Sen's Capability Approach to Welfare Economics

(preliminary – comments welcome)

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Abstract

We describe Amartya Sen's Capability Approach to welfare evaluation in the language of standard welfare economics, and assess to what extent it provides a genuine alternative for individual welfare measurement and policy evaluation. We review the nascent empirical literature on the capability approach and assess whether it makes a genuine difference with standard welfare evaluation.

Keywords: capability approach, welfare economics, welfare measurement, welfarism

JEL Classifications: I31, I32

1 Introduction

Amartya Sen's capability approach is a framework for the evaluation of individual welfare and social states, and as such can provide the theoretical basis for evaluative analyses and policy prescriptions. Sen's capability approach has found wide resonance in a number of disciplines, including heterodox economics (Fukuda-Parr [23], Gasper [26], Robeyns, [54]), development economics (Alkire [1], Qizilbash [52]), development ethics (Crocker [20], Gasper [25]) and economic and political philosophy (Daniels [21], Nussbaum [46], Pettit [49], Williams [69]). This literature is characterised by its highly interdisciplinary nature and the predomination of philosophical and conceptual reasoning instead of modelling and

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formalisations. The impact and development of the capability approach in mainstream welfare economics has so far been much more limited, a few exceptions notwithstanding (Atkinson [4], Basu and López-Calva [10], Maasoumi [42]). There are several ways in which this could be explained. It might be the case that the capability approach is 'old wine in new bottles', and has very little to offer to welfare economics. If this were true, then why would welfare economists pay any attention? Another possible explanation is that most of the work on the capability approach has been written in a jargon and disciplinary style that is too philosophical to be appealing to most economists. Or alternatively, the fact that there is no consensus on how to apply the capability approach might be off-putting. To determine whether the capability approach has something to offer to standard welfare economics we need a characterisation and analysis of the capability approach using the methodology and language standardly employed in welfare economics. That is the aim of this paper.

We will first briefly describe the capability approach and present a formalisation (section 2). Then we define standard welfare economics and present a basic model in section 3. In section 4, the assumptions of this model are scrutinised from a capability perspective. This allows us to understand better whether the capability approach is a genuine theoretical alternative to the standard welfare economic model. In addition, we not only need a theoretical comparison of the standard welfare economic model with the capability approach to welfare economics, but we also need to know to what extent the capability approach makes a difference at the empirical level. This question is addressed in section 5 where we provide a survey of the quantitative empirical applications of the capability approach. The last section concludes.

2 Sen's Capability Approach

The capability approach is an evaluative framework for individual welfare and social states. The core concepts are functionings and capabilities. Sen defines functionings and capabilities as follows: "The primitive notion in the approach is that of functioning – seen as constitutive elements of living. A functioning is an achievement of a person: what he or she manages to do or to be, and any such functioning reflects, as it were, a part of the state of that person. The capability of a person is a derived notion. It reflects the various combinations of functionings (doings and beings) he or she can achieve. It takes a certain view of living as combinations of various 'doings and beings'. Capability reflects a person's freedom to choose between different ways of living" (Sen [64]:5).

In traditional economic welfare evaluation, particularly in the context of poverty and inequality, income or expenditure is analysed. In the capability approach, an evaluation involves the analysis of a *capability set*, X_i, which is defined over the different potential activities or states of being $\mathbf{b}$ of individual i

$$X_i(Q_i) = \{\mathbf{b}_i | \mathbf{b}_i = f_i(c(\mathbf{q}_i), \mathbf{z}_i) \quad \forall \quad f_i \in F_i \text{ and } \forall \quad \mathbf{q}_i \in Q_i\} \tag{1}$$

where $\mathbf{q}_i$ is a vector of commodities chosen by the individual, $c(\cdot)$ is a func-

tion that maps goods into the space of characteristics, $\mathbf{z}_i$ is a vector of personal characteristics and societal and environmental circumstances, f_i is a function that maps characteristics of goods into states of being or activities $\mathbf{b}_i$, conditional on $\mathbf{z}_i$. X_i is the set of all possible $\mathbf{b}_i$, given the entitlement constraint Q_i (Sen [60]:7-10).

The vector of commodities $\mathbf{q}_i$ is the demand for goods. Note, however, that Sen explicitly includes non-market goods and services. Similarly, the entitlement Q_i corresponds to the standard budget constraint, but also includes the availability of non-market goods and services.

The space of functionings $\mathbf{b}$ is the space of states of being and activities, while the space of capabilities X is the space of *potential* functionings. The functioning space is related to the goods and characteristics space through the personal conversion function f_i. The capability space is related to the functioning space in that it comprises all functionings an individual can potentially achieve. It is thus the individual's choice set, and could be interpreted as an augmented budget set, which also takes account of non-market goods and services, and non-monetary constraints.

Two examples are discussed by Sen [60]. A bicycle (commodity) provides transport (characteristic); and depending on an individual's physical ability and the state of the roads, she can cycle or not. Food provides nutritious capacity, which is converted into 'being well-nourished', depending on physical circumstances such as the metabolic rate, presence of parasites etc.. The individual's capability includes then the freedom to either be well-nourished, to fast for religious reasons or to go on hunger strike for another's sake.

