

12th EADI General Conference
**Global Governance for
Sustainable Development**

The Need for Policy Coherence
and New Partnerships



**Identifying the Capability-Poor:
Problems and a Proposal**

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Abstract

Two features of the Capability Approach constitute challenges with respect to poverty measurement. The first is its multidimensionality. Although the literature on multidimensional poverty measurement is growing, no ready-made solution has emerged (Garcia Diaz 2003 provides an overview). In this paper I introduce a scheme for classifying multidimensional poverty indices according to the order of the three steps involved in multidimensional poverty measurement. Then I look at the various ways to identify the poor if poverty thresholds are defined in every dimension. The paper introduces and discusses five variants of identifying the poor. The second challenge for applying the Capability Approach to poverty measurement consists in the idea of a capability set. Two major questions arise with regard to capability sets: (a) How to estimate a person's capability set?, and (b) How to evaluate her capability set? properties of the capability set. They show the role these assumptions play in the evaluative process. I take another perspective and challenge some of the standard assumptions.

The first two sections of the paper are dedicated to the challenges of measuring capability poverty described above. In the third and last section I propose to identify the poor in two steps in line with Sen's distinction between fasting and hunger. Only those persons are counted as poor whose capability set doesn't entail a single functioning bundle above the poverty lines. Hence, the application of this identification method hinges upon an estimation of the capability set, but it grasps the distinction between persons who cannot escape poverty and those who have chosen a functioning bundle that is below the poverty threshold in certain dimensions.

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The paper draws mainly on my PhD thesis (Lessmann 2007a). I am grateful for the discussions with my mentor Udo Ebert. All errors are mine. Preliminary version. Please don't quote without permission of the author.

When the Capability Approach (CA) emerged there was already a growing consensus among researchers that poverty is best assessed in a multidimensional framework (Seidl 1988: 137–138). The Capability Approach provided a theoretical basis for doing so. CA holds that the doings and beings (or functionings) a person achieves and can achieve are constitutive of that person's well-being. (Well-being is about being well and doing well.) CA suggests therefore to look directly at the functionings a person achieves or can achieve. Thus, it is inherently multidimensional. Many studies of multidimensional poverty and inequality refer to CA as a major motivation for their multidimensional perspective (e.g. Tsui 2002, Bourguignon/Chakravarty 2003, Atkinson 2003).

Multidimensionality calls for some changes in measurement methods. The first of which is to choose the dimensions which are taken into account. CA does not provide a definite and final answer to the question which dimensions should be included. While Nussbaum (see e.g. 2000: 78–80) brought forward a list of “central human capabilities”, Sen (1993: 47) refuses to determine a definite list, because he wants to keep the approach open for various uses. There has been some discussion on that issue both between Nussbaum (1988, 2000, 2003) and Sen (1993, 2004, Sen/Agarwal et al. 2003) as well as among other capability theorists (Desai 1990, Qizilbash 1998, Robeyns 2003, 2005, Alkire 2007). In the current paper I will not take up this discussion further¹, but I sympathize with Robeyns (2003, 2005) proposal to determine procedural criteria for selecting dimensions.

The second change in measurement methods is that multidimensionality adds a further step to poverty measurement. Sen (1976) named the two steps of poverty measurement as (1) identification of the poor and (2) aggregating poverty across individuals in order to arrive at a social poverty index. Multidimensionality requires additionally (3) aggregation across dimensions. The first section considers the various problems that come about in a multidimensional setting with regard to identification of the poor. In the one-dimensional setting identification is done by determining a poverty line. This is always the first step in the measurement process and aggregation the second. In the multidimensional setting the order of the steps is not predetermined. There are various options for arranging the steps in poverty measurement and dealing with a multitude of poverty lines. Further, in empirical studies typically more than one indicator is used for the individual dimensions.

Apart from its multidimensionality CA provides another challenge for applying it to poverty measurement: the idea of capability sets. A capability set entails all functioning bundles feasible for a person. Thus, it is the set of options a person faces and the person has to choose but one option from it. By introducing the concept of a capability set Sen introduces freedom of choice into his approach to well-being. He holds that the outcome is not all that matters. Freedom of choice matters as well. A good outcome is flawed when it is the only feasible outcome and is not chosen from a menu of possible outcomes. On the other hand

¹ I have discussed the issue in Lessmann (2007b).

the freedom of choice a person enjoys clearly depends on the quality of the outcomes feasible for him. But these are questions concerning the evaluation of capability sets. Prior to the evaluation is the estimation of capability sets. The second section deals with both problems. Since only the chosen element of the capability set – the achieved bundle of functionings – can be observed, estimating the capability set is a difficult task and there are not many empirical studies taking up this challenge. Some of the considerations used in the evaluation of capability sets may, however, help to clarify the nature of the capability set. According to Sen freedom of choice matters also in the context of poverty. He frequently points to the difference between hunger and fasting. The functioning outcome in terms of nutrition is poor in both cases, but someone who fasts voluntarily doesn't eat whereas someone who hungers simply hasn't got enough to eat. The third section proposes a method that implements this difference in the process of identifying the poor and briefly discusses some merits and disadvantages of the proposed method. Section four concludes.

