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Abstract The aim of this paper is twofold: first, we discuss the main conceptual and methodological issues related to the operationalization of Amartya Sen’s capability approach. Second, we review quantitative applications of the capability approach in different domains to examine how methodological and empirical challenges are addressed. The use of the capability approach implies a broadening of the “informational basis of judgments” and thereby leads to conclusions that differ from those drawn using standard economic approaches.

Keywords: capability approach, operationalization, assessing capabilities, multi-dimensional welfare indicators, freedom, quantitative applications

JEL Classifications: B40, B50, C10, C30, I30

1. INTRODUCTION

Sen’s capability approach is grounded in his analysis of famine and poverty and derives from a critique of, on the one hand, welfare economics and the utilitarianism underlying it, and on the other hand, Rawls’s Theory of Justice and his concept of “primary goods” (Atkinson 1999; Sugden 1986). The capability approach is an evaluative framework for individual welfare and social arrangements (Sen 1993: 30). The approach highlights the importance of improving individuals’ substantive freedoms or real opportunities to achieve valuable states of being and doing.

Because of the framework’s incomplete and multidimensional nature, in his critical review of Sen’s Inequality Reexamined, Sugden (1993: 1953) asks “how far Sen’s framework is operational.” Rawls (1999: 13) also argues that the
capability approach is an “unworkable idea.” However, over the past decade, there has been a growing interest in operationalizing Sen’s capability approach (Comin et al. 2008; Kuklys 2005; Robeyns 2006).

This paper aims to show that Sen’s capability approach could be used to address multiple issues in economics and could also provide a framework for evaluation. For this purpose, we propose a non-exhaustive overview of quantitative applications based on the capability approach. Before proceeding, two remarks can be made. First, our preference for quantitative applications does not suggest that qualitative applications or studies using the capability approach as a basis for social and political criticism do not matter (see, e.g., Bonvin and Farvaque 2005; Salais and Villeneuve 2004). Moreover, according to Atkinson (1999: 185 and 186), a concept or an idea may be operational in several ways. On a purely theoretical level, a concept or idea may lead people to think about problems differently. Empirically, this concept or idea is subjected to quantitative measures, but measurability is not a necessary condition for a conceptual approach to have practical value.¹ Second, the quantitative applications that we will review have been selected because they are among the best known or most frequently cited, and because of the variety of application fields and methodological tools they were used to implement Sen’s concepts. Our aim is not to provide a comprehensive overview of quantitative applications of the capability approach, but to show that key aspects of the capability approach are its flexibility and pluralism, which explain why it is compatible with a plurality of techniques used in empirical studies.

The structure of this paper is as follows. Section 2 provides a brief description of the key concepts of Sen’s capability approach. Section 3 outlines the challenges that any attempt to operationalize the capability approach must face and present Sen’s responses to these challenges. Section 4 presents empirical studies that are based on the capability approach and applied to different domains in economics, and it reports on the methods used to address practical challenges of the capability approach. Section 5 concludes.

2. THE CORE CONCEPTS OF THE CAPABILITY APPROACH

The capability approach focuses directly on the quality of life that individuals are able to achieve. The key concepts of this theoretical framework are as follows: functionings, capabilities, freedom, and agency. These concepts are closely related.

“Functionings” are what a person “manages to do or to be” (Sen 1985a: 10) and include achievements such as being well-nourished, being healthy, not suffering

¹ This point is also made by Comin (2008: 157 and 158).
from a lack of self-respect, taking part in social life, and so on. A person’s “capabilities” reflect the different functionings he or she may achieve. In other words, capabilities incorporate the idea of freedom and refer to real opportunities to live the life that one has reasons to choose and value. Freedom depends on the social environment and possibilities of variation. Sen uses the term “conversion factors” to call attention to this variability in the translation of commodities or resources into functionings and capabilities and identifies several types of conversion factors (Sen 1992: 19 and 20, 26–30, 37 and 38, 1999: 70 and 71, 2009: 255 and 256), which may be grouped into three categories: personal conversion factors (such as physical conditions, age, and gender), social conversion factors (e.g., institutions, cultural, and social norms), and environmental conversion factors (including climate, pollution, and public facilities). The process of converting of available resources into well-being is dependent on these individual, social, and environmental features.

Formally, following Sen (1985a: 9–16), and Kuklys (2005: 11) who has extended Sen’s formalization slightly to explicitly consider personal, environmental, and social conversion factors, capabilities may be expressed as follows:

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Q_i(X_i) = [b_i | b_i = f_i(c(x_i)|z_i, z_e, z_s), \text{ for some } f_i() \in F_i \text{ and for some } x_i \in X_i],
\]

where \( x_i \) is the vector of commodities possessed by person \( i \); \( X \) is the set of all possible commodity vectors; \( c(x_i) \) is the function converting the commodity vector into a vector of objective characteristics; \( f_i() \) is “a personal utilization function” in Sen’s terminology or a conversion function, specific to each person, reflecting the individual \( i \)’s transformation of the commodity characteristics into a vector of functionings \( b_i \); \( F_i \) is the set of all possible conversion functions; and \( z_i, z_e, \) and \( z_s \) symbolize vectors of personal, environmental, and social factors, respectively, that influence the range of rates of the conversion of resources into functionings (outcome or achievement) and capabilities (real opportunities or positive freedoms).

The individual’s capability set is a set of feasible functioning vectors from which the person has the freedom to choose. The strengths of the capability approach are threefold. First, the capability approach acknowledges the importance of human diversity and accounts for interpersonal variations in the conversion of the characteristics of the commodities into functionings and capabilities. As Sen (1999: 3) notes, “the pervasive diversity of human beings intensifies the need to address the diversity of focus in the assessment of equality.” Sen’s standard example is the bicycle (commodity), which displays the