Other examples of functionings, taken from Sen [63] are 'being alive', 'being in good health', 'being well-sheltered', 'moving about freely', 'having self respect and respect of others', 'taking part in the life of the community'. One could add many other functionings, such as 'being employed' or 'being educated'.

The capability approach clearly operates at two levels, namely the level of realised welfare, which is measured by functionings, and the level of potential or feasible welfare, which is measured by capabilities. This is equivalent to the outcomes vs. opportunities distinction in standard welfare economics and especially in social choice theory.

3 Definition and Characterisation of Welfare Economics

In this section, we offer a definition of welfare economics and present a benchmark model. Our limited aim is to briefly outline the field of welfare economics before we scrutinise it in light of the capability approach in section 4.

3.1 Definition

Welfare economics is concerned with the evaluation of the level of individual and social welfare, and the welfare impact of economic and social policies (see

e.g. Dutta [22], Sen [61] and Suzumura [66]). The welfare of the individuals is represented by utility, usually understood as desire fulfillment or preference satisfaction. Although there is some debate on the exact properties and characterisation of the notion of utility, there is general agreement that utility as used in economics is a one-dimensional concept.

Social welfare is an aggregation of the individual welfare by means of an aggregator function which can be interpreted as a social welfare function. Social welfare functions can have different forms, implying that some of them will take distributional considerations into account while others will not. If the social welfare function is the maximisation of the non-weighted sum of the individual welfares, then it is a *utilitarian* social welfare function. In applied welfare economics, utility is routinely measured by monetary variables. This is only valid under restrictive assumptions about the individual and the market, which will be discussed in section 4.

Most research in welfare economics uses individual utilities as the exclusive basis of welfare judgements. This tradition, which has been dominant for the last two centuries, is called *welfarism* [59]. However, in recent decades several important departures from welfarism have been made, by including non-utility information in the evaluation of individual welfare. Pattanaik [47] distinguishes between two broad areas of non-welfaristic research in welfare economics. The first area is the work on individual rights and liberties, which was pioneered by Sen's work on the liberal paradox (Sen [57], [58]). The second area concerns the measurement of the standard of living, inequality and poverty using an informational basis that is broader than utilities only. It is in this second line of departure from welfarism that the capability approach can be situated. In section 4, we will analyse welfare economics from a capability perspective, but first we present a simple formalisation of standard welfare economics.

3.2 The model

Let us take as point of departure the basic textbook model for welfare evaluation in a many consumer market economy where all consumers face the same consumption prices. Assume an economy without uncertainty, with n identical utility maximising consumers, who can all choose among a vector of goods $\mathbf{x}$, and who are subject to a budget constraint:

$$\max u_i = u(\mathbf{x}) \quad \text{subject to } \mathbf{p}.\mathbf{x} = m_i \quad i = 1, ...n \tag{2}$$

where m is the exogenously given income, and $\mathbf{p}$ a vector of market prices corresponding to goods $\mathbf{x}$. u_i is individual i's utility. u is the individuals' continuous and differentiable utility function, for which $\frac{\partial u(x_j)}{\partial x_j} > 0$, and $\frac{\partial^2 u(x_j)}{\partial x_j^2} < 0$. The indirect utility function v can be written

$$v_i = v(\mathbf{p}, m_i). \tag{3}$$

The level of indirect utility can be measured by the individual's income if all individuals have the same preferences and face the same prices. Assuming prices

to stay constant, the impact of social and economic policy on an individual's welfare can be evaluated by

$$dv_i = \frac{\partial v}{\partial m_i}\frac{\partial m_i}{\partial \pi} \tag{4}$$

where π is the implemented policy.

In this model, overall social welfare W depends on the individuals' utility. This is expressed by the social welfare functional G,

$$W = G\left(v_1\left(\mathbf{p}, m_1\right), ..., v_n\left(\mathbf{p}, m_n\right)\right) \tag{5}$$

Social welfare functions comprise, for example, a large class of inequality and poverty indices.

Social welfare functions are also used as a tool for policy analysis. Under differentiability, continuity, separability and cardinality assumptions, the social welfare functional G can be used to calculate welfare change owing to a small change in income as

$$dW = \sum_{i=1}^{n} \frac{\partial W}{\partial G}\frac{\partial G}{\partial m_i} dm_i = \sum_{i=1}^{n} \beta_i\left(m_i\right) dm_i$$

where $\beta_i\left(m_i\right)$ corresponds to the marginal social utility of income m_i. If the marginal social utility of income is assumed to be constant and equal across individuals, it can be normalised to $\beta_i = 1$, and G corresponds simply to the sum operator, so that

$$dW = \sum_{i=1}^{n} dm_i. \tag{6}$$

The overall welfare change owing to a change in individual incomes then corresponds to the sum of these changes; this would correspond to a utilitarian analysis of welfare changes induced by the implementation of a policy.

4 Welfare Economics Revisited

In the light of the capability approach, we will now take a second look at this model. We want to analyse in which way Sen's approach goes beyond this model, and to what extent this is different from other strands of research within welfare economics. The core critique of the capability approach on welfare economics is the exclusive use of utility, which is represented by income or expenditure as the measure of welfare. More specifically, there are three problems with the use of income: the omission of the impact of non-market goods and services on the individual's welfare; secondly, a disregard of interpersonal heterogeneity in converting income into welfare; and thirdly, the neglect of the intrinsic value of choice.