1. *Multidimensionality and the Identification of the Poor*

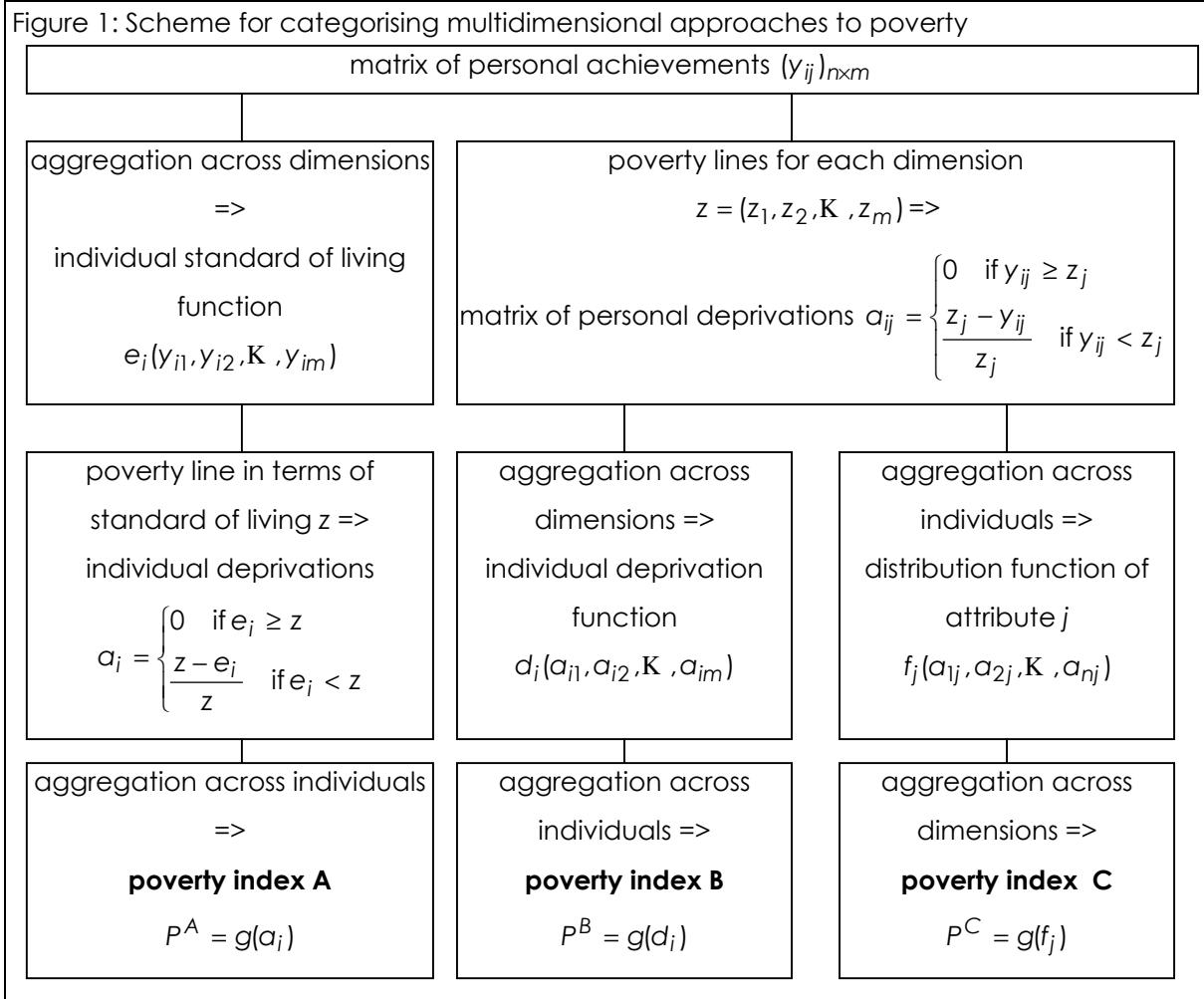
In the one-dimensional case identification of the poor is done by defining a poverty line which separates the poor who fall below this line from the non-poor who achieve an outcome at least as high as this line. In the multidimensional case it is either possible to determine a poverty line *after* aggregating across dimensions, i.e. a (unidimensional) poverty line in terms of standard of living, or one may choose to determine poverty lines for every single dimension and aggregate the deprivations afterwards. I suggest to classify poverty indices on the basis of the order of these steps (section 1.1) and give examples for the different indices.

If poverty thresholds for every dimension are defined, an additional rule is needed how the thresholds have to be combined in order to identify the poor. Several possibilities come to mind. Section 1.2 explains the various options for identifying the poor.

Most empirical studies use, however, an even more complex structure of indicators than a mere multitude of dimensions: They combine several elementary indicators into an indicator of a dimension. Thus, there are two levels of indicators. Section 1.3 discusses the two-level structure in the context of identifying the poor.

1.1 Classifying Multidimensional Approaches to Poverty Measurement

If there are n individuals $i = 1, 2, \dots, n$ and m attributes or dimensions $j = 1, 2, \dots, m$, the achievements of individual i in terms of attribute j is given as y_{ij} . The achievements of all individuals in terms of all attributes are then represented in a matrix $(y_{ij})_{n \times m}$. We can thus distinguish three ways of processing the given information:



My inclination is to call the poverty index A unidimensional and to consider only indices of the kind B and C as multidimensional poverty indices (see Bourguignon/Chakravarty 2003: 5 and Alkire/Foster 2008: 6–7 on this), because only then the multidimensionality is used to define poverty.

In case of an index of type A the achievements in the various dimensions are first aggregated to a single dimension (well-being or standard of living). Poverty is then defined in terms of that single dimension. Several studies exemplify this approach. For instance, the famous study on poverty in Great Britain by Townsend (1979) used a methodologically unidimensional poverty index of type A. He first collected data on a multitude of attributes and defined deprivation with regard to these attributes. Then he counted the number of deprivation and related it to income. Finally he determined a poverty line in the income space and identified the poor accordingly. Thus, Townsend used a kind of counting approach (see below 1.2), i.e. he counted the number of deprivations, not as a means of aggregating the deprivations but as a method for determining the poverty line. Though today we classify the method of Townsend as unidimensional and criticize the implied waste of information, at that time the study pioneered the collection of detailed data on the standard of living in Great Britain and greatly encouraged a multidimensional view on poverty.

An example for an index of type A in the context of CA can be found in the work on poverty and deprivation in South Africa by Klasen (2000). He compares the results of traditional income poverty indices to that of a "deprivation index" based on CA. For arriving at the deprivation index he first aggregates the achievements with regard to the chosen functionings and then uses a cut-off line in terms of overall deprivation. Essentially the paper shows that capability deprivation is not always closely related to income poverty.

