Measuring social exclusion

using the capability approach[1]

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Abstract

The aim of this paper is to explore the possibility of a multidimensional analysis of social exclusion using the capability approach. According to Sen, we define social exclusion as a process leading to a state of functioning deprivations (impossibility to reach a certain level of well-being). Therefore, the "process" of social exclusion produces a "state" of exclusion that can be interpreted as a combination of some relevant deprivations. Starting from this definition, we set down a social valuation function and we propose the unique social exclusion measure consistent with our social valuation function. Finally, we present an empirical application to 1998 Spanish data from the European Community Household Panel.

Keywords: Social Exclusion Measurement, multi-dimensional index.

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1. Introduction: what is social exclusion?

At the end of 1980s, in developed countries, we observed a conceptual shift from the concept of income poverty to the concept of social exclusion. In fact, the deep transformations in the economic system in Western countries, and the strong individualism emerged, led to the emerging of problems that were not only related to a lack of income or wealth. The weakening of family ties, an increase in the job insecurity and in the unemployment rate, a growing violation of human rights and a decline in social participation show the inadequacy of standard measures of poverty in describing the new reality.

Social exclusion can be seen as a process that fully or partially excludes individuals or groups from social, economic and cultural networks and has been linked to the idea of citizenship (Lee-Murie, 1999). In fact, social exclusion can be defined as disempowerment at the individual level and as structural obstacles at the social level, which deny some groups access to resources associated with citizenship (Gore, 1997). In particular, Bhalla-Lapeyre[2] define social exclusion as a process, which causes individuals or groups, who are geographically resident in a society, not to participate in the normal activities of the citizens in that society. Thus, social exclusion is a multidimensional concept. In fact, the European Commission suggests that " (social exclusion) states out the multidimensional nature of the mechanisms whereby individuals and groups are excluded from taking part in social exchanges, from the component practices and rights of social integration and identity... it even goes beyond participation in working life: it is felt and shown in the fields of housing, education, health and access to services".[3]

Social exclusion can also been seen as a part of the Sen's capability approach, and it can be defined as a process leading to a state of functioning deprivations (Sen, 2000). Therefore, the "process" of social exclusion produces a "state" of exclusion that can be interpreted as a combination of some relevant deprivations.

In order to promote social cohesion and inclusion (as explicitly required by the Lisbon Summit), the EU states have to identify the social excluded individuals. In fact, in order to evaluate the efficacy of any inclusion policy it is necessary to observe the change in the level of social exclusion over time. Thus, the way in which the level of social exclusion is measured is important both for understanding of exclusion and for policy implications. Therefore, there is a growing literature that focuses on the definition of an appropriate measure of social exclusion and in the identification of who is socially

[2] Definition based on Lee \& Murie (1999) and Burchardt (1999)

excluded today (e.g. D'Ambrosio – Chakravarty 2002, Tsaklogou-Papadopoulos 2001, Nolan- Whelan-Maitre-Layte 2000). There also exists a literature on multidimensional poverty that, as well as the literature on social exclusion measurement, suggested several functional forms for multidimensional poverty indices (Tsui 1997, Chakravarty et al. 1998, Bourguignon – Chakravarty 1999, 2002).

The main problems in the choice of a particularly measure of social exclusion are the followings two. First, the identification of the social excluded (the problem of counting the number of social excluded people and determining the degree of individual exclusion) becomes a multivariate problem. Second, the choice of a particular measure of social exclusion can be arbitrary, and so can be the conclusion based on that measure. However, it may be possible to reduce the degree of arbitrariness by choosing all measures that fulfill a set of reasonable postulates (see Bourguignon – Chakravarty 2002). That is, instead choosing individual social exclusion measure we are choosing a set of criteria for social exclusion measures which in turn implicitly determines a class of measures.

This paper contributes identifying the social excluded individuals using Sen's capability approach, Moreover, it contributes on the existing literature defining general classes of social exclusion measures based on a set of properties that has to be satisfied by multidimensional exclusion measures. In fact, the aim of this paper is to construct a measure of the state of social exclusion using an appropriate theoretical framework where all the hypothesis, as well as the corrisponding welfare structure, are fully specified.

In next section, we review the main literature on social exclusion and multidimensional poverty. In section 3, we use Sen's capability approach in order to specified a certain social valuation function. In section 4, we discuss a set of properties to be satisfied by multidimensional social exclusion measures. Finally, in section 5, we explore the link between the selected index and the specified social valuation function. We prove to be an unique relationship between them. Therefore, if we wish to use the specied index to analyse social exclusion we should be award of the social valuation function and the properties below it. The specification of such hypothesis below the selected index is the real contribute of this paper. In section 6, we present an empirical application to 1998 Spanish data from the European Community 9Household Panel (ECHP). [4] Finally, some conclusions are made.

[3] Commission, 1992, p.8; Commission 1993c, pp 20-1
[4] European Community Panel Data version December 2002

2. Literature review

The measurement of social exclusion is actually object of study and the literature on multidimensional poverty measurement has just begun. Moreover, research on social exclusion has actually taken two branches.