To analyse these critiques in detail, we study one by one the assumptions about the market and the individuals implicit in the model in section 3.2. For

each, we give a brief account of the criticisms that the capability approach makes towards them, and formalise this criticism in the language of our textbook model. We then present recent research in welfare economics, and assess whether the capability approach offers a genuine alternative to the existing framework. To reflect the recent advances in welfare economic research adequately, we distinguish systematically between the measurement of individual welfare levels along the lines of equation (3) and the evaluation of changes in welfare induced by economic and social policies as in equation (4). This distinction is made because our analysis will show that both types of research are to a different degree vulnerable to the capability critique.

4.1 The Market

The individual utility function and the budget constraint in equation (2) are defined over a composite good, or in a slightly more complex model, over a vector of goods and services which can be bought in the market. In the basic model, it is assumed that all consumers face the same consumption prices, that there are neither externalities nor public goods and that all goods are always available. Many economists, including Sen, have pointed out that not all objects of an individual's interest are marketable. The market might be subject to imperfections such as externalities or rationing, or simply not provide certain goods and services at all. For example, the income of individuals living close to a polluting factory is not compensated for the effect of the pollution on their welfare. The cost of hiring an elderly care worker is not necessarily equivalent to the welfare effect of care by loving relatives.

One could, in principle, include externalities and other non-market goods and services into the benchmark model. These extensions could be introduced *ceteris paribus* into the model by defining the utility function in (2) over a range of market consumption goods $\mathbf{x}$, the average consumption of these goods, $\bar{\mathbf{x}} = \sum_{i=1}^{n} x_i$, a public good x^{pg}, a rationed good x^r and a good which is not buyable in the market x^{nm} so that for $i = 1, ..., n$

$$\begin{aligned} \max u_i &= u\left(\mathbf{x}, \bar{x}, x^{pg}, x^r, x^{nm}\right) \quad \text{subject to} \qquad (7) \\ \mathbf{p}.\mathbf{x} &= (1-t)\, m_i \\ x^r &= \underline{x}^r \\ x^{nm} &= \underline{x}^{nm} \qquad (8) \\ x^{pg} &= \sum_{i=1}^{n} t m_i \end{aligned}$$

where t is the tax rate, $\underline{x}^r$ and $\underline{x}^{nm}$ are the available amounts of the rationed good and the non-market good respectively, $\frac{\partial u}{\partial x_j} > 0$ as before, $\frac{\partial u}{\partial \bar{x}_j} > 0$ if the good has a positive externality, $\frac{\partial u}{\partial \bar{x}_j} < 0$ if it has a negative externality, and $\frac{\partial u}{\partial \bar{x}_j} = 0$ if it has no externality; further, $\frac{\partial u}{\partial x^{pg}} > 0$, $\frac{\partial u}{\partial x^r} > 0$, $\frac{\partial u}{\partial x^{nm}} > 0$.

Of course the basic model in section 3.2 generally does not reflect current research on evaluating policy induced changes on an individual's welfare. In

research specifically focussing on public goods, non-market goods and externalities, the measurement of the welfare impact of policies, as modelled in equation (4), is adapted for these purposes. Recent research includes the analysis of demand for angling grounds (Train, Goett and Hudson [67]), moorlands (Gayatri and Bunnet [27]) and recreation in general (Hausman, Leonhard and McFadden [30]). Health care and educational policy analysis (e.g. Garber [24]) as well as the vast literature on externalities also transcend the basic model.

However, if the focus of the research is not on the welfare change induced by policies, but on the measurement of individual welfare levels, Sen's critique has bite. The money metric utility function in equation (3) can only be used to represent an individual's welfare in terms of utility if the market assumptions hold, which is generally not the case. Nevertheless, routinely income or expenditure is used as a parsimonious proxy for an individual's utility in welfare comparisons and potential measurement errors are ignored. Inequality and poverty analysis (based on equation (5)) as well as project analysis (based on equation (6)) are performed in terms of income or expenditure. Non-monetary sources of well-being are elegantly eclipsed by conventional cost-benefit analysis as intangible effects (Harberger [29]), and in the majority of cases not mentioned by economic inequality analysis (see e.g. Cowell [18] and Goodman, Johnson and Webb [28]). When accepting the expanded utility function in equation (7), the individual welfare measurement in terms of indirect utility has to reflect this. To stay in the standard welfare economic framework, it would therefore be necessary to derive from equation (7) an extended indirect utility function v^{ext} analogue to equation (3):

$$v_i^{ext} = v\left(\mathbf{p}, p_i^*, p_i^{pg}, p_i^r, p_i^{nm}, m_i\right) \tag{9}$$

where $p_i^*, p_i^{pg}, p_i^r, p_i^{nm}$ are the shadow prices (individual valuations) of the good with externality $\overline{x}$, the public good, the rationed and the non-market good respectively.

Considering the difficulties with welfare measurement and functional forms in the simple model in section 3.2, it is no surprise that equation (9) is not the route gone down by researchers who would like to take account of rationing, non-market goods, public goods and externalities in welfare measurement. Measurement of shadow prices of goods whose market prices do not reflect their marginal utilities is in general difficult. Measuring indirect utility according to (9) for each individual in a society as an input to inequality or poverty analysis would imply a prohibitive effort, if it were at all possible. Instead, economists recently have started to study inequality and poverty in terms of other variables than income; they study outcome variables *directly*. We will review this literature in section 5, but first we analyse the capability critique of the assumptions about the individual in the standard model.

4.2 The Individual

The assumptions made in the basic model about the individual can be distinguished in behavioural assumptions on the one hand, and assumptions about the

individual's preferences and her utility on the other. The behavioural assumptions include that the individual takes decisions based on utility maximisation (equation (2)). In the basic model, this implies that, subject to her budget constraint, an individual chooses the basket of goods which maximises her satisfaction or pleasure. The second class of assumptions about the individual include that the utility achieved is independent of the non-chosen goods or services. Furthermore, the act of choice or opportunity to choose in itself is not valued. Another important assumption is that individuals have the same preferences and needs; in other words, individuals only differ in terms of their budget constraint.

The capability approach questions all of these assumptions. In what follows, we will not examine Sen's critique of maximising behaviour, as this critique is independent of whether welfare is defined in terms of utility, income or capability (Sen [62]). Instead, we focus on the assumption of irrelevance of the intrinsic value of choice, and the assumption of constant preferences across individuals.

4.2.1 Intrinsic Value of Choice

Firstly, Sen [60] suggests that individuals derive utility both from the range of options in the choice set, as well as from the possibility to perform the act of choice themselves. Compare the following three choice sets: $A = \{a\}$, $B = \{a, b\}$ and $C = \{a, b, c\}$. The individual prefers a over b and c. In standard welfare economics individual i's utility derived from the sets A, B, and C is the same. However, Sen argues that the loss of freedom of choice in B compared to C and A compared to B should be reflected in individual i's welfare. The intrinsic value of choice consists of two components: the act of choosing itself (absent in A, present in B and C) and the range of valued options (largest in C). This critique has triggered a large literature on the ranking of sets in social choice theory and non-welfarist welfare economics, which started with Pattanaik and Xu [48].

Of course, when carefully interpreted, welfarism *is* sensitive to some of these aspects. If the act of choice itself would generate utility, then being able to choose from B will generate more total utility for individual i than A, even though the utilities derived from the option that is picked alone (a) will be the same. The problem thus lies in the fact that welfare economics in general does not compare the utility generated by having option set A or B, but instead compares the option picked from A or B. Similarly, welfarism could take account of some welfare consequences of the range of the choice set. For example, a person who chooses a certain chocolate bar among five alternative bars might derive more utility from this chocolate bar than a person who could not choose. Alternatively, a further brand of dishwashing liquid might make the decision making process among these liquids more difficult and hence produce disutility for the decision maker. But while the latter situation is sometimes modelled as a disutility provoked by information costs, the earlier finds no echo in welfare economics. In contrast, the capability approach, by distinguishing between functionings and capabilities, accounts for both welfare derived from the chosen

outcome and welfare derived from the opportunity or choice set.

4.2.2 Preferences and Needs across Individuals

Secondly, and most forcefully, Sen disputes the validity of the assumption that individuals have the same preferences or needs. As we have seen, he formalises this by means of a conversion function, by which resources are converted into outcomes, the functionings, with the conversion rate depending on personal, societal and environmental factors. When utility is defined over market goods as in the basic model, and consumers face the same prices, different levels of utility can only be derived from different levels of income. However, when utility is defined over functionings, different levels of utility can be derived either from different levels of income or from different capacities to turn income into functionings. We will call this latter difference in conversion factors the heterogeneity of needs. In line with the capability approach, we will assume that this difference is relevant for social welfare evaluation. At present, extensions of the basic model sometimes allow for differences in utility functions across individuals. However, since these utility functions are defined over goods, they confuse differences in the utility function with differences in the conversion function. In other words, these extensions conflate preferences with needs.

This notion of heterogeneity of needs could be formalised within the basic model by defining the utility function over outcomes $\mathbf{o}$, which are in turn a function of goods, and conditioning it on a vector of conversion factors, $\mathbf{z}$. Hence, equation (2) becomes

$$\max u_i = u\left(\mathbf{o}\left(\mathbf{x}, \mathbf{z}\right)\right) \quad \text{subject to } \mathbf{p}.\mathbf{x} = m_i \quad i = 1, ...n \tag{10}$$

These outcome functions $\mathbf{o}$ have parallels in existing welfare economics research, as early as in Becker's ([11]) reformulation of consumer theory (commodity production function in the household) and in Atkinson and Stern's activities model ([7]). While Becker insists as in Becker and Stigler [65] that preferences are stable and equal across individuals, Aktinson and Stern accept the need to control for heterogeneity of expenditure patterns by including socio-demographic variables in their regressions.

This is in line with empirical research in policy evaluation, where heterogeneous preferences are routinely modelled by conditioning the estimations on a range of socio-demographic characteristics. However, such techniques only allow for a rough differentiation in preferences and needs across demographic subgroups. This literature has recently been enhanced: for example, the importance of differential responses to policy because of heterogeneous preferences is analysed by Browning, Hansen and Heckman [16] and Heckman [31]. These authors show that the evaluation of a policy where agents participate voluntarily in a social policy programme depends crucially on the motives they have for participating. If they are motivated by the gains from the programme – certainly not an improbable assumption –, the basic model of policy evaluation breaks down, even if it accounts for observable heterogeneity of preferences and needs across demographic subgroups.

For the measurement of individual welfare levels, as in inequality and poverty measurement, the record is less impressive, however: equivalence scales accounting for differences in size and composition across households are the only way in which heterogeneity is taken into account. While the methods of estimating such scales are becoming more and more sophisticated (Bellemare, Melenberg and van Soest [12], Cowell [19], Murti [45]), they concentrate only on assessing the additional cost that children present to a household. Jones and O'Donnell [33], Kuklys [36] and Zaidi and Burchardt [70] estimate equivalence scales in the presence of disabilities, thus taking into account one additional type of needs. However, equivalence scale estimation can only account for a small amount of heterogeneity, both for econometric reasons and data limitations (see Kuklys [36]). In addition, the sources of individual heterogeneity can be either voluntary choices or exogenous differences, but the equivalence scale technique assumes that all heterogeneity is exogenous and breaks down if heterogeneity is the consequence of voluntary choice (see Pollak and Wales [51]).

Summing up, heterogeneity of utility functions is recognised in standard welfare economics, although the extent to which these interpersonal differences are incorporated in welfare analyses differs considerably between policy evaluation on the one hand and inequality and poverty measurement on the other. Moreover, the degree to which heterogeneity can be accounted for by equivalence scales is structurally limited.

4.3 The capability approach – a genuine alternative?

When combining our analyses of the assumptions of markets and individuals, an appropriate measure of an individual's welfare would be a further extension of equation (9)

$$v^{ext} = v\left(\mathbf{p}, p_i^*, p_i^{pg}, p_i^r, p_i^{nm}, m_i; \gamma\left(\mathbf{z}^i, \mathbf{z}^s, \mathbf{z}^e\right); choice_i\right) \tag{11}$$

where $\mathbf{z}^i, \mathbf{z}^s, \mathbf{z}^e$ are vectors of personal, societal and environmental factors that affect the conversion of available resources into outcomes, and $choice_i$ reflects the intrinsic value put by the individual on the freedom to choose. Policy analysis could then be performed by analysing $dv^{ext} = \frac{\partial ext}{\partial \pi} d\pi$. Depending on the problem being analysed, recent research in welfare economics does reflect parts of (11), but measurement of individual welfare levels is still confined to the analysis of household incomes or expenditure, albeit adjusted for household size.

It is clear that welfare measurement according to equation (11) will be extremely difficult. However, the question is whether it is easier to account for all the parameters by measuring functionings directly. To shed light on this question, we will now review the applied research on welfare measurement and policy evaluation specifically dealing with the capability approach.

5 Evidence on the Measurement of Functionings and Capabilities

So far we only discussed theoretical critiques of the capability approach of standard welfare economics. In this section we will review existing applications, analyse the employed methodologies and the difficulties faced in such applications. In particular we want to investigate whether measurement of functionings and capabilities makes a significant difference with the traditional welfare measurement in terms of income or expenditure.

5.1 Methodological Issues

The literature on functionings measurement deals, to differing extent, with four main methodological problems: selection of the relevant functionings, the measurement of these functionings, the aggregation of these functionings into a composite measure of individual welfare and finally, the aggregation of individual welfare to societal welfare, e.g. in inequality or poverty analysis.

5.1.1 Selection of Relevant Functionings

Firstly, in most empirical contributions the selection of functionings is done in an *ad hoc* way, in accordance with the researchers' values (see for example Klasen [34] and Chiappero Martinetti [44]). Sometimes (in particular, in the research of Schokkaert and Van Ootegem [56], Lelli [39] and Balestrino and Sciclone [9]), a wide range of potentially relevant variables from household surveys are submitted to exploratory factor analysis to 'let the data decide' which are the relevant functionings. Here, the factor scores resulting from this analysis are used as the functionings representing an individual's welfare.

Robeyns [55] has developed a methodology for selecting relevant dimensions in a less ad hoc way. She proposes that the selection of functionings or capabilities would be structured along a number of methodological criteria. These criteria would require making the selection as explicit as possible, justifying the selection method used, making the selection sensitive to the context, distinguishing between different levels of generality, and striving for a non-reductionist and complete selection. If the selection of functionings does not concern the typical research setting, but instead is needed in a local situation with few affected individuals, then participatory methods can be used, as has been done by Alkire [1].

5.1.2 Measurement of Functionings

Secondly, measurement is important because we want to compare individuals with each other and might want to reduce the number of functionings in the welfare measure or summarise the functionings later in a one-dimensional composite individual welfare measure. At this stage, there is no consensus how to go about this problem. Factor analysis has the two-fold advantage of reducing

the number of functionings, e.g. by combining several variables such as humidity in dwelling or household members per room into a functioning 'being well-sheltered' and assigning numbers to the achieved level of each functioning. The authors employing factor analysis usually use orthogonal factor scores as measurement units to avoid double counting of functionings. The use of factor analysis entails several problems. Firstly, if the observable variables submitted to this analysis are measured on different scales, the factors might pick up method effects rather than substantive variance effects. Secondly, imposing orthogonality on the factor scores might blur the fact that the underlying functionings are actually correlated. For example, there is no reason why the functionings 'being healthy' and 'being well-sheltered' could not be correlated. It is questionable that if the functionings in real life are correlated, orthogonal factors would represent adequately an individual's welfare. The third problem is that in factor analysis, different variables (e.g. housing indicators) are aggregated to a functioning (being well-sheltered) by *statistical* weights. There is no reason why these weights should reflect the researcher's values or the individual's subjective valuation (relative prices) of the different variables. Finally, factor analysis as employed in these applications is not appropriate for dealing with ordinal variables, or for testing whether the implied model is adequate for the data.

An extension of confirmatory factor analysis are covariance structure models, employed in the capability context by Kuklys [35]. While variables are still combined into functionings by statistical weights, these models can be adapted to take into account ordinality of observed variables and allow testing for model adequacy in a statistical framework.

A different method, which avoids the problem of statistical weights to a certain extent, is scaling, or an extension of it, the use of fuzzy sets. Scaling, i.e. a projection of each variable into a 0-1 range, was employed in the first major operationalisation of the capability approach, the human development index [68]. Chiappero Martinetti [44] pioneered the use of fuzzy sets theory in this area. The first step in fuzzy sets theory is to scale the variables into a 0-1 interval. In a second step, several variables (e.g. health indicators) can be aggregated by different set operators ($\cap, \cup$,etc.) to a single functioning (e.g. 'being healthy'). This method allows the researcher to explicitly impose her value judgments on the aggregation. She can decide in which way the different indicators are considered to be complements or substitutes to each other, for example.

5.1.3 Aggregation across functionings

The third methodological issue related to the capability approach is the aggregation of the multiple functionings of an individual into one composite welfare indicator. This is necessary if we want to compare welfare in terms of functionings with a one-dimensional measure such as income. The already discussed methods provide for this aggregation in a similar fashion: it is possible to derive a second-order factor, called 'welfare', from the dimensions arrived at by

factor analysis. Similarly, it is possible to aggregate the fuzzy sets to a higher order set with similar operators, according to the value judgments of the researcher. To arrive at one welfare measure in terms of functionings, Klasen [34] has used principal components analysis. The human development index is calculated by simply averaging the scaled functionings. Hirschberg, Maasoumi and Slottje [32] have used time-series clustering to aggregate different functionings. Maasoumi [40], [41] has worked extensively on the information theoretical and axiomatic underpinnings of multidimensional welfare analysis. He derives an optimal aggregator function for the different functionings by minimising the distance between the distributions of the composite measure and those of each functioning. Together with Nickelsburg [43], he has applied this approach to welfare analysis in the US.

It is also possible not to work with a composite welfare measure but analyse each functioning individually (see e.g. Chiappero Martinetti [44], Lelli [39] Robeyns [54]).

5.1.4 Aggregation across individuals

Finally, to assess social welfare, it is necessary to aggregate individual welfare to an overall social welfare measure, e.g. an inequality or poverty index. While the primary literature on the capability approach is not explicit about this, the issue has to be faced inevitably if the capability approach is used for empirical inequality or poverty analysis. In principle, two possibilities exists in a multidimensional setting, namely, using the composite measure derived in the previous paragraph in standard unidimensional inequality or poverty indices, or using the functionings in a multidimensional inequality or poverty analysis. Maasoumi and Nickelsburg and Brandolini and D'Alessio [15] have used multidimensional inequality indices, while Atkinson and Bourguignon ([5], [6]) have prepared the way for multidimensional stochastic dominance rankings of functionings distributions. Bourguignon and Chakravarty addressed the issue of multidimensional poverty indices [14] and multi-dimensional poverty (stochastic dominance) orderings [13].

5.2 Measurement of Welfare Levels

To investigate whether the capability approach leads to different assessments of welfare in comparison with standard welfare economics, we will now review the quantitative empirical applications of poverty and inequality measurement. The first two applications were made by Sen himself, and were meant to illustrate the basic principles behind the approach, using data on the national level. In his first study based on data from 1980 to 1982, Sen found that while the (roughly equivalent) GNP per capita of Brazil and Mexico are more than 7 times the (roughly equivalent) GNP per capita of India, China and Sri Lanka, performance of life expectancy, infant mortality and child death rates were most favourable in Sri Lanka, and better in China compared to India and Mexico compared to Brazil (Sen [60]: 46-51). Although Sen used only three very basic functionings,

he showed that ranking of countries based on GNP per capita can be quite different from the ranking based on the selected functionings. Sen's second application examined sex bias in India (Sen [60]: 52-69). He found, among other things, that females have worse achievements than males for a number of functionings, including age-specific mortality rates, malnutrition and morbidity.

Over the last decades, this kind of quantitative applications based on aggregate data has become widespread, especially in development studies. The most well-known is the concept of human development, which has its theoretical roots in the capability approach (Fukuda-Parr [23]), and which has resulted in a number of indices developed by the United Nations Development Programme, such as the human development index, the gender-related development index, or the human poverty index. The selection of functionings for all these indices comprises life expectancy at birth, education (measured by adult literacy and educational enrolment rates), and adjusted real GDP per capita, which should serve as a proxy for the material aspects of welfare. Comparisons of rankings of these indices with GNP per capita shows significant differences (UNDP [68]). These indices have been criticised on a number of grounds, including their statistical properties and their selection of functionings. Although they are perhaps a crude application of the capability approach, they probably have the largest political impact.

Other studies use data at the provincial or regional level. Balestrino and Sciclone [9] tested the strength of the correlation between income and functionings for Italy. The functionings they included were being healthy, educated, employed, and living in a comfortable house, in a safe area, and in a non-polluted environment. Although they found that the functionings-based ranking and the income based ranking are strongly positively correlated, the rankings differed for 7 out of 20 regions. Qizilbash [53] used the 1996 South African Census to analyse provincial rankings of financial poverty and human poverty, with the latter being comprised of 6 functionings and their proxies (education, water, refuse removal, cooking facilities, rooms per household and employment). He found that the expenditures and human poverty rankings of the 9 provinces differs significantly. For example, the province KwaZulu Natal has the third lowest incidence of income or expenditure poverty, but is the third worst for human poverty.

Other applications do not rank regions or countries, but measure levels of welfare directly based on micro-data. This corresponds to measuring vector $\mathbf{b}_i$ in equation (1)

$$X_i(Q_i) = \{\mathbf{b}_i | \mathbf{b}_i = f_i(c(\mathbf{q}_i), \mathbf{z}_i) \quad \forall \quad f_i \in F_i \text{ and } \forall \quad \mathbf{q}_i \in Q_i\}$$

Schokkaert and Van Ootegem [56] used 1979 micro-data to study the welfare of the unemployed. They selected 46 variables that were reduced to 6 functionings: a social functioning, a psychological functioning, a physical functioning, micro-social contact, activity levels, and a financial functioning. They found that material factors are almost irrelevant in the determination of the well-being of the unemployed, and suggested that non-financial policy instruments

targeted at specific groups might have a larger welfare-improving effect than financial ones.

Balestrino [8] analysed whether a sample of officially poor people are functioning poor, income poor, or both. The functionings under consideration were education, nutrition and health. Out of the 281 Italian households in his sample, 73 households are pure functioning poor, 71 are pure income poor, and 137 are both. The analysis suggests that a sizeable share of the poor in affluent societies is actually not income poor.

Ruggeri Laderchi [37] tested on 1992 Chilean data to what extent an income indicator can capture some of the most essential functionings (education, health and child nutrition). She concluded that the income variable appears an insignificant determinant for shortfall in the three selected functionings. In a more recent paper [38], she analyses the types of classification errors made in poverty analysis when adopting monetary welfare measures instead of functioning measures such as children's health and education, using a Peruvian household survey. She concludes that in order to achieve a higher overlap between analyses based on monetary welfare measures and functionings, the monetary poverty line has to be significantly increased. In addition, she identifies individuals who are non-poor, but functionings deprived, e.g. 22.8% of the stunted children in Peru are non-poor in monetary terms.

Phipps [50] made a comparison of the well-being of children aged 0-11 in Canada, Norway and the USA, using equivalent household incomes and 10 quite specific functionings (low birth weight, asthma, accidents, activity limitation, trouble concentrating, anxiety, disobedience at school, bullying, lying and hyperactivity). Her study had two main findings. First, the Canadian and USA distributions cannot be ranked, but the Canadian children with incomes in the bottom quintile are better off than the American children. Second, while average incomes are similar in the three countries, Norwegian children are better off in terms of functionings than the Canadian. Thus, the evaluations based on functionings and income give complementary information.

Chiappero-Martinetti [44] used the 1994 Italian Household Survey to measure welfare with 5 functionings (health, education, knowledge, social interaction and psychological functionings) at three levels of aggregation. Women, elderly (especially if they live alone), people living in the South of Italy, housewives and blue-collar workers have lower functionings achievements, no matter how the overall well-being was determined. She did not compare her functionings measurement with income measurement.

Klasen [34] measured and compared expenditure poverty and functionings poverty in South Africa. He made a detailed analysis of 14 functionings and proxies for functionings: education, income, wealth, housing, water, sanitation, energy, employment, transport, financial services, nutrition, health care, safety, and perceived well-being. On the aggregate level, the expenditures poverty measure is among the best proxies for the functionings-index, but not equally well for all quintiles. However, as Klasen argues, it is not more difficult to construct the functionings-index than to measure expenditure levels. Also, some groups are much deeper functionings-deprived than suggested by the expendi-

ture measurement, and 17% of the people who are functionings-deprived are not identified as poor by the expenditure index.

Finally, Lelli [39] measured welfare using 54 variables from the Panel Study of Belgian Households, focussing on psychological well-being, social interactions, economic conditions, cultural activities, working conditions, health and shelter. Regressions of socio-demographic variables on these functionings revealed a detailed picture of the welfare differences among the Belgian population. She did not examine the relationship between functioning levels and income levels, but found that the correlations between the functionings were low, with absolute values ranging from 0.02 to 0.39

Clearly, all the papers discussed so far measure functionings, and not capabilities. As far as we are aware, there are only three attempts so far to (partially) measure capabilities or self-percieved capabilities instead of achieved functionings. Burchardt and Le Grand [17] focus on the functioning of being employed and assess to what extent individuals are voluntarily or involuntarily unemployed i.e. whether they have the capability to be employed or not. They identify this capability by determining whether her condition of being unemployed is the outcome of a decision by herself or due to constraints she faces, i.e. factors beyond her control. They estimate that 10% of unemployed are in this condition by their own choice.

Anand and van Hees [3] conducted a survey specifically designed to collect information on self-reported levels of capabilities and achieved functionings. The survey covered happiness, general achievement, health, intellectual stimulation, social relations, environmental quality and personal integrity at the levels of capabilities and actual achievements. Based on a sample of 273 respondents in England, they found that different capabilities can clearly be distinguished from one another, and that income is negatively correlated with self-reported overall capability levels. They also found high positive correlations between self-reported capabilities and achievements.

Anand, Hunter and Smith [2] examined the data on capabilities which is included in the 10th wave of the British Household Panel Study. They mapped the available data on the list of capabilities which has been theoretically developped by Martha Nussbaum [46] to structure the analysis. The available data on capabilities are strongly correlated with data on subjective well-being. Nevertheless, it should be noted that many capabilities that have theoretically been argued to be relevant, both by Nussbaum and other scholars, are not sufficiently covered, or even not included at all, in the BHPS. Moreover, Nussbaum's list is so broad and general that there remains a large potential scope for disagreements among researchers about what information is needed to cover all the capabilities in her list, or about how a particular survey-question should be classified under Nussbaum's categories of capabilities. Summing up, it is obvious that a lot of work remains to be done in the collection of new data on capabilities rather than achieved functionings, and their subsequent analysis.

5.3 Policy Evaluation

As an evaluative approach, the capability approach can also be applied for policy evaluations, and related to that, for policy design. However, in this area only limited applied research has been done. At the level of applied policy research, the UNDP [68] includes in its annual *Human Development Report* analyses of good practices of countries who have implemented policies that have enlarged people's capability sets, and gives abundant policy recommendations on how this could be done.

But it is also possible to apply the capability approach in a more scientific way to policy evaluation in micro-settings, for example when a local government redesigns the public infrastructure in a neighbourhood, or when a development NGO wants to evaluate its projects. Formally, the change in functionings induced by policy implementation π can be expressed as

$$d\mathbf{b}_i = \frac{\partial \mathbf{b}_i}{\partial \mathbf{q}_i}\frac{\partial \mathbf{q}_i}{\partial \pi}d\pi + \frac{\partial \mathbf{b}_i}{\partial \mathbf{z}_i}\frac{\partial \mathbf{z}_i}{\partial \pi}d\pi,$$

i.e. the policy has an impact on functionings through its impact on market and non-market resources, but also through its impact on conversion factors.

Alkire [1] used the capability approach to evaluate functionings and capability-changes in three Oxfam poverty reduction projects in Pakistan: goat rearing, female literacy classes and rose garland production. A standard cost-benefit analysis would evaluate the goat rearing project as a sound economic investment, with a number of non-quantifiable capability changes, such as the acquisition of useful knowledge and the cultivating of friendships. The capability evaluation of the goat rearing project is thus positive both for the quantifiable and the intangible effects. The female literacy project, on the other hand, is a prime example of a project that would no longer be funded if it were evaluated only based on a standard cost-benefit analysis, as this project has hardly any effects on women's earnings, because there are no markets for female employment in this area of Pakistan. But Alkire found that it had a fundamental and transformative effect on the students, which cannot be quantified. These intangible effects include that they learn that they are equal to men, that they do not need to suffer abuse, that literate women can solve their own problems, that they learn how to read, and their subjective experience of great satisfaction at being able to study. The evaluation of the rose cultivation project also showed a contrast between the negative internal rate of return and a number of valuable non-economic intangible effects. Summing up, a standard welfare economic evaluation would conclude that the goat-rearing project dominates the literacy and the rose garland production projects, but from a capability perspective no project clearly dominates the other. Alkire concludes that "the choice cannot be made on technical grounds but rather is a morally significant choice" ([1]: 286)

5.4 Conclusion

From the above literature review we derive the following conclusions. Firstly, it is possible to measure welfare in terms of functionings. Second, welfare levels measured in terms of functionings differ significantly from those measured in terms of income or expenditure. As a consequence, rankings of welfare levels of countries and regions are different when they are performed according to standard welfare economics or the capability approach. In addition, not all who are income-poor are functionings poor and vice versa, which can have important implications for poverty reduction policies.

Our review also suggests that it is much more challenging to measure capabilities than functionings. For both the measurement of functionings and capabilities it holds that this literature is relatively recent and many of the applications are of an exploratory nature. Much more work needs to be done before a definite empirical assessment of the capability approach to welfare economics can be made.

6 Concluding Remarks

In this paper we have characterised and analysed the capability approach from the perspective of standard welfare economics. We have argued that the capability approach entails profound critiques of the underlying assumptions of the standard welfare economic model. Taking on board these critiques can be done in two ways. Either one modifies the standard economic model to account for non-market goods and services, public and rationed goods, externalities, interpersonal heterogeneity and the intrinsic value of choice. Applied policy research in economics increasingly takes up this challenge, but poverty and inequality analysis has so far not sufficiently incorporated these concerns. The alternative strategy is to measure outcomes and opportunity directly, which is being advocated by the capability approach with its focus on functionings and capabilities. Interestingly, it is precisely inequality and poverty research in which welfare is increasingly measured in terms of functionings. Our survey of empirical applications suggests that welfare measurement in terms of functionings give complementary insights to the standard methods which focus on income and expenditures.

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