Indices of the type B and C are based on defining separately for each dimension a poverty line or deprivation level. While a poverty index of type A allows for compensation of a low achievement in one dimension through a high achievement in another dimension, indices of type B or C always consider a low achievement in one dimension as being poor or deprived in that respect. The indices B and C differ, however, in the order of aggregating the information further: Indices of type B first build an individual poverty function or profile by aggregating deprivation across dimensions. Indices of type C first aggregate across individuals to arrive at the social deprivation with respect to one dimension. The order of aggregation is important and influences the resulting assessment of poverty in the society as several researchers pointed out (e.g. Bourguignon/Chakravarty 2003, Dutta/Pattanaik/Xu 2003, Pattanaik/Reddy/Xu 2008). They coincide only if additive aggregation functions are used. However, the use of additive aggregation functions presumes the independence of the dimensions and individuals (Bourguignon/Chakravarty 2003: 36). While this is a reasonable assumption in case of individuals, reflecting methodological individualism, it is not convincing to assume the dimensions to be independent of each other. The dimensions of well-being interact and depend on each other like e.g. health and education: It is easier to acquire education for those who are in good health. Conversely, knowing about healthy living is one part of education. Thus, there is some reservation vis-à-vis using additive functions for aggregating across dimensions.

Some empirical studies use a poverty index type B, e.g. Brandolini and d'Alessio (1998). They analyse data from the Italian SHIW (Survey of Household Income and Wealth) on the basis of the Capability Approach. They employ various methods – indices as well as poverty dominance orderings. They start with elementary indicators and first aggregate the elementary indicators into a functioning indicator. For example they use four elementary indicators (heating system, floor area index, quality's rating, location's rating) for calculating an indicator for the functioning of housing. Then they calculate an overall poverty index that simply states the percentage of people who suffer at least one functioning deprivation (head count ratio). Next, they sum up the scores of each person for achievements in the six functionings they consider (health, education, social relations, labour market participation, housing, economic resources) or in the elementary indicators respectively. This sum can be interpreted as an individual deprivation function. Finally, they aggregate across individuals using several aggregation functions and several weighing schemes. They state that the correlation between the functioning indicators is rather low (p. 38).

Bourguignon and Chakravarty (2003) illustrate their case for multidimensional indices using samples from the PNAD household survey (Pesquisa Nacional por Amostra de Domicílios) on poverty in rural Brazil regarding income and education. Poverty is measured on the individual level and then aggregated across individuals. They compare two points in time (1981 and 1987) and state how the measured poverty depends on the various assumptions underlying the poverty indices used. They put special emphasis on the importance of the accumulation of hardships in individual persons. Their results suggest that income poverty increased in the period but the coincidence of income poverty with education poverty decreased which has a positive effect on overall poverty if income and education are treated as substitutes.

Other examples for a poverty index of type B are to be found in the literature on fuzzy approaches to poverty measurement. Instead of a clear-cut poverty line the fuzzy approach introduces an interval in which people are neither poor nor non-poor. It is necessary to define an upper and a lower bound of this interval and to define a membership function that determines the degree of belonging to the group of poor people.² Since these membership functions are defined for each individual, fuzzy approaches usually follow the aggregation procedure of a type B index.

Chiappero-Martinetti (2000) presents a fuzzy approach to measuring capability deprivation based on a micro-data sample survey conducted by the Italian Central Statistical Office (ISTAT). She takes five functionings into account: housing, health, education/knowledge, social interactions and psychological conditions. For most of these functionings more than one elementary indicator is used. Chiappero-Martinetti defines membership functions for each elementary indicator and for each functioning and reports overall as well as group (differentiated by sex, age, geographical area etc.) deprivation with regard to each dimension. She also calculates average membership across dimensions. Analogous to Brandolini and d'Alessio (1998) she observes that the correlation between the indicators is rather low (p. 228).

Ceroli and Zani (1990) develop a fuzzy approach to poverty measurement that is inspired by Townsend's work on deprivation. They use sample data on families at risk of poverty collected in the Province of Parma (Italy). It is a multidimensional approach in that they consider several variables such as presence of an invalid or old person in need of care, absence of savings, housing conditions and define a membership function that indicates the degree of overall deprivation an individual suffers. These membership functions aggregate deprivation across dimensions and can be interpreted as individual deprivation functions. In a second step Ceroli and Zani (1990) aggregate the membership functions into a (social) poverty measure.

² With regard to the arbitrariness of poverty lines this is an attractive characteristic of the fuzzy approach. But instead of having one arbitrary setting, the fuzzy approach needs to set *three* characteristics equally arbitrarily: the upper and lower bound of the interval and the membership function.

As Dutta, Pattanaik and Xu (2003) point out one reason for using a poverty index of type C is the data available. If there is only aggregate data for single dimensions available, the use of an index of this type is straightforward. The most prominent example of such an index is the Human Poverty Index (HPI) of the United Nations Development Programme (UNDP 1997, Anand/Sen 1997). The HPI covers the same three dimensions as the Human Development Index (HDI), namely longevity (health), education and living standard. While the HDI focuses on the positive achievements in these dimensions (overall mortality, literacy/school enrolment and income), the HPI draws on (aggregate) indicators for deprivation in these dimensions (expected incidence of mortality at the age of 40, adult illiteracy and missing access to health care/absence of safe water/undernourishment). The HPI first averages the indicators for the third component (economic deprivation) and then uses a weighted average for aggregating the three components into a single index. The main advantage of this procedure is the possibility to use aggregate data for the various dimensions which may stem from different sources. But indices of type C are insensitive to cumulative deprivation³, i.e. these indices do not distinguish between a situation where many people suffer deprivation in only one respect or some people suffer deprivation in many respects.

There are also some studies which define poverty thresholds for each dimension and state the deprivation with respect to these without aggregating the results further. For instance, Balestrino (1996) draws on a small sample of data on social services of the city of Pistoia. He defines functioning poverty with regard to three functionings (education, health and nutrition) and income poverty and compares the groups. There is some overlap between the group of income poor and the groups of functioning poor, but there is also a large share of people who are either only income poor or only functioning poor. Balestrino concludes that income poverty and functioning poverty need not coincide. The assessment of functioning poverty thus helps to draw a richer picture of poverty.

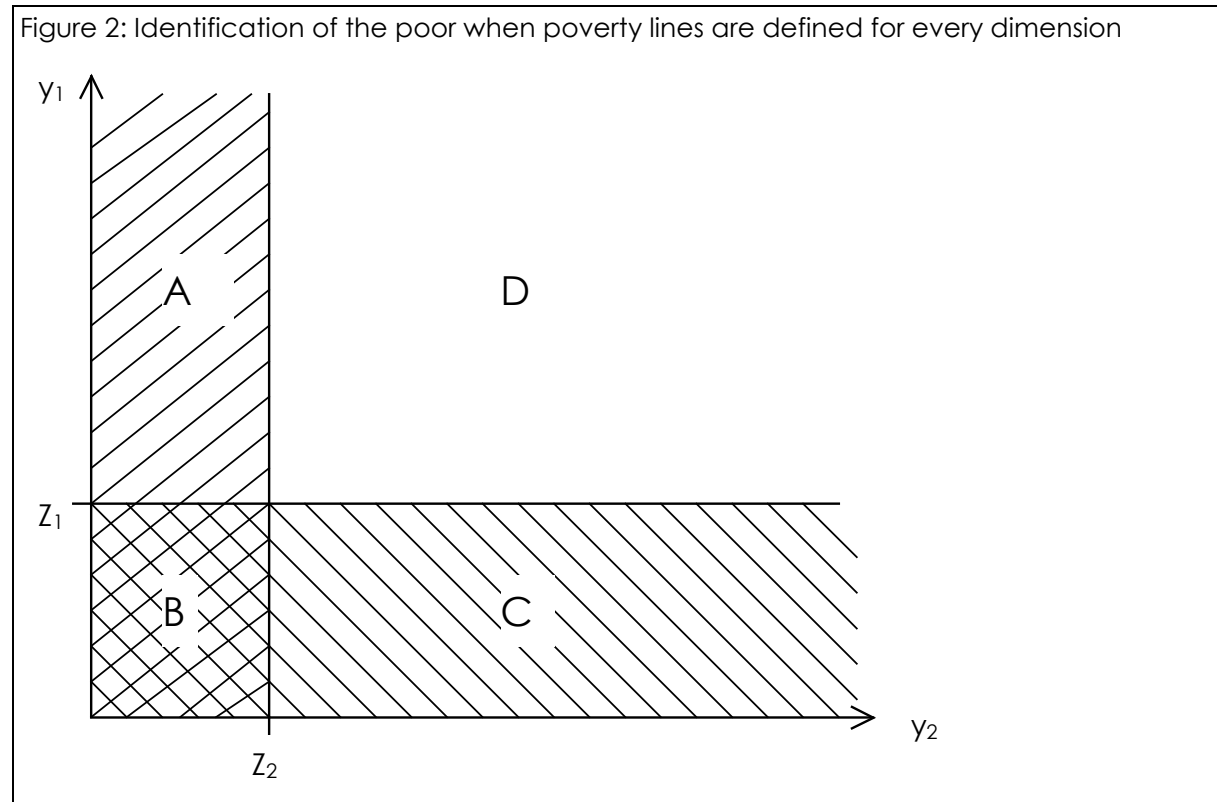
Similarly, Ruggeri-Laderchi (1997) studied the influence of income on functionings deprivation. She applies the method of probit analysis to data from the Chile National Socioeconomic Characterisation Survey (CASEN). Her main result is that income is not the only variable that influences functioning achievements and may not even be the dominant factor in generating functionings.

1.2 Identification of the Poor in the Multidimensional Case

If poverty lines are defined for every single dimension as for poverty indices of type B and C, the identification of the poor is more complex than in the unidimensional case. There are several options of combining the poverty lines in identifying the poor in this case. First, there are the two extreme cases which are called the *union* and the *intersection* approach

³ This is established by several researchers, see Bourguignon and Chakravarty (2003), Tsui (2002), Pattanaik, Reddy and Xu (2003), Dutta, Pattanaik and Xu (2008).

respectively (Bourguignon/Chakravarty 2003). The union approach holds that all individuals that are poor with respect to *one* dimension at least should be regarded as poor. That is the poverty areas of the various dimensions are united (area ABC in figure 2).



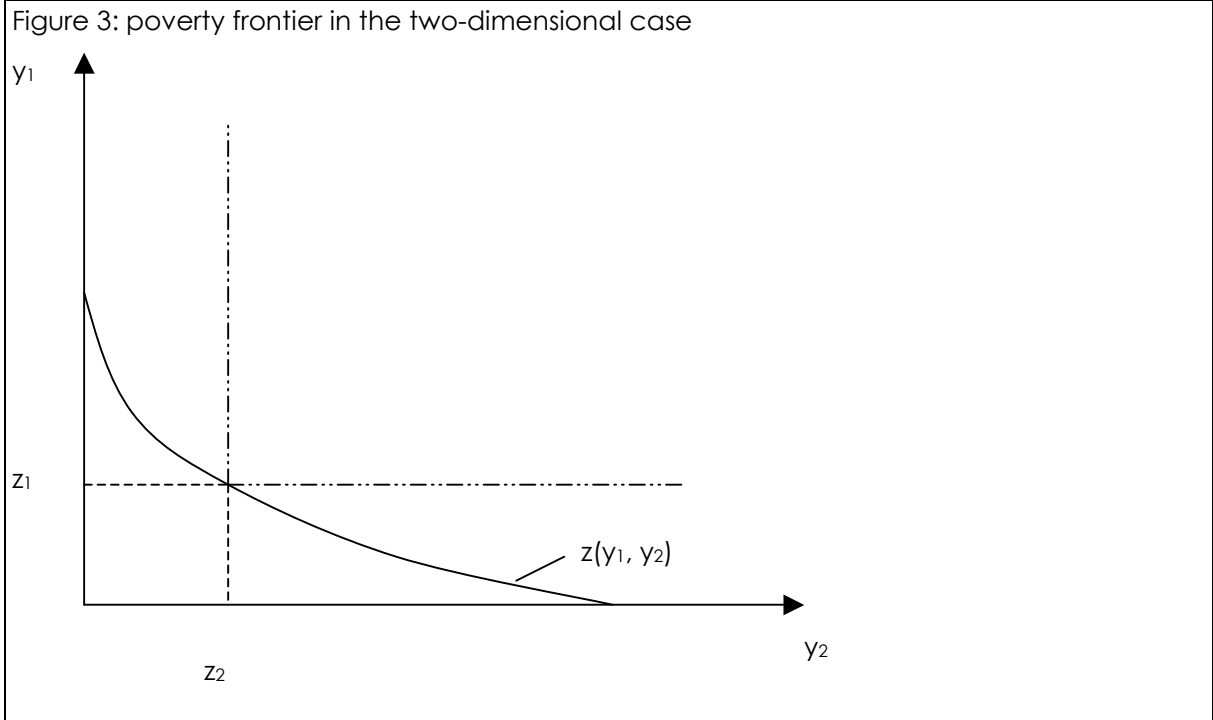
(see Bourguignon/Chakravarty 2003, p. 28)

The union approach seems to overestimate the number of the poor since even those persons are regarded as poor who are only deprived in one dimension. The other extreme case is that of considering only those persons as poor whose achievement is below *all* poverty lines. IN this case only those persons whose bundle of achieved functionalities is in the intersection of the poverty areas of all dimensions (area B in Figure 2). While there is no discussion about the assessment of these persons as poor, this method seems to restrict the group of the poor too much since those who suffer a hardship in more than one dimension but not in all dimensions are also seriously deprived.

A straightforward compromise between the two extreme cases of union and intersection approach is the counting approach (Atkinson 2003). The counting approach suggests to regard all persons as poor who suffer deprivations in at least k dimensions, where $1 < k < m$. Alkire and Foster (2008) call this approach the dual cut-off: First cut-off lines for every dimension are introduced and then a second cut-off line with respect to the number of hardships is used. The simplicity of counting the hardships someone suffers is very appealing on the first sight. The approach grasps the idea that deprivation with respect to only one dimension may reflect voluntary choice rather than deprivation, but that the accumulation of hardships over and above a certain extent should be counted as poverty.

The counting approach can be extended to counter reservations concerning differences in importance of the dimensions by combining it with a weighing scheme. Then only those persons are considered as poor whose weighted number of hardships is below k . They call it generalised dual cut-off (Alkire/Foster 2008: 19).

Another method of identifying the poor that is somewhere between the extreme cases is the definition of poverty frontiers (Duclos/Sahn/Younger 2006, Bourguignon/Chakravarty 2003). A poverty frontier is defined analogous to indifference curves in consumer choice theory, i.e. it simply defines the locus of those combinations of the dimensions where the standard of living is said to be poor ($z(y_1, y_2)$ in Figure 3). This method yields the same group of the poor as the poverty index type A if the weighing scheme at the point of poverty in the type B and C indices is the same as that used in aggregating the dimensions in the index of type A. Implicitly, this method defines rates of substitution between various hardships. To a certain extent it allows for compensation of one hardship by good achievements in another dimension.



(see Duclos/Sahn/Younger 2006, p. 946)

Finally, there is the method of giving one dimension (typically income) priority in the identification process. Only this dimension is then used to identify the poor, but their poverty is regarded as more serious the more they are deprived in other respects as well, i.e. the more they are falling below thresholds in the other dimensions. The group of the poor is defined unidimensionally, but the poverty measure covers other deprivations as well and is adjusted accordingly. This approach may not seem attractive on theoretical reasons, but it is frequently used in practice to show the cogency of taking more than one dimension into account (see e.g. Hanesch et al. 1994, Hummer 2005 or the studies of Balestrino 1996 and Ruggeri-Laderchi 1997).

As already mentioned Bourguignon and Chakravarty (2003) are especially concerned about the concentration of hardships in individual persons. They relate the concentration of deprivations to the question whether the dimensions are seen as substitutes or complements. Income for instance is said to compensate for hardships in other dimensions such as health and education. This means that income is to a certain extent a substitute for these dimensions. In contrast safe water cannot be substituted by sufficient nourishment. The items contribute jointly to the standard of living; they are complements.

In a contribution on multidimensional poverty dominance Bourguignon and Chakravarty (2002)⁴ further show that under the assumption that the dimensions are substitutes their joint distribution matters only in the intersection of poverty areas (area B in figure 2). Under the assumption that the dimensions are complements the joint distribution of the attributes in the union of poverty areas matters (areas A+B+C in figure 2). Hence, the identification of the poor should depend on the assumed relation between the attributes: for substitutive attributes the intersection approach is suitable and for complementary attributes the union approach is appropriate.

1.3 Dimensions, Indicators and Identification of the Poor

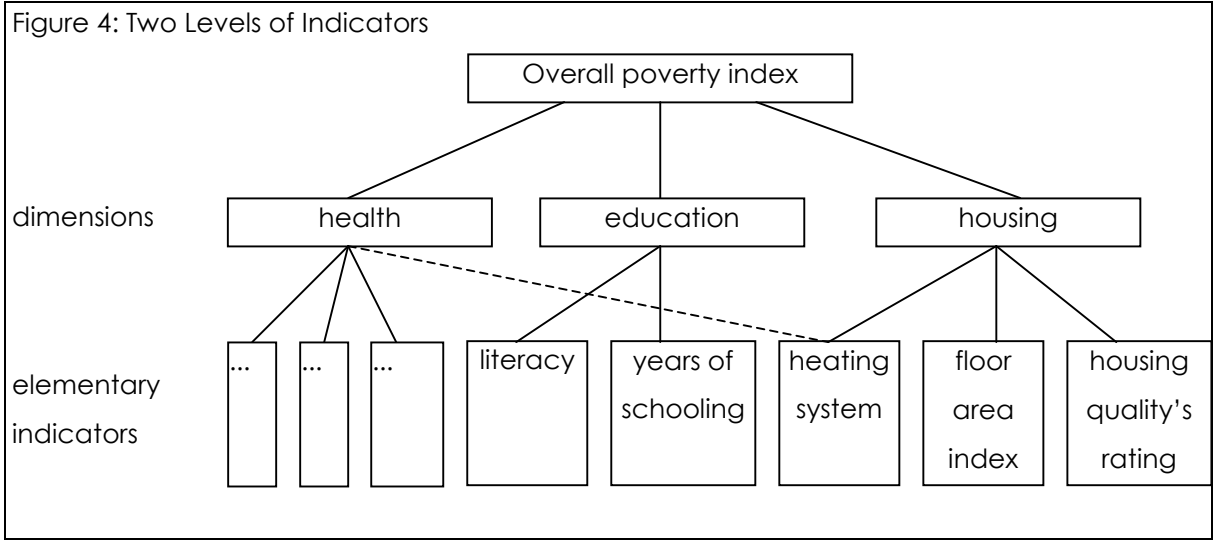
So far we just looked at multidimensional approaches in a rather abstract way and forbore from the discussion about choosing dimensions. However, many of the empirical studies mentioned⁵ use a two-level system of indicators consisting of elementary indicators and aggregate ones. Thus, there is another step of aggregation, i.e. the aggregation of elementary indicators into indicators for individual dimensions (functionings). The use and aggregation of elementary indicators raises several questions. On the one hand the task of choosing or identifying relevant functionings becomes more complex on the technical level. Schokkaert and Van Ootegem (1990) used factor analysis and Klasen (2000) principal component analysis to investigate the relationship between elementary indicators and functionings (dimensions). On the other hand the interaction between elementary indicators and functionings questions the strictness and accuracy of any list of dimensions (on these issues see Lessmann 2007a, b).

However, in this paper the focus is on identifying the poor in the complex setting of CA. If it is necessary for empirical studies to work with a multitude of elementary indicators for the individual dimensions (functionings), the question of what kind of index to use and how to set poverty lines is put forward twice: first on the level of elementary indicators and second on the level of dimensions (figure 4). Most of the empirical studies decided to define poverty

⁴ See as well Atkinson 2003.

⁵ See Anand/Sen (1997) and UNDP (1997 on the HPI, Brandolini and d'Alessio (1998), Chiapperi-Martinetti (2000), Klasen (2000). See as well Kuklys (2004, 2005) and Krishnakumar (2007) for a more theoretical treatment of the matter.

thresholds for every elementary indicator⁶ if an index of type B or C is used. Since the studies simply sum up the elementary indicators into aggregate indicators for the individual functionings this procedure is unproblematic.⁷ One could, however, reasonably argue for using an index of type A on the level of elementary indicators and type B or C on the level of dimensions, e.g. create an index for housing quality and set a poverty line in terms of that index. One could also argue for using the intersection (or counting) approach on the level of elementary indicators, therefore assuming substitutability (to a certain degree) on this level, and the union approach on the level of dimensions, demanding the availability of minimal achievements in all dimensions.



2. Measuring Capability Sets

So far we looked at the achieved functionings of individuals. Apart from the achieved functionings CA holds that freedom of choice matters for evaluating a person's standard of living. Freedom of choice is modelled by the capability set that consists of all functionings bundles the person *can* achieve. Freedom of choice requires that the capability set comprises more than one feasible option. Sen (1990: 470) further holds that the extent of freedom a capability set offers depends also on the quality of the available options:

“A set of three alternatives we see as ‘bad’, ‘awful’ and ‘dismal’ cannot, we think, give us as much real freedom as a set of three others we prefer a great deal more and see as ‘great’, ‘terrific’ and ‘wonderful’. The idea of effective freedom cannot be dissociated from our preferences. Freedom is not just a matter of having a larger number of alternatives, it depends on what kind of alternatives they are.”

The set of options feasible for a person is, however, not directly observable but “has to be constructed on the basis of presumptions” as Sen (1992: 52) points out. The natural starting

⁶ See e.g. Ruggero-Laderchi (1997), Anand/Sen (1997), Brandolini/d'Alessio (1998), Chiappero-Martinetti (2000).
⁷ See above: If additive aggregation functions are used for aggregating across individuals and across dimensions, we have a two-way poverty breakdown (Bourguignon/Chakravarty 2003: 35).

point for doing so is the bundle of achieved functionings, because it's the one that can be observed.

Thus, there are two major problems concerning capability sets: First the problem of constructing and estimating capability sets (section 2.1) and second the problem of evaluating these sets⁸, for instance to assess the importance of freedom of choice for poverty (section 2.2).

2.1 On the Construction and Estimation of Capability Sets

In his first comprehensive writing on CA, Sen (1985) adds a formal model to the verbal description of the approach. Following the approach of Lancaster (1966) to consumer choice theory, Sen distinguishes goods and characteristics of this good. He further supplements this idea with the thought that people differ in their ability to use goods. Therefore, he introduces the concept of utilization functions and models a person as having a set of utilization functions. He then describes functionings as the outcome of combining a bundle of goods (with certain characteristics) with the individual set of utilization functions. One can also think of these utilization functions as conversion functions that describe how a person converts resources (goods) into functionings.

Most empirical studies that go beyond the measurement of achieved functioning bundles exploit this model and estimate conversion functions.⁹ The dilemma any such estimate faces is that the utilization functions and the capability set differ from one person to the next in principal, but the only way to estimate conversion functions and capability sets is to use either cross sectional data and make some assumptions on “normal behaviour” and typical conversion functions in one group¹⁰ or to use longitudinal data and derive a conversion function by making assumptions about the consistency of a person's behaviour over time.

2.2 On Standard Propositions of Capability Sets

Define the functioning space as the non-negative orthant of the Euclidean n-space $y_i \in \mathfrak{R}_+^n$. Then the capability-set is a subset of the non-negative orthant of the Euclidean space, $Q_i \subseteq \mathfrak{R}_+^n$. The entries of the functioning vectors are interpreted as quantities of the functionings. Further an ordering on each functioning is assumed to hold, i.e. a higher entry with respect to a functioning is regarded to represent a better situation with respect to that functioning. It should be noted that this kind of quantitative specification precludes the

⁸ See the related literature on opportunity sets. For an overview: Sugden (1998) and Barbera/Bossert/Pattanaik (2004).

⁹ See Kuklys (2004, 2005) and Krishnakumar (2007). In a similar vein Hossein (1990) uses conditional probabilities for estimating the capability of people and Lovell et al. (1990) use an input (resources)-output (functionings) model for calculating “conversion efficiency”.

¹⁰ Lessmann (2004) treats the various homogeneity assumptions in more detail.

possibility that a functioning variable can be of qualitative type – for instance of the type whether the housing is old or new.

The following assumptions can be found in the literature¹¹: Capability sets are non-empty¹², compact¹³, comprehensive¹⁴ and convex¹⁵ or star-shaped¹⁶.

Echavarrri and Permanyer (2006: 4) argue that convexity does not make much sense in the context of capability sets, since there is no intuitive reason why any bundle lying exactly on the line segment connecting two functioning bundles included in the capability set should belong to the set, but not those slightly below or above that line (for a more intuitive reasoning see Lessmann 2004).

I would also like to challenge the propositions of comprehensiveness or star-shapedness respectively. If someone achieves a certain level of education (think either in terms of the ability to read and write or in terms of receiving a degree), lower levels of education are not feasible for this person any longer (i.e. being illiterate or striving for a lower level degree, see Lessmann 2004). Thus, there may be lower bounds with respect to some functionings. Of course, one could simply adjust the measurement scale for that functioning accordingly, but than one has to define an individual measurement scale for every person and sacrifice interpersonal comparability in terms of that functioning.

As explained the formal description of CA views the capability set as a combination of the resources available (represented by the budget set) and the ability of a person to use her resources (represented by the individual set of utilization functions). In particular, one can think of one bundle of resources (i.e. one element of the budget set) and apply the utilization functions to that specific bundle. Thus the set of all functioning bundles that can be achieved with this specific bundle of resources given the individual set of utilization functions is derived. Finally the capability set entails all functioning bundles that can be achieved with some bundle of resources from the budget set. Hence, the capability set can be seen as the union of all those sets of functioning bundles attached to single elements of the budget set.

¹¹ Herrero (1996, Basu/Lopez-Calva 2002 repeat her results), Xu (2002), Pattanaik/Xu (2005), Gaertner/Xu (2006) and Echevarri/Permanyer (2006).

¹² Pattanaik/Xu (2005). Xu (2002) and Echevarri/Permanyer (2006) call this proposition "non-degenerate" and explain that there should be at least one functioning bundle with positive entries for each dimension: $\exists y_j \in Q_j : y_{ij} > 0 \forall j$.

¹³ A capability set is compact if it is closed and bounded.

¹⁴ A capability set is comprehensive if for all functioning vectors belonging to the capability set any functioning vector with less functionings (lying on the line segment connecting the vector and the origin) belongs to the set as well. Not in Herrero (1996) and Gaertner/Xu (2006).

¹⁵ Only in Xu (2002), Pattanaik/Xu (2005) and Gaertner/Xu (2006). Convexity demands that the line segment connecting two functioning vectors belonging to the capability set lies entirely in the set as well.

¹⁶ This is a weakening of comprehensiveness and convexity: A capability set is star shaped if starting from a point in the boundary of that set any functioning vector *in the same direction* with less functionings belongs to the set as well (Herrero 1996: 72). Not in Echevarri/Permanyer (2006). Xu(2002) and Pattanaik/Xu (2005) make the stronger assumption of convexity and comprehensiveness.

Thus, the propositions of the capability set hinge upon the propositions of the budget set on the one hand and the utilization functions on the other hand. For instance, if the budget-set is closed and the utilization functions continuous, then the resulting capability set is closed. Starting from the sets of functioning bundles attached to every single element of the budget set, one can ask further questions on the propositions of the resulting capability set. In particular, are the sets necessarily connected? Only if they are, the resulting capability set is compact and may be said to display a special shape like comprehensiveness or star-shapedness.

3. A Proposal: Identifying the Capability-Poor

Although poverty has been called the “motivating interest” of Sen’s CA, Sen does not offer a definition of poverty that makes use of his concept of capability but only provides some arguments in favour of measuring poverty by capabilities as opposed to achieved functionings. In this context he gives the following example again and again:¹⁷

“The example ... of the person who *fasts* out of choice as opposed to another who *has to starve* because of lack of means, is relevant here. Both may end up starving and fail to be adequately nourished, but the person without the means – and thus without the capability to be adequately nourished – is poor in a way that the fasting person is not.” (Sen 1992, p. 111)

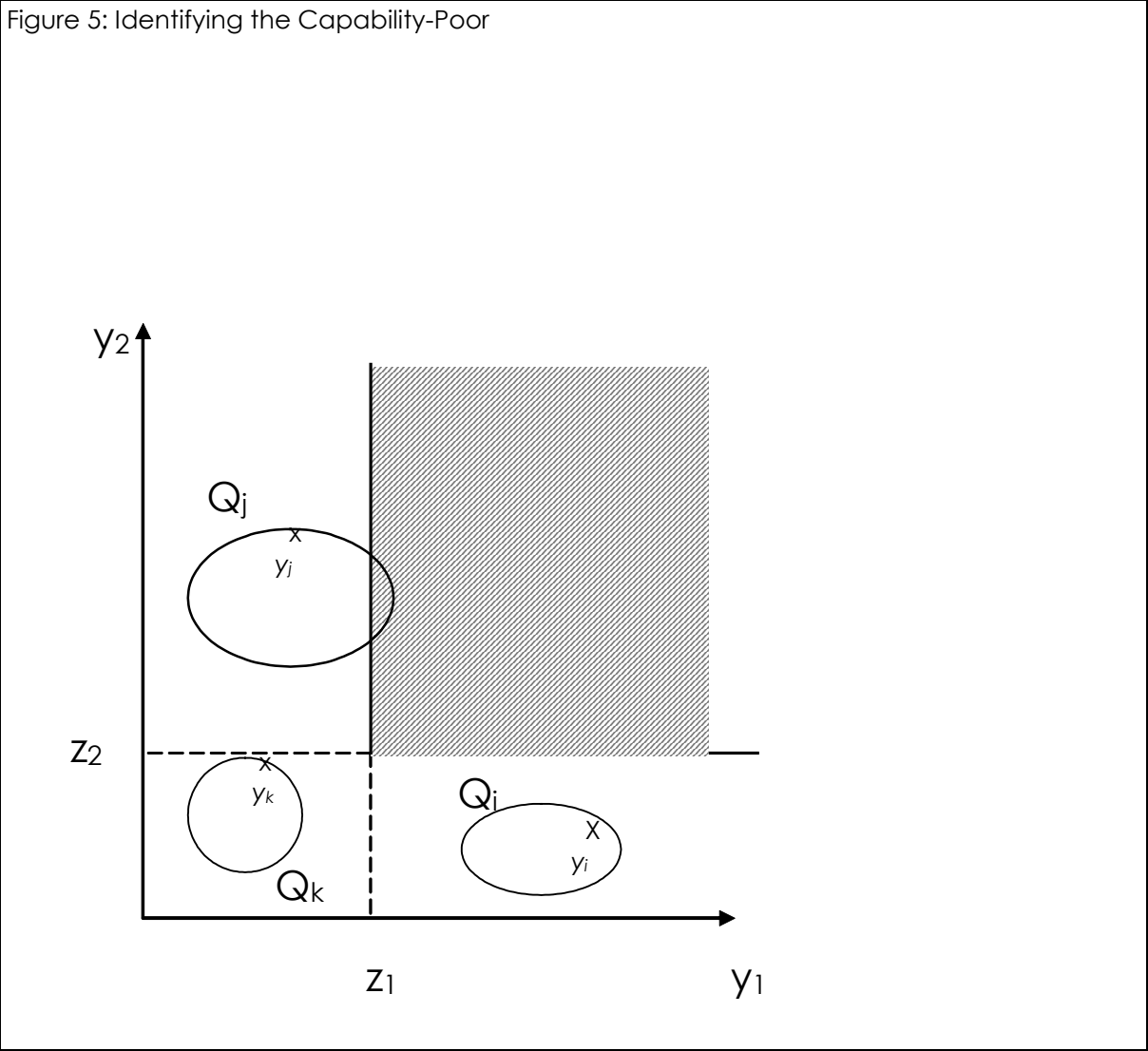
In other words, poor functioning achievements are not sufficient as indicators of poverty because what matters is the feasibility – and not the actual achievement – of decent levels of functionings. Implicitly Sen uses a kind of minimal standard with reference to the functioning involved when he talks of “being adequately nourished”. This minimal standard serves for identifying those who can be regarded as non-poor with certainty because they achieve functioning bundles above the minimal standard. Whereas those who achieve functioning bundles below the minimal standard may have *chosen* to fail the standard or *lack* the opportunity to achieve it. The former should be regarded as non-poor and only the latter define the group of poor people. Poverty may thus be defined as following:

Defining the capability poor: A person i is capability poor, if her capability set Q_i does not contain a functioning vector b_i being at least as good as the vector of minimal standards z . Then, the group of the poor is defined as consisting of all those who are poor with reference to a given vector of minimal standards: $D(z) := \{i \mid \text{not } b_i \succ z \ \forall b_i \in Q_i\}$.

The final identification of the capability-poor according to this proposal hinges upon the measurement of the person’s capability set. Yet, the proposal has the advantage of narrowing down the number of potentially poor people: In a first step all persons who are certainly non-poor (i.e. who have achieved functioning bundles above all poverty thresholds)

¹⁷ See as well: Sen 1999, p. 76; 19

can be identified and excluded from further consideration. Then the capability sets of the potentially poor, i.e. of those who have realised a functioning bundle below the poverty threshold, have to be determined and in a second step the content of these capability sets is examined. If their capability set contains at least one bundle of functionings above the poverty they are not considered as poor (like person j in figure 4). Only those who achieved a bundle of functionings below the threshold *and* miss the capability of achieving one above the threshold are considered as poor (like persons k and i in figure 4).



4. Conclusion

The paper explores how the poor can be identified in line with the Capability Approach. Identification of the capability poor poses a challenge in two ways: First, the problem of multidimensionality has to be solved. The paper suggests a classification scheme for multidimensional poverty measures and assigns some empirical studies of the CA accordingly. The paper presents the various methods of identifying the poor proposed and applied in multidimensional poverty measurement. The paper further hints to the two-level

structure of indicators often used in empirical studies and discusses the problems that follow. Secondly, CA puts special emphasis on freedom of choice and implements this idea through the concept of a capability set. The estimation of capability sets poses a challenge in itself. The literature on opportunity sets provides some ideas on the propositions of such sets. The paper suggests to link the operationalization of the concept of capability sets to this literature and investigate whether the concepts for operationalization match the propositions desired by theory. Based on the considerations with regard to multidimensionality and the treatment of freedom of choice the paper proposes one method of identifying the capability-poor.

Though the paper is restricted to the identification of the poor, it hints to the interaction between the steps of identification of the poor and aggregation of poverty. In contrast to one-dimensional approaches to poverty measurement, the sequence of these steps is not predetermined and has an impact on the outcome. The literature on multidimensional poverty measurement shows that some features of the poverty measure depend on the identification method used. Hence, while the distinction between identification and aggregation is useful in many ways, it is important to take the whole process into account and look at the interaction between the various steps. Alkire and Foster (2008: 5) define a methodology for measuring multidimensional poverty to consist of an identification method and an aggregate measure. Thus they open up the road to systematically explore the interaction between identification and aggregation.

Finally, I would like to point out the many roles in which income enters the picture:¹⁸ In some empirical studies income is one dimension among others. Some empirical studies explicitly explore the interdependence between income poverty and deprivation with respect to other dimensions. Sometimes the identification is based solely on income. The approaches on estimating capability sets, however, see income as one (probably the most important) resource that is used in combination with individual abilities (utilization functions) to generate functionings. The role of income in the Capability Approach is certainly an area that requires further attention and research.

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¹⁸ See as well Lessmann (2007a).

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