The first branch of literature is focused on developing an axiomatic approach to the measure of social exclusion. For example, Chakravarty-D'Ambrosio (2002) identified a class of subgroup decomposable social exclusion measure using a set of independent axioms and, then, they looked at the problem of ranking exclusion profiles by exclusion dominance principle under certain restrictions. Our paper also wishes to investigate the theoretical background below some social exclusion measures. Moreover, we wish to go forward the problem of identifying individuals as excluded or not, and to focus on the exclusion gap (that is the problem of measuring the degree of exclusion).

The second branch of literature is focused on the empirical analysis of social exclusion without developing an appropriate theoretical background. In this branch we find some recently application of Sen's capability approach to the multidimensional analysis of social exclusion. Brandolini-D'Alessio (1998) defined a small number of indicators classified in six categories (health, education, employment, housing, social relationship, and economic resources) and they computed them using Italian data for 1995. A low correlation between functioning measures confirms the usefulness of broadening the analysis to non-economic factors. Tsakloglou and Papadopoulos (2001) applied the same kind of analysis in order to identify the population members at high risk of social exclusion in Europe. Following the idea that social exclusion is a dynamic process leading to deprivation, they construct static indicators of deprivation in particular fields (income, living conditions, necessity of life and social relations). Then, they aggregate this information in order to obtain a static indicator of cumulative disadvantage. So, individuals classified as being at high risk of cumulative disadvantage at least twice during the period of three years, are classified as being at high risk of social exclusion. In this way, the indicator of cumulative disadvantage (indicator of cumulative deprivation) describes the level of social exclusion. In our paper, we also apply Sen's capability approach to identify social excluded individuals and we also face an identification problem of multivariate type. However, our aim is to construct a theoretical background in order to justify such kind of empirical analysis.

Measurement a multidimensional context is also an issue in poverty analysis. In fact, according to Bourguignon - Chakravarty (1999, 2002), poverty of a person arises due to his/her insufficiency of different attributes of well-being (e.g. housing, literacy, health, provision of public good, income, etc.). This turns poverty in a multidimensional phenomenon, and the poverty concept becomes very close to the concept of social exclusion. Thus, Bourguignon and Chakravarty provided multidimensional poverty-measure ordering corresponding to a family of multidimensional poverty measures satisfying a set of intuitive axioms. We use a procedure similar to the one suggested by Bourguignon and Chakravarty but, we extend the set of properties that a general class of social exclusion measures has to satisfy.

3. Identification of the social excluded individuals

There are dimensions of well-being of people that are not easily captured by income or monetary indicators. In particular, Sen argues that the well-being of an individual is best seen as an index of the individual's functionings (Sen, 1985). Functionings represent parts of the state of an individual, in particular the various things that he or she manages to do or be in leading life. The capability of a person reflects the alternative combinations of functionings the individual can achieve, and from which he or she can choose one collection (Sen 1993). Thus, living is viewed as a combination of various "doings and beings", with quality of life to be assessed in terms of the capability to achieve relevant functionings.

According to Sen's capability approach, we define social exclusion as the impossibility to achieve some relevant functionings. Since, the impossibility to reach a functioning leads to a state of deprivation, the "state" of social exclusion can be defined as a combination of some relevant deprivations. Therefore, in order to implement our analysis we need to solve the following problems: first, we need to define "the relevant functionings", that is, the dimensions of analysis; second, we need to identify the excluded individuals in every dimension and their degree of exclusion; and, finally, we need to evaluate the individual vectors of relevant functionings, that is, we need to write an individual, and an aggregate, social valuation function.

In this section, we focus on the second and third problem leaving to the empirical section for identification of the relevant functionings.

Assume that we have N individuals and G relevant functionings. x_g is the column vector containing N individual observations, defined on the support [0,1], relative to functioning g. Therefore, its

transpose is $x'_g=(x_{1g},\ldots, x_{Ng})$. Every individual i has achieved the functioning value of x_{ig} (with g=1..G). We define the individual deprivation relative to the g-th functioning as the deprivation gap:

$$y_{ig} = \max \{ (x^*_{ig} - x_{ig}), 0 \}$$

where x^*_{ig} is the threshold (cut-point) that groups the g-th functioning distribution in two clusters: deprived and not-deprived individuals. This cut-point is defined as:

$$x^*_{ig} = \alpha \mu_g$$

where $\alpha \in (0,1)$ and $\mu_g=(1/N)\sum_i x_{ig}$ is the mean for functioning g.

The social value in the society can be seen as a decreasing function of the impossibility of achieving some relevant functionings (impossibility of reaching a certain level of well-being). Therefore, the individual valuation function can be seen as a combination of the G deprivation values:

$$z_i = -\sum_g w_g y_{ig} \qquad \text{with} \qquad \sum_g w_g = 1 \text{ for all } i=1,..,N$$

where w_g is the weight given to the g-th deprivation value.

We define the weighting structure as a decreasing function of the proportion of the deprived individuals in each dimension. An inverse relation, between the weight and the number of deprived individuals in each dimension, was also used by Desai-Shah (1988), Cerioli-Zani (1989), Nolan-Whelan 1996, Tsakloglou-Papadopoulos, and Whelan-Layte-Maitre (2001).[5] Therefore, the weight given to the g-th functioning has the following expression:

$$w_g = [(1-\alpha_g)/(\sum_g (1-\alpha_g))]$$

where α_g is the proportion of deprived people in dimension g determined using x_g^* as cut-off.

We can simply derive the social valuation function, V, from the individual valuation functions as the their sum:

$$V= \sum_i z_i$$

It can also be expressed as:

$$V(x)= -\sum_i \sum_g w_g \max \{ (x^*_{ig} - x_{ig}), 0 \} \qquad (1)$$

where x is the NxG matrix equal to $(x_1 \mid \ldots \mid x_g \mid \ldots \mid x_G)$ and x_g is the colunm vector containing the N individual values x_{ig} with i=1…N.

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5 Often the weight proposed for each variable is the proportion of households possessing the item.

The social valuation function, as defined above, has the following properties:

1) The social valuation function, V, is homogenous of degree one: V(ax)=aV(x) for all x? R^{NxN}_{++} and a>0.

Proof

$$V(ax)= -?_i ?_g w_g \max\ ? (ax^*_{ig} - a x_{ig}), 0 ? = -a?_i ?_g w_g \max\ ? (x^*_{ig} - x_{ig}), 0 ? = aV(x)$$

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2) The social valuation function, W, is increasing along rays: W(ax)>W(x) for all x? R^{NxN}_{++} and a>1.

Proof

It follows from the homogeneity of degree one.

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3) The social valuation function, W, is additive and continuous.

Next step is to derive a particular measure of social exclusion "compatible" with the social valuation function constructed using the Sen's capability approach. However, there exists many social exclusion measures compatible with our social valuation function, and we cannot choose arbitrary one of them. In fact, different measures imply different results. Thus, we need to define some criteria to make this choice less arbitrary as possible. This is done in the following sections.

4. Properties for a measure of social exclusion

The choice of a particular measure of social exclusion is quite often arbitrary and, therefore, the conclusion based on such measure is also arbitrary. Since in this paper we wish to define a general class of social exclusion measures in the least arbitrary way possible, in this section we discuss a set of reasonable properties for a social exclusion measure and, then, we use these properties to determine a class of measure. We start discussing a set of properties considered as reasonable from the literature on income poverty. Then, we extend these properties to the case of multi-dimensional well-being attribute.

Sen (1976) suggested two basic postulates for income poverty measure: the monotonicity axiom (which demands poverty to not decrease under a reduction in the income of a poor), and the transfer axiom (which requires that poverty should not decrease if there is a transfer of income from a poor person to anyone who is richer) Following Sen several other properties have been proposed in the literature (e.g.

Foster, Greer and Thorbeck 1984, Donaldson and Weymark 1986, Chakravarty 1990, Foster and Shorrocks 1991, and Bourguignon and Fields 1997).

The properties proposed for an income poverty index have been generalized by Bourguignon – Chakravarty (2002) for any index, SE(x), defined on G dimensions. We define x as a matrix where each column contains N individuals observations relative to functioning g, for g=1…G. Therefore, x_{ig} is defined as the value representing the individual i in dimension g. We also define as deprived in dimension g any individual i=1…N such that $x_{ig} < x^*_g$ (where x^*_g is the threshold in dimension g, that is, the minimal value necessary to be defined as "not excluded"). The properties, generalized by Bourguignon – Chakravarty, are:

? Focus (FOC): for any person i and attribute g such that $x_{ig} ? x^*_g$, an increase in x_{ig}, given that all other attributes remain fixed, does not change the social exclusion value SE(x).

? Normalization (NOM): if $x_{ig} ? x^*_g$ for all individuals i and attribute g, then SE(x)=0; moreover, SE(x) ranges between zero and one.

? Monotonicity (MON): for any person i and attribute g such that $x_{ig} < x^*_g$, an increase in x_{ig}, given that all other attributes remain fixed, does not increase the social exclusion value SE(x).

? Principle of population (POP): for all $x ? R^N_+$ and for all integer m>0, SE(x[m])=SE(x).

? Symmetry (SYM): for all $x ? R^N_+$ and for all permutation matrices, P, SE(x)=SE(Px).

? Subgroup Decomposability (SUD): for any x^1, x^2, …, x^k such that $x= Ux^j$, $SE(x)=? ^k_i (N_i/N) SE^i(x^j)$ where N^i is the population associated with x^j and $? ^k_i N_i=N$.

? Continuity (CON): for any vector of thresholds $(x^*_1,…, x^*_g,…, x^*_G)$, SE(x) is continuous.

? Transfer Principle (TRP): all the other things being equal, a pure transfer in the well-being in dimension g of a person above the threshold to someone below it must not increase social exclusion.

? Nondecreasing index under correlation increasing switch (ND): if attribute j can compensate for the lack of attribute g, then increasing the correlation between the two attributes must not decrease the index value.

The first property states that if an individual is not excluded with respect to an attribute, then giving him more of this attribute does not change the intensity of social exclusion even if he is excluded in some other attributes. "Normalization" says that if all individuals in the society are not excluded, than the index is valued zero. