between the dimensions of well-being.

Although they differ in technical complexity, these three alternative techniques (Venn-diagrammatic representations of the dependency structure; multivariate stochastic dominance and the analysis of copula functions) would seem to avoid the disadvantages associated with both the scalar indices and the dashboard approach. Like the dashboard approach (but unlike scalar indices), they do not require the use of generally arbitrary weights to aggregate across dimensions, with their unpalatable implications in terms of trade-offs. Like scalar indices (but unlike the dashboard approach) they incorporate information about how the deprivations are *jointly* distributed and allow analysts to take into account different levels or changes in the extent of overlap or correlation between them. This is a menu of analytical approaches that

represent an advantageous middle ground in multidimensional poverty analysis, and which might add value to some of the poverty analysis currently undertaken at the World Bank (and beyond).

**Figure 3. The evolution of the dependence between the dimensions of well-being over time in Russia**



Source: RLMS 1995-2003. Reprinted from Decancq, K. (2009), "Copula-based measurement of dependence between dimensions of well-being", HEDG Working Paper 09/32, University of York. Page 21.

There is one important caveat, however. It is a requirement for this kind of analysis that the information on the various dimensions be observed for each unit of observation (typically the individual or the household). In other words, they must be observed in the same survey (or census) or, at least, in different surveys that covered the same set of households and contained common identifiers. Otherwise, it is clearly impossible to observe the joint distribution.

An important argument put forward by Ravallion (2011) for the dashboard approach is the fact that the best data on separate dimensions (say, health status and consumption expenditures) are often to be found in different data sets, from which no joint distribution can be constructed. In those cases, a trade-off between data quality and information on the joint distribution may arise, and such trade-offs must be evaluated on a case-by-case basis. If the quality of information is thought to differ only marginally – for example, anthropometric information about children in a health survey is thought to be superior to that contained in an LSMS-type survey, but the latter does have some information – it is perfectly possible that some analysts would be sufficiently interested in the extent of overlap of deprivation in health and consumption to incur the cost of using the slightly worse data. Conversely, other analysts

that place sufficient weight on the accuracy of the information on the marginal distribution would choose to analyze each margin separately, in each case drawing from the best survey.<sup>3</sup>

In many cases, of course, reliable information on relevant dimensions - such as health status, anthropometrics, education and consumption - does exist in the same survey. This is the case, for instance, of the Russian RLMS survey used by Decancq (2009), the Indonesia Family Life Survey, and various LSMS-type surveys. In those cases, it is difficult to find an excuse for not complementing the marginal analysis with information on the dependency structure. Furthermore, one should not underestimate the power of the demand for better data. If there are certain aspects of well-being and deprivation which are not regularly captured in household surveys, but whose joint distribution with other dimensions (such as income) is of real policy interest, then more frequent analysis of the kind we suggest might well encourage statistical institutes, or other data providers, to collect information on them.

### 3. *What about scalar multidimensional poverty indices?*

Finally, we turn briefly to the question of whether the analytical approaches we propose should completely preclude the computation of scalar multidimensional poverty indices. It is already clear that they do not preclude the “dashboard approach”, in so far as looking at the marginal distributions is inherent in looking at the joint. The three approaches described above are best seen as complementing the “dashboard approach” with information on the dependency structure between the dimensions, when that is available.

But what room do we see for the definition and computation of *scalar* multidimensional poverty *indices*? We see this question as just another instance of choice given a trade-off. A scalar multidimensional index buys you a complete ordering, i.e. the ability to rank two years, or countries, or regions, even then their joint distributions (or copulas) cross. Just as in unidimensional poverty or inequality analysis, that ability to generate a complete ordering comes at a cost in terms of specific functional form assumptions, etc. In the case of multidimensional well-being and poverty, this price is higher, for two reasons.

The first reason is that the identification step (in the sense of Sen, 1976) is considerably more complex for multidimensional poverty than for unidimensional poverty. This is emphatically *not* only because one has to define a threshold for each individual dimension. It is also because a difficult choice must be made – at the identification step – about “how many” deprivations constitute poverty. This harks back to the fundamental choice between the union and intersection approaches (e.g. Bourguignon and Chakravarty, 2003) or to the establishment of an

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<sup>3</sup> The question of whether data on a particular variable is indeed more reliable in one survey than in another may, in some cases, be investigated empirically. At a minimum, survey-to-survey imputation techniques can be used to assess the sensitivity of results to using information from different sources. This remains an area for future work.

intermediate cut-off in the number of dimensions (Alkire and Foster, 2011a). Or indeed to whether the depth of deprivation in one dimension should be allowed to offset well-being in another at the identification stage (e.g. Duclos et al. 2006). In this note we have largely ignored issues of identification, though these are clearly important if one does decide to go down the scalar index route.

The second reason, of course, is the need for weights to aggregate across dimensions. Even conditional on a particular identification algorithm, the issue of weights remains. Whether or not that price is worth paying is therefore likely to depend on two things. First, how important is the ability to rank for the purpose of the analysis at hand? Second, how arbitrary (and how many) are the weights?

It is hard, therefore, to take definitive positions in the abstract. Just as in the case of unidimensional poverty measurement, it would seem that two extreme positions are untenable. The first would be to say that a particular multidimensional poverty index is *the* one true measure of poverty. The second would be to argue that *any* particular index that makes some unpalatable assumption is inadmissible. Just as we all recognize the limitations of the headcount index, but still report it (hopefully alongside other measures and more disaggregated and robust analysis), there will clearly be uses for various indices of multidimensional poverty.

In our view, such scalar indices would be most likely to be useful if they relied, to the *greatest possible extent*, on (shadow or market) prices to aggregate across different goods and services. Only those aspects of well-being for which there can truly be no sensible estimate of relative prices should be treated as separate *dimensions*. Although food, cooking utensils, toilets, clothing, vehicles, etc., may well be resources that affect different ‘functionings’ (in the sense of Amartya Sen), they are best treated as components of a single dimension of welfare – command over private goods – whose internal weights are given by relative prices.

Equilibrium prices, as noted earlier (and in your elementary first-year economics course), reflect people’s preferences and constraints, as well as market structures. If individual choices can be reasonably approximated by the result of maximizing a utility function subject to a budget constraint, and if the law of one price holds, then it follows that – regardless of people’s individual utility functions or income levels – the rate at which everyone will trade off one unit of a good against one unit of another good will be the same. In other words, relative prices reflect the marginal rate of substitution between the goods.

Naturally, price data is often problematic. Very often the available data on prices do not accurately represent the prices actually faced by individuals for the indicators that we would want to include in the analysis. This is largely due to the fact that there is price heterogeneity

across regions (or even cities) within a country and in the quality of the good, whereas price data tend to be collected at a higher level of aggregation and for a representative (average) item in each category. But it is hard to think that these problems are so severe that choosing arbitrary weights across “dimensions” such as the availability of cooking utensils and, say, the ownership of certain means of transport, would yield a preferable metric. In this regard, Ravallion’s (2011) arguments for a greater reliance on market prices seem overwhelmingly compelling.

The true value of the analysis of multidimensional poverty (or well-being) lies in the existence of certain aspects of well-being that we deem important, but for which there can truly be no sensible estimate of relative prices. It is reasonable to include in this category items such as political and personal freedoms, health and, arguably, education. While various inputs into the production of health and education are marketable, that is not true of all of them. Health is influenced by environmental quality and a number of other public goods. “Education”, once embodied in human capital, generates so many externalities that it is difficult to think that school fees or costs are suitable approximations to its true shadow price. These things – not the material from which a ceiling is made, or what kind of stove one uses – are true *dimensions* of welfare.

It is in these cases that multidimensional analysis becomes particularly relevant. If, for the purpose at hand, the analyst decides that the price of selecting weights is worth paying (in order to obtain a complete ordering), then the question is whether one can choose relative weights that at least attempt to represent the existing trade-off between the different components of deprivation (or well-being). There are various approaches for setting these weights, some based exclusively on the observed distribution of attributes, others based on people’s opinions, and others using both sorts of information (Decancq and Lugo, forthcoming). Whatever the weighting scheme and precise functional form chosen, multidimensional indices of deprivation (or well-being) should be allowed to be sensitive to the one thing the multidimensional approach is called upon, that is, to changes in the degree of dependency between its components.

#### 4. *Conclusions*

There is widespread agreement that poverty is a multifaceted phenomenon. Income shortfalls, which translate into an inability to consume certain basic commodities, are central to this phenomenon. But income poverty is typically associated with deprivations in other realms, such as health, education, social status and political power, which are harder to price. These associations, or correlations, between the constituent dimensions of poverty vary over time and from place to place, and are often thought to matter. Recent advances in multidimensional

poverty analysis seek to capture these interactions, and revealed preference seems to suggest that they are of interest to policymakers in many developing countries.

Despite this widespread agreement on the essential fact that poverty is multidimensional, there has been a lively debate on whether that implies that one should construct scalar indices that summarize information on those various dimensions in a single number, or provide multiple indices, one for each dimension, in a “dashboard approach”. Drawing entirely on the existing literature, we have argued here that such a dichotomous view misses the point. The most interesting aspects of the multidimensionality of poverty arise from the *interdependence* among dimensions. The joint distribution of dimensions over the population contains more information than the corresponding marginal distributions, and the correlation patterns in that joint distribution may change how we compare poverty across two countries or time periods. This dependency structure is missed entirely by the dashboard approach, and often obscured by scalar indices.

Drawing on examples from both developed and developing countries, we illustrated three alternative approaches that allow researchers and policy analysts to focus on the dependency structure of a joint distribution. The first was stochastic dominance analysis, which permits partial orderings across joint distributions that are robust not only to poverty lines and welfare weights (as in the unidimensional case) but also to dimension weights. The second was a representation of the overlap of deprivations over the population, by means of simple tabulations or Venn diagrams. Given agreement on the identification criterion along each dimension, this extremely simple tool can complement the “dashboard” statistics on the marginal distributions in informative ways. And the third was the use of copula functions to study the multivariate association among different components of well-being across two or more joint distributions.

Finally we have argued that multidimensional poverty indices, like most other tools, can be accommodated in the economist’s toolkit, and that the risk of serious injury decreases with reliance on relative prices and the focus on a few core, truly irreducible dimensions. If such indices are used, plenty of fodder will remain for future controversies on the choice of weights, poverty lines, and functional forms. But they would largely be a distraction from what really matters to policymakers, which is the pattern of associations and overlaps across the core dimensions of well-being.



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