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2 As Sen (1985a) notes, the \( c() \) function must be interpreted in the Gorman–Lancaster tradition.
characteristic of transportation regardless of whether the owner is able-bodied or handicapped. If a person is unable to ride a bicycle because he or she is disabled (personal conversion factor), because roads are in poor condition (environmental conversion factor), or because the owner is a woman and social norms do not allow women to ride bicycles (social conversion factor), then the possession of a bicycle would not produce the functioning of mobility. This focus on the heterogeneity of human beings explains why Sen has rejected welfarist theories or resource-based theories as a framework for well-being and justice. Second, the capability approach offers a multidimensional perspective of human well-being. Indeed, the approach assesses individual well-being in terms of what a person is actually able to do or be—namely, functionings and capabilities. The capability approach not only broadens evaluative spaces and the “informational basis of judgments,” in Sen’s language, but it also represents a different means of defining well-being. Quality of life is more than the amount of resources available. Third, under the capability approach, the relevant evaluative space “is neither that of utilities (as claimed by welfarists), nor that of primary goods (as demanded by Rawls), but that of the substantive freedoms—the capabilities—to choose a life one has reason to value” (Sen 1999: 74). Sen equates capabilities with freedoms that refer to the presence of valuable options—that is, opportunities that are effectively available to the individual. He places a great deal of importance on the freedom to assess human well-being and social states because more freedoms provide us with more opportunities to obtain what we value and have reasons to value and because freedom also has intrinsic value. As noted by Sen (1988: 290), one reason why freedom may be important is that ‘choosing’ may itself be an important functioning (…). Insofar as choosing is itself valuable, the existence and extent of choice have significance beyond that of providing only the means of choosing the particular alternative that happens to be chosen.

Freedom comprises two aspects: the “opportunity aspect” and the “process aspect” (Sen 2002, Chapters 20–22, 2009: 228–230). The “opportunity aspect of freedom” concerns the opportunity to have access to various combinations of valuable beings and doings (functionings) and to choose among them. In this regard, the opportunity aspect of freedom is captured by the concept of capability; at the same time, the process aspect of freedom relates to whether people have the freedom to participate in a decision-making process. The process aspect of

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3 According to Sen, all evaluative exercises rely on an “informational basis of judgments”:
The informational basis of a judgment identifies the information on which the judgment is directly dependent and no less important asserts that the truth or falsehood of any other type of information cannot directly influence the correctness of the judgment. The informational basis of judgments of justice thus determines the factual territory over which considerations of justice would directly apply. (1990: 111, Sen’s emphasis; also see Sen 1974, 1992: 43 and 73, 1999: 56)
freedom is concerned with decision autonomy and immunity from encroachment. Although these two aspects of freedom are distinct, Sen argues that a comprehensive assessment must consider both of these aspects.

Another important concept in the capability approach is “agency.” Sen distinguishes between two ways of defining a person’s interest and their fulfillment: well-being and advantage. The former is regarded “as an assessment of the particular achievements of the person—the kind of ‘being’ he or she succeeds in having” (Sen 1985a: 51) and is referred to as “well-being achievement” (functionings). “Advantage” involves “the evaluation of a set of potential achievements and not just the actual one” (Sen 1985a: 51, original emphasis), that is, the capability set. This concept is therefore similar to that of “well-being freedom.” In his Dewey lectures, Sen (1985b) introduces another distinction, one existing between the well-being aspect and the agency aspect of a person. By “agency,” Sen means the ability to achieve the goals that a person values regardless of whether these goals are connected to human well-being. For example, one may go on a hunger strike for political reasons even if it reduces his or her well-being. The notion of agency is thus broader than that of well-being. The agency aspect of a person may be regarded in terms of “agency achievement” and “agency freedom.” “Agency achievement” is defined as follows: it “refers to the person’s success in the pursuit of the totality of her considered goals and objectives” (Sen 1992: 56). From this perspective, well-being achievement is only one dimension of “agency achievement.” Furthermore, not all goals and objectives are considered in a person’s agency achievement because a person is considered by Sen to be a “doer and a judge” (1985b: 208), a responsible agent. A person’s “agency freedom” relates to “one’s freedom to bring about the achievements one values and which one attempts to produce” (Sen 1992: 57).

To summarize, in Sen’s work, four concepts are used to judge a person’s situation: on the one hand, well-being achievement and well-being freedom in terms of an agent’s personal well-being, and on the other hand, agency achievement and agency freedom in terms of the agent’s goals.

Agency goals pertain to political convictions, religious beliefs, social commitments, the person’s conception of the good, and so on. Agency freedom is distinct, although not independent of well-being freedom; this concept goes further and examines achievements and opportunities in terms of both objectives.

4 In fact, Sen (1986: 38) also distinguishes between well-being and standard of living:

it may be said that we move from agency-achievement to personal well-being by narrowing the focus of attention through ignoring “commitments,” and we move from personal well-being to the standard of living by further narrowing the focus through ignoring “sympathies” (and of course “antipathies,” and other influences on one’s well-being from outside one’s own life). Thus narrowed, personal well-being related to one’s own life will reflect one’s standard of living.
and values, possibly going beyond the pursuit of one’s own well-being. Both of these freedoms are important in the capability approach. The agency aspect is more closely related to the person as doer, whereas the well-being aspect is closely related to the person as being.

What is at stake in the distinction between well-being and agency? This distinction provides conceptual space for a separation between individual responsibility and social or collective responsibility. Society should be responsible for the fundamental dimensions of the well-being of its members, whereas individuals are responsible for their agency goals. The well-being aspect is relevant to the analysis of social inequality and the assessment of public policy. The agency aspect is important in such matters as moral judgments, liberty, and autonomy:

the well-being aspect may be particularly important in some specific contexts, e.g., in making public provisions for social security, or in planning for the fulfillment of basic needs. ( . . . ) On the other hand, in many issues of personal morality, the agency aspect, and one’s responsibility to others, may be central. (Sen 1985b: 208; see also Sen 1992: 70–72, 2009: 288 and 289)

The choice of evaluative space depends on whether the analysis relates to the well-being aspect or to the agency aspect. The evaluative space of the capability approach, that is, the functionings or capability space, is appropriate for addressing issues relating to the well-being aspect but irrelevant to a comprehensive picture of the agency aspect:

( . . . ) the space of functionings may be rather restrictive because the person’s goals may well include other types of objective (going well beyond the person’s own state of being) ( . . . ). The assessment of agency success is a broader exercise than the evaluation of well-being. (Sen 1993: 37)

However, Sen notes that even when the evaluative focus is on well-being freedom or well-being achievement, agency concerns may be considered to the extent that a person’s agency goals may enhance or reduce his or her well-being (Sen 1992: 72). Furthermore, the freedom and agency that each individual enjoys are deeply linked to the existence of social arrangements and how they function (Sen 1999: 142). To use Sen’s often-cited example, the existence of democratic governments may prevent the occurrence of famines. Institutions are of central importance in the promotion of individual freedoms (well-being freedom and agency freedom). Although Sen argues that well-being and agency are distinctive, they are not independent of each other. Indeed, without an adequate level of well-being freedom and achievement, people are unable to exercise their agency. If people make their own decisions and manage their own lives, they are more likely to realize well-being achievements. For this reason, the assessment of institutions or social arrangements “can be sensibly evaluated in the light of their
contributions to our freedom” (Sen 1999: 142)—that is, well-being freedom and agency freedom.

3. DIFFICULTIES AND CHALLENGES IN OPERATIONALIZING THE CAPABILITY APPROACH AND SEN’S RESPONSES

The capability approach is not strictly theoretical. Sen himself attaches great importance to the approach’s practical implications (1986: 27, 1992: 11). Flexibility and pluralism are key aspects of the approach, but the approach is highly information intensive and thus not easy to put into practice. To some extent, Sen himself acknowledges the concern regarding the empirical difficulties that are faced when operationalizing the capability approach (1985a: 46–48, 1992: 52, 1999: 81). A careful reading of Sen’s writings shows that he has attempted to resolve these empirical difficulties or to suggest ways to make the capability approach more practical.

In the following, we will simply outline the main set of issues that must be addressed to empirically apply the capability approach: the choice between the capability metric and the functioning metric, the selection of relevant functionings or capabilities, the weighting problem, and the aggregation problem. These issues are well known in the critical literature. Because Sen’s responses primarily concern the first two issues, we will discuss them in more detail.

The first issue in operationalizing the capability approach is choosing the adequate evaluative space: capabilities or achieved functionings. Indeed, depending on the context, the relevant interpersonal comparisons may be standard of living, well-being achievement, well-being freedom, or the agency aspect. If the focus is on the standard of living or well-being achievement, functionings are the appropriate metric, whereas well-being freedom is captured by capabilities. If the objective is to concentrate on the agency aspect, one must move beyond analysis in terms of functionings and capabilities and consider agency goals. The choice between functionings or capabilities does not appear to be a problem for Sen (1992: 50, original emphasis):

Since an important part of the force of the capability approach lies in moving us away from the space of commodities, incomes, utilities, etc., on to the space of the constitutive elements of living, it is particularly important to note that there is no difference as far as the space is concerned between focusing on functionings or on capabilities. A functioning combination is a point in such a space, whereas capability is a set of such points.

However, the capability approach advocates that in assessing people’s well-being or social arrangements, we should focus primarily on what people are effectively able to do and to be—that is, on their capabilities. Why should the
evaluative focus be on capabilities instead of functionings? First as emphasized below, a description of the individual’s well-being in terms of achievements (functionings) is insufficient because one must also consider freedom of choice or genuine choice. Freedom has not only instrumental importance but also intrinsic value. Sen (1992: 52) distinguishes between “doing x” and “choosing to do x and doing it.” To illustrate this idea, Sen often contrasts the case of a person who starves for religious or political reasons with that of a person who does not have enough to eat. Both of them lack the achieved functioning of being well nourished. However, the former has the capability to be well nourished, whereas the latter does not. Second, another argument relates to the role of responsibility in the capability approach. Indeed, this approach is not based on a particular conception of the good life. The distinction between capabilities and functionings also introduces a clear line of demarcation between social or collective responsibility and individual responsibility. Sen argues that individuals should not be responsible for their opportunities (capabilities). However, these individuals are responsible for their choice of a functioning vector within their opportunity set and their choice of the type of life related to it. An individual’s effective freedom to choose between different functioning combinations that he or she has reason to value is the relevant yardstick for determining whether an inequality is a matter of justice or merely a private concern. As in the example discussed above, the rich or religious faster is responsible for his or her nutritional state, whereas the destitute person who starves is not. If people suffer from illness or disadvantages as a result of conversion problems, they should not be held responsible for their outcomes. Nevertheless, if a person is able to exercise freedom but wastes his or her opportunities, then no injustice has occurred (Sen 1993: 39, note 23, 2009: 238). According to Sen, social and individual responsibility may and must complement each other: “Responsibility requires freedom ( . . . ). Expanding people’s freedom can therefore be seen as an argument for individual responsibility” (Sen 1999: 284).

Focusing on capabilities broadens the “informational basis of judgment of justice,” but much data are required to operationalize the capability approach, and the information required for its full implementation does not exist in any data-set currently available. Indeed, the description of opportunities (capabilities) requires the consideration of counterfactual states, which are not easily or directly observable. For these reasons, the choice of the achieved functionings set appears

5 This example is often highlighted by Sen to justify the move from the space of functionings to the space of capabilities. According to Fleurbaey (2006: 304), this example is not sufficient to prove that functionings do not matter in social evaluation because Sen explores the case of two individuals with the same level of a particular functioning, whereas the analysis requires a comparison of two individuals with the same vectors of functionings but different capabilities.
to be the more practicable one. Sen is aware of these problems and calls for flexible and pragmatic use of the capability approach:

(….) the capability set is not directly observable, and has to be constructed on the basis of presumptions (…). Thus, in practice, one might have to settle often enough for relating well-being to the achieved—and observed—functionings, rather than trying to bring in the capability set (when the presumptive basis of such a construction would be empirically dubious). (Sen 1992: 52; also see Sen 1999: 85 and 86)

Regardless of the data availability problems inherent in the application of the capability approach, in some particular configurations, direct observation of the achieved functionings provides sufficient information on people’s capability sets. Indeed, in some cases, it is possible to identify contexts and circumstances for which both counterfactuals and realized states may be approximated:

While this may look like adding to the already heavy informational demand for analyzing freedoms, it need not, in fact, make the practical problems of such analyses more intractable. Sometimes the natures of counterfactual choices are very easy to guess, e.g., that people could choose to avoid epidemics, pestilence, famines, chronic hunger. The elimination of these unloved things, through public policy aimed at giving people what they would want, can be seen as an enhancement of people’s real freedom. In this sense, even simple observations of realized states may have direct relevance to the analysis of freedoms enjoyed. (Sen 1992: 66)

Finally, as Fleurbaey (2006) remarks, if one is pushed to focus on functionings instead of capabilities when applying the capability approach, then the theoretical and practical relevance of the concept of capability would be called into question. He claims that the use of the approach in terms of “refined functionings” is more appealing because it includes counterfactual information on the sets of options and the choices that have led to individual states or activities that are actually observed. The notion of “refined functioning” has been proposed by Sen as a means of incorporating freedom as a part of the conditions of life. Thus, “choosing A when B is also available is a different refined functioning, it can be argued, from choosing A when B is not” (Sen 1986: 49; also see Sen 1985b: 202, 1988: 290 and 291). Consider again the famous fasting-starving distinction. If the person is fasting and therefore under-nourished despite having access to food and the conversion ability to attain an adequate nutritional level, the functioning “under-nourished” or “fasting” would be considered a “refined functioning.” This “refined functioning” is different from another “refined functioning,” “starving” resulting from economic deprivation. In the case of “refined functionings,” therefore, alternative opportunities figure in the characterization of the functionings themselves.

The second issue is related to the selection of relevant capabilities or functionings. Sen’s capability approach is deliberately incomplete. He refuses to
endorse “one predetermined canonical list of capabilities, chosen by theorists without any general social discussion or public reasoning” (Sen 2004: 77) and insists on a selection, weighting, and sequencing exercise based on democratic processes (also see Sen 1999: 76–81). However, it is unclear how public discussion and democratic deliberation may lead to the sharing of evaluations. Consequently, the question remains unanswered. Although Sen does not provide a fixed list of capabilities or guidelines to elaborate such a list, he argues that for some evaluative exercises, especially poverty analysis or the assessment of people’s well-being in developing countries, it would be relevant to specify some “basic capabilities,” that is, “the ability to satisfy certain crucially important functionings up to a certain minimally adequate level” (Sen 1993: 41). Sen (1992: 45) provides examples of “basic capabilities, e.g., the ability to be well-nourished and well-sheltered, the capability of escaping avoidable morbidity and premature mortality, and so forth.” According to Sen, these “basic capabilities” enable easy agreement on what should be considered urgent moral and political priorities, but he also indicates that the capability approach may be used to assess individual advantage within a range of different spaces. Furthermore, he emphasizes that the capability approach is only an open framework for the evaluation of individual advantage and social arrangements and not a full-fledged theory: “It is not clear that there is any royal road to evaluation of economic or social policies either” (Sen 1999: 85; also see Sen 1993: 48, 2009: 232). Depending on the context and purpose of the evaluative exercise, other relevant dimensions of human life such as participation in social life or engagement in social interactions could be included in a list of capabilities in addition to the basic capabilities mentioned above.

The third issue concerns the valuation and weighting problem. Suppose that relevant capabilities and subsequent functionings are identified and a consensus on a list of capabilities and functionings is achieved. For policy purposes, we should be able to express trade-offs between different functionings and capabilities in a consistent way. This need raises the issue of what sort of weight or priority should be given to these different functionings and capabilities. Sen adopts three strategies to manage this criticism. First, once again, he claims that his approach is deliberately incomplete and advances two explanations for this

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6 Some scholars have attempted to supplement Sen’s framework with a list of important capabilities (e.g., Nussbaum’s list of “central human capabilities”) or with different methods for the selection of capabilities for particular purposes. See, for example, Robeyns (2005) for the differences between Sen and Nussbaum’s approaches and a discussion of the set of methods used to select capabilities for quality of life measurement.

7 The notion of “basic capabilities” first appeared in Sen’s Tanner Lecture “Equality of What?” delivered at Stanford University in 1979 and emerged through criticisms of the Rawlsian and standard utilitarian interpersonal comparison measures. He uses the example of a disabled person and shows that “the notion of urgency related to this is not fully captured by either utility or primary goods, or any combination of the two [ . . . ]. There is something still missing in the combined list of primary goods and utilities” (Sen 1979: 218).
incompleteness: a fundamental reason and a pragmatic reason. Sen (1992: 49) writes: “The fundamental reason for incompleteness” is that

the ideas of well-being and inequality may have enough ambiguity and fuzziness to make it a mistake to look for a complete ordering of either . . . . The pragmatic reason for incompleteness is to use whatever parts of the ranking we manage to sort out unambiguously, rather than maintaining complete silence until everything has been sorted out and the world shines in dazzling clarity.

As a second related argument, Sen advances techniques such as the “dominance partial order” and the “intersection approach.” These techniques may be used without specifying weights. A third argument states that the selection of weights in an evaluative exercise “is a ‘social choice’ exercise, and it requires public discussion and a democratic understanding and acceptance” (Sen 1999: 78 and 79). Sen is very critical of the pre-selection of weights needed for evaluative judgments (Sen 1993: 49).

The last issue related to the operationalization of the capability approach is the aggregation problem. How do we compare individuals with different functionings and/or different valuations? One might be interested in combining all of the relevant dimensions to perform an overall evaluation of well-being. Sen’s response to this issue is that it depends on the context and purpose of the evaluative exercise: “The passion for aggregation makes good sense in many contexts, but it can be futile or pointless in others” (Sen 1986: 44). Furthermore, when reasoning using an aggregate indicator, we lose information on human heterogeneity and the plurality of dimensions, which are the main features of the capability approach.

4. OPERATIONALIZATION OF THE CAPABILITY APPROACH: A (NON-EXHAUSTIVE) OVERVIEW OF QUANTITATIVE APPLICATIONS

The aim of this section is to provide a non-exhaustive overview of how some important issues related to the operationalization of the capability approach have been addressed in the empirical literature. Emphasis will be placed on the multidimensional measurement called for by the capability approach and how the

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8 When some functionings are identified as valuable, one may use the “relation of dominance” to obtain a partial ordering without full agreement regarding the relative weights to be attached to different functionings and capabilities: “If person i has more of a significant functioning than person j, and at least as much of all such functionings, then i clearly has a higher valued functioning vector than j has” (Sen 1999: 78). As for the “intersection approach,” its use yields a partial ordering: “An ‘intersection’ partial ordering places x above y if and only if x is better than y according to all the desirables features” (Sen 1992: 133; see also Sen 1985a, Chapter 5). However, the “relation of dominance” conflicts with the personal-preference principle (Schokkaert 2009: 558).
conversion factors and the problem of adaptive preferences are taken into account in empirical studies.

Concerning the assessment of functionings and capabilities, many empirical applications use multivariate analysis techniques (e.g., factor analysis, principal component analysis, correspondence analysis, and cluster analysis) to identify and measure components of valuable functionings and capabilities. This set of statistical techniques allows researchers to summarize the information from many variables into a reduced set of variates that are formed as linear combinations of measured variables. The aggregation and weighting structure are empirically grounded, derived directly from the data. The issue of weighting is thus resolved, and the researchers do not need to decide what weighting system to adopt. However, these techniques have some drawbacks: first, there is no single aggregation solution, and second, the aggregation and weights vary every time new data are analyzed, making comparison between years or countries difficult.

Another technique used to operationalize the capability approach is fuzzy set theory. Fuzzy sets are sets whose elements have degrees of membership. Fuzzy set theory permits the gradual assessment of the membership of elements in a set, and it can be used in different domains in which information is incomplete or imprecise. Fuzzy set theory is particularly appropriate for poverty or well-being measurement. Indeed, functionings such as “being educated,” “being nourished,” or “being well sheltered” have been either fully achieved or clearly not achieved, but, more often, there are different degrees of achievement that also depend on individual aspects and specific context. Several methods for assigning degrees of membership exist, and a range of operators can be applied to aggregate across functionings or well-being dimensions.

Regression techniques, including ordinary least squares (OLS) regression, probit models, ordered logit models, and structural equation modeling, are the third group of techniques frequently adopted to operationalize the capability approach. These techniques allow researchers to model multidimensional aggregate variables (e.g., capabilities, functionings, and subjective well-being) as functions of resources and sociodemographic variables.

In what follows, we will review some empirical applications using the techniques outlined above. Some of these techniques combine multivariate data reduction techniques with regression analysis and fuzzy set theory with multivariate data reduction techniques.

Schokkaert and Van Ootegem (1990) analyze the living standards of unemployed people based on the capability perspective. They use data from a survey of Belgian unemployed individuals, set up by a government agency, and factor analysis to identify six factors (i.e., social functioning, psychological functioning, physical functioning, micro-social contact, plans for the future and...
degree of activity, and financial functioning), which are interpreted in terms of relevant “basic functionings.” These findings are consistent with Sen’s framework for the following reasons: first, they illustrate that the unemployed person’s standard of living reflects Sen’s thesis that unemployment is a substantial form of capability deprivation (Sen 1997). Second, according to Sen (1985a: 46), in developed countries, some capabilities, such as the ability to entertain friends, participate in community life, and so on, may vary significantly between people. Third, the functionings obtained are a type of “refined functionings,” incorporating the counterfactual opportunities of the unemployed. Furthermore, to evaluate the possibility of perception bias or cases of adaptation to constraints resulting from the use of subjective data, the authors regress the obtained functionings on several socioeconomic variables (age, marital status, having or not having children, and so on). This regression analysis also enables the characterization of the living standards of different groups of unemployed people without the adoption of an aggregation procedure for an overall valuation.9 Two key findings may be highlighted: first, the level of net disposable household income only affects the financial functioning vector. Second, social integration and close relations have important effects on the standards of living of certain groups of unemployed individuals. The authors advocate that public policy for specific groups of the unemployed also be aimed toward aspects of well-being other than income.

Several empirical studies have sought to measure poverty and well-being comprehensively. These studies illustrate the idea, contained in the capability approach, that income alone is not sufficient to adequately assess individual well-being because non-financial issues may be even more decisive. We can distinguish applications based on macro-data-sets and those using micro-data-sets. For example, Bérenger and Verdier-Chouchane (2007) propose to measure standard of living and quality of life using the fuzzy sets approach and factorial analysis of correspondences and to compare results obtained with these different techniques. Their application is based on macro-data for the year 2000 and for 170 countries, with a focus on African countries. The standard of living index comprises nine means indicators covering three domains: education, health, and material well-being, whereas the quality of life index is a combination of nine indicators related to the quality of health, education, and environment in a broad sense. The indices incorporate no income component. The quality of life index also includes indicators of civil rights and political freedom to take into account the capability for participation in community life that is omitted from the HDI. The authors compare two methods, the fuzzy set theory and factor analysis, by ranking

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countries in descending order of well-being. The results are not identical because the assignment of weights to components of the standard of living and quality of life is different in each method. However, the matrix of the rank correlations shows that differences in ranking are not significant. The authors also compare their indices with the GDP per capita and the HDI. They find that the correlations between the standard of living and quality of life indices with the HDI are higher than with GDP per capita. Another interesting result is that their standard of living and quality of life indices can be disaggregated into sub-indices by domain, revealing weak achieved functionings in certain domains or a deprivation of basic capabilities or freedoms that would allow an individual to have the type of life he/she has reason to value. This information is relevant to policymakers developing policies that aim to increase human capabilities and fight under-development.

In the same vein, Krishnakumar (2007) has tried to ascertain whether well-being analyses focusing on functionings and capabilities produce different results compared with assessments based on the HDI or GDP per capita. Applying cross-sectional data of middle-income and low-income countries across the world for the year 2000, drawn from different databases (UNDP, World Bank Group, Country indicators for Foreign Policy), to her structural equation model10 in order to derive an aggregate capability index reflecting three dimensions of human development (knowledge, health, and political freedom), she finds that the rank correlations between the HDI and the aggregate capability index are higher than that between GDP per capita and the aggregate capability index. However, for some countries, country rankings based on the aggregate capability index differ quite a lot from rankings based on HDI. In other words, some countries do much better in terms of the aggregate capability index than of the HDI, while the opposite is true for other countries.

Based on data-sets from the 2001 household survey and four censuses (1971, 1981, 1990, and 2001), Roche (2008) proposes a series of indicators and indices for monitoring progress and inequality in housing adequacy in Venezuela. He has combined principal component analysis and fuzzy set theory to address the complexity inherent in the capability approach. This method allows him to obtain

10 Structural equation models are part of the latent variable models with applications in the context of human development and based on Sen’s capability approach (Krishnakumar and Nagar 2008). Structural equation modeling techniques enables researchers to answer a set of interrelated research questions by modeling the relationships among multiple independent and dependent constructs simultaneously. A structural equation model contains two inter-related models, the measurement model and the structural model. Both models are explicitly defined by the researcher. The measurement model defines the latent variables that the model will use and assigns observed variables to each. The structural model then defines the causal relationship among these latent variables. For example, from a capability perspective, the different dimensions of development (or deprivation) cannot be directly measured but can be represented by latent variables manifesting themselves through a set of achievements (or the lack of it). At the same time, these latent dimensions mutually influence one another; hence, it is important to explicitly specify these interactions in the form of a structural model. (Krishnakumar and Nagar 2008: 487 and 488)
an overall synthetic index of housing adequacy; three synthetic indices that capture different dimensions, such as housing services (sewage facilities, water, electricity, and fuel for cooking), housing structure (material in the roof, floor, and walls), housing space and density; and eight indicators related to specific areas of housing adequacy. These indicators are used to assess inequalities in housing adequacy among social groups and among provinces or municipalities.

Additional empirical studies have been undertaken at the micro-level of analysis within the capability approach. Using data from the Panel Study of Belgian Households, Lelli (2008: 351) applies factor analysis and fuzzy set theory to well-being measurement and finds that both techniques show that “income accounts only for a very limited part of the story and this should definitively be seen as a reason to follow multidimensional approaches like Sen’s.” The author provides not only an overall picture of Belgians’ living standards but also a portrayal of the most deprived individuals (unemployed, housewives, retired, and divorced) according to each functioning identified by factor analysis and fuzzy set theory.11 Furthermore, her analysis displays important regional disparities.

Using data from the 8th wave of the British Household Panel Study, Burchardt and Le Grand (2002) propose an innovative method to assess employment capability and distinguish individuals who choose not to seek employment (voluntary non-employment) from those who are not employed because they face constraints that are beyond their control (involuntary non-employment). Paid employment is a functioning that is observed straightforwardly, whereas employment capability is unobservable. However, a person observed not to be performing paid work may lack employment capability or may prefer not to work to perform other tasks (e.g., education or training and caring responsibilities) even if employment is within his or her capability set. Another issue is the problem of adaptive preferences: people who are out of work may withdraw from the labor force because their job prospects are not strong, and they are thus discouraged; social factors may play a role in reducing women’s labor participation.

To resolve these issues, the authors proceed in two steps. In the first analysis, they suppose that all non-employment is voluntary and seek to identify individuals who may, in fact, face constraints on employment. Possible constraints are introduced in layers12 in probit regression models. The idea is that where someone

11 The assessment of functionings according to factor analysis and fuzzy set theory highlights seven functionings: psychological distress, social interactions, economic conditions, cultural activities, working conditions, health, and shelter.

12 Four types of constraint layers are distinguished: layer 1 includes age, sex, ethnicity, and parent’s social class; layer 2 includes layer 1 and adds individuals’ health status; layer 3 includes layers 1 and 2, as well as individuals’ level of education and labor market experience; layer 4 includes all of the previous layers, as well as other factors such as local unemployment rate, housing tenure, marital status, age of the youngest child, and caring responsibilities, which influence an individual’s employment opportunities.
has a high predicted probability of employment but is not working, this outcome is a result of his/her preferences. Because the first analysis might underestimate the effect of unobserved or hidden constraints, a second analysis is conducted that begins from the opposite assumption—that all non-employment is involuntary—and gradually subtracts those who prefer to be out of work. Indeed, the survey provides information about the job search activities of the non-employed, those who are enrolled in full-time education or training, those who are sick or disabled for the long term, and those who have full-time care responsibilities. Finally, this two-stage method shows that one-tenth of the non-employed in the sample may be unambiguously classified as being voluntarily out of work, with the others facing many constraints and lacking job readiness. This method is replicated in another work (Burchardt 2002), and the result is that at the end of the 1990s, approximately three-quarters of the women who were not working in Great Britain lacked employment capability. Only one-third of these individuals were included in the official unemployment statistics. From a policy perspective, these findings suggest that policymakers should seek to remove employment barriers (housing and transport policy, health policy, training programs, childcare facilities, and so on) to increase employment opportunities for those who are involuntarily out of the workforce and vulnerable.

The empirical studies reviewed until now have been based on secondary data. However, there have been some attempts to measure capabilities directly with the design of ad hoc surveys (Anand et al. 2009, 2011; Anand and van Hees 2006). The aim is to gather capability-related information at the individual level. Anand and van Hees (2006) developed a survey questionnaire that aimed to distinguish between achievements (functionings) and scope in people’s lives. This approach provides a way of measuring capabilities. The questionnaire contains items related to seven dimensions: happiness, achieving things, health, intellectual stimulation, satisfying social relations, pleasant environments, and personal projects. There is also a set of questions asking people to estimate the proportion of the total English population who have severely limited opportunities in the seven areas identified. The respondents’ answers to some questions also enable the researchers to take into account well-being, as well as agency issues. Using ordered logit models, the researchers explore the relationships between capabilities and satisfaction. The authors show that capabilities, achieved functionings, and life satisfaction (subjective well-being) are correlated across a range of life domains. The finding appears robust after controlling for sociodemographic characteristics. Although Anand and van Hees (2006: 276) recognize that “self-reports may themselves be correlated via some personality trait,” no control variables for different personality traits are introduced in the ordered logit regression models. Furthermore, personality may affect the rate at which people convert resources into welfare.
Thus, personality may impact both an individual’s perceived capabilities and their expressed well-being. This issue must be resolved when subjective data are used.\footnote{Furthermore, according to Schokkaert (2007: 423), if we adopt a non-welfarist framework like the capability approach, we should clean the measures of overall life satisfaction based on self-reports in happiness surveys by drawing a demarcation line between legitimate and illegitimate causes of inequality in life satisfaction: “The cleaned measure should be sensitive to the compensation variables (i.e., the illegitimate sources of inequality), but not to the responsibility variables (i.e., the legitimate sources of inequality).”}

Anand et al. (2009) construct a survey instrument to identify capability indicators related to relevant dimensions of human well-being. For this purpose, they refer to Martha Nussbaum’s list of capabilities. They assess how far capabilities, derived from interviews of a representative sample of employed persons in Great Britain, are covariates of a life satisfaction measure of utility. Using OLS regression analysis and controlling for sociodemographic factors and personality traits, the authors find that 17 capability indicators covering a broad range of life domains (bodily health, bodily integrity, emotions, practical reason, affiliation, and control over one’s environment) significantly influence life satisfaction.

In the same perspective, drawing on data from a version of the OCAP survey instrument for measuring capabilities\footnote{The OCAP survey instrument is part of the capabilities measurement project. The survey comprises questions related to an individual’s personal perception of his/her own freedom of choice or opportunities. It was developed to provide information on the Nussbaum capabilities, a range of standard socio-demographic covariates, and a five-dimensional measure of personality. See https://www.open.ac.uk/ikd/projects/capabilities-measurement/.} that was delivered in 2007 to 976 adults in Argentina, Anand et al. (2011) seek to estimate the influence of capabilities on life satisfaction. First, a set of capability indicators is developed, covering 10 domains (i.e., health, freedom of political expression, freedom of religion, freedom of thought, emotional capabilities, security, environment and social relations, discrimination outside of work, and work). Then, these capability indicators are introduced in a generalized linear latent and mixed model, taking into account potential problems of endogeneity and unobservable heterogeneity. Indeed, personality traits likely affect the answers to life satisfaction questions and also to capability questions. As life satisfaction is a dependent variable, while capability indicators are the explanatory variables in the model, a potential problem of endogeneity results. Thus, controlling for potential endogeneity is crucial in this exercise. Finally, the authors find that empathy, self-esteem, goal autonomy, discrimination, safety, and stress matter significantly for life satisfaction.

Although primary empirical studies generate data specifically suited for applying the capability approach, the main drawback is that it is difficult to generalize the findings because they depend on the specific sample of respondents, and the implementation of questionnaires is costly.

Surprisingly, the capability approach has been adopted to assess French corporate policies, especially in the field of continuing vocational training.
Lambert and Vero (2013) challenge the idea that “appetence for learning” derives exclusively from individual motivation or desire. The desire to learn is actually shaped by human resource management policies regarding vocational training. They ask how firms can contribute to developing what they call the “capability to aspire” for learning among employees. Based on data from the French linked employer–employee survey DIFES1, the authors proceed in two steps. First, they propose a cluster analysis that leads to a typology of corporate training policies, taking into account both the vocational training opportunities and the opportunity for employees to express their points of view on training actions and to be heard. The aim is to identify capability-friendly backgrounds concerning vocational training. This approach enables the authors to consider both the opportunity and the process aspect of freedom, a central tenet of Sen’s capability approach. Four training corporate policy models are distinguished: no specific continuing vocational training policies (47.5% of the firms surveyed), competence-oriented management logics (27% of the firms surveyed), training based on participation (15% of the firms surveyed), and training based on capabilities (10.5% of the firms surveyed). Second, they seek to highlight the determinants of the capability to aspire for learning, especially the role played by corporate training policies. For this purpose, they use four bivariate recursive probit models to estimate the probability of employees declaring unsatisfied training needs according to their sociodemographic characteristics, their current employment conditions, their past training experiences, their occupational trajectories and whether they belong to one of four groups of firms exhibited by the cluster analysis. They find that, all other things being equal, working in a capability-friendly firm increases the probability of reporting unsatisfied training needs by 60%, whereas the probability of employees stating unsatisfied training needs and belonging to the first group of firms with few or no opportunities for vocational training decreases by 36%. This result shows that these firms’ lack of investment in training impedes their employees’ expression of their unfulfilled needs for training because they comply with organizational expectations, which raises the issue of adaptive preferences.

Lecourt (2013) focuses on the pathways to obtaining qualifications through the French Accreditation of Prior Experience Learning (APEL) process by adopting a capability perspective. APEL was first introduced in the 2002 Social Modernisation Act. The applicant must prove that his/her experiences fit with the desired qualification. The “capability pathway” within the APEL process is characterized by individual constraints and structures of opportunities, such as years of experience, professional pathway, employment status, initial level of education, gender, individual motivation for entering APEL process, type of employer, sector of activity, conditions of application, being or not being supported (APEL leave, enrollment fees, personal accompaniment services), and
so on. Using data from a French survey conducted in 2007 and logistic regression analysis, the author determines the average effects of the various resources and conversion factors on the probability of accreditation. The main findings are that applicants’ chances of success significantly depend on their status, the type of employer, and the occupational sector involved. Benefiting from personal accompaniment and APEL leave increases applicants’ chances of obtaining qualifications. Finally, applicants undertaking APEL procedures are not all on equal footing, although they have the same formal rights, because employer–employee relationships are important, and working in a capability-friendly firm is one of the main factors that contributes to a successful outcome.

To conclude this overview of empirical applications of the capability approach, we note that a few works have focused explicitly on the problem of adaptive preferences on the one hand and on the process of converting resources into functionings or capabilities on the other.

Burchardt (2005) investigates the relationship between changes in actual income and subjective well-being. She asks whether people adapt to changes in income level. Using longitudinal data over a 10-year period from the British Household Panel Survey and multivariate techniques (OLS fixed effects regressions and ordered logit regressions), she highlights two main results. First, the individual’s position in the income distribution matters. Indeed, people in the top quintile group with high income in 2 consecutive years are less satisfied than those who have recently experienced an increase in their income, whereas the opposite result is observed for the bottom quintile group: those with stable low income are more satisfied than those with a recent increase in income. Second, if one is interested in long-term changes in income, the results show that compared to people who have had a stable income trajectory over the 10-year period, those who have experienced rising incomes are no more satisfied, as they become increasingly accustomed to a higher consumption level and strive to keep up with the rest of society. In contrast, those who have become poor within a 10-year period are less satisfied than those who have been poor throughout that time. All of these results are consistent with the adaptation hypothesis. However, this form of adaptation is not quite similar to that developed by Sen, who refers to “the battered slave, the broken unemployed, the hopeless destitute, the tamed housewife” (Sen 1986: 17) and insists that people adapt to poverty and hardship or that their aspirations are conditioned by social, cultural, or religious norms.

Sen’s prominent argument against utility-based approaches is that they are not sensitive to the problem of adaptive preferences (Sen 1992: 55), whereas the capability approach can address this problem. Nevertheless, according to Burchardt (2009), the capability approach is subject to the same criticism. She argues that evaluation based on agency goals or well-being freedom is
problematic in the presence of adaptation phenomena because an individual’s ability to formulate agency goals and to express higher aspirations is affected by his or her past experience and socioeconomic status, but the process of selecting valuable functionings from a given capability set also depends on previous experience of economic inequality. Based on a case study of the educational and occupational aspirations of a cohort of young people in Britain and ordered logit regressions, Burchardt finds that young people’s ability to plan for the future in relation to education and employment and the capability to continue in education at age 16 are strongly and significantly correlated with past experience and parental social class. She thus concludes on the need to address preferences and aspirations as endogenous and to adopt a dynamic conception of capability, which implies an assessment of capability over the human lifecycle, that is, to conduct not only a cross-sectional study but also a longitudinal study of capability.

The empirical examination of conversion factors has received comparatively less attention in the literature. Conversion factors are often taken into account in an implicit way: for example, a vector of achieved functionings is regressed on several socioeconomic variables (i.e., age, gender, employment status, marital status, number of children, and geographical areas). Only few papers have tried to measure or to estimate conversion rates. Blinder and Broekel (2008) adopt a two-step approach to assess the conversion efficiency of three basic functionings, “being happy,” “being educated,” and “being healthy,” using the British Household Panel Survey data-set. In a first stage, they provide a measure of conversion efficiency by calculating a frontier of efficient individuals. Individuals on this efficiency frontier are efficient in achieving valuable functionings given their resources. The distance to the efficiency frontier indicates the degree of inefficiency in the conversion of resources into functioning achievement, that is, “being happy,” “being educated,” and “being healthy.” This method enables the authors to obtain a distribution of efficiency scores relative to the efficiency frontier. In a second stage, they regress the obtained efficiency scores on a number of factors, such as age; gender; being self-employed; not being unemployed; and being married, separated, divorced, or widowed. The main results of this two-step approach are as follows: first, 23.36% of the individuals in the sample can be considered efficient in their conversion; second, the average inefficient individual achieves approximately 33% less functioning achievement than an efficient individual with the same resources; third, being female, young, self-employed, not being unemployed, and not being separated, divorced, or widowed significantly increases the conversion efficiency.15

15 The authors discuss the finding that being female increases significantly the conversion efficiency that may appear puzzling.
Chiappero-Martinetti and Salardi (2008) use analogies from production theory to conceptualize the well-being process as a sort of conversion function: inputs (private and public resources) are transformed into outputs (functionings achievement). The conversion factors (personal, social, and environmental factors), similarly to technical constraints, affect and determine the conversion rate, that is, the ability to convert means to achievement. The authors propose an estimation of the conversion rates. The data are drawn from a sample survey conducted in 1999 by the Italian Central Statistical Office. They estimate an ordered probit model for each following functioning, “being healthy,” “being educated,” and “living in a healthy and safe environment,” taking into account private resources, public services, and conversion factors. The impact of public resources on functioning achievements is statistically significant. The authors also estimate the conversion rates for six different population subgroups according to age and gender to identify subgroups that are efficient or less efficient in converting resources into achievements. From a gender perspective, women are generally more efficient in converting public resources than men across all the achievements considered.

To our knowledge, only one paper has stressed the importance of considering the temporal dimension of capabilities. Blinder and Coad (2011) underline the interrelation between functionings, conversion factors, and resources on the one hand and their intertemporal development on the other hand. In fact, for example, “being in good health” depends to a certain degree on the individual’s resources, but the achievement in this dimension would also influence the individual’s resources and another functionings. In addition, some functionings, for example, “being happy” and “being healthy,” are connected and evolve together over time. This issue, according to the authors, is neglected in the empirical literature related to the capability approach. Using data from 15 waves of the British Household Panel Survey, they first construct a set of six “basic functionings”: “being happy,” “being healthy,” “being nourished,” “moving about freely,” “being well-sheltered,” and “having satisfying social relations.” For each functioning selected, different indicators are chosen and aggregated into one comprehensive functioning achievement measure via a principle component analysis. In a second stage, the authors adopt a vector autoregression approach to analyze the “dynamic processes of the evolution of functionings and resources over time” (Blinder and Coad 2011: 332). Conversion factors are represented by control variables such as gender, age, level of education, being unemployed, individual marriage status, and so on. Happiness positively affects the health, food, and mobility functionings. Increases in health are associated with higher mobility and positively influence mental well-being. Income is traditionally considered to be a resource, but it is also influenced by the functioning achievement for mobility.
On the other hand, rises in income are not followed by an increase in happiness. This finding provides some support for the adaptation hypothesis.

5. CONCLUSION

The operationalization of the capability approach is a demanding task because of its “underspecified” nature. Moreover, additional issues related to the operationalization of the capability approach arise: should capabilities or functionings be addressed? How should relevant capabilities or functionings be identified? What weighting procedures should be adopted? When applying the capability approach, how should internal and external conversion factors that affect the ability to convert resources into valuable outcomes be applied?

This paper has provided a literature review of quantitative applications based on the capability approach in different domains. The aim is to show that the capability approach is increasingly used as an evaluative framework for individual welfare and social arrangements. It also enables a discussion of how methodological problems and empirical challenges have been addressed.

The acknowledgment of human heterogeneity and of the heterogeneity of objectives implies a broadening of the “informational basis of judgments.” In fact, the adoption of an “informational basis of judgments” is not value-free because it shapes the perception of reality and thus underpins policy design. We must evaluate freedoms for people to be able to make decisions they value and work to remove obstacles to these freedoms. To what extent do the policies in place or to be implemented act as driving forces or obstacles to the development of capabilities?

Although the objective of empirically assessing capabilities is not easy, it has become feasible, and more applications based on the capability approach should be undertaken, and some empirical questions need further investigation. First, the effect of time should be addressed to consider both process and opportunity freedom. Moreover, capabilities are not fixed and may evolve. It is therefore important to consider the temporal dimension of capabilities. Second, more analyses should be conducted to understand how an individual’s ability to choose may vary over time. Third, the problem of “adaptive preference” would have been more satisfactorily handled had the use of questionnaire data been completed through direct observations of personal status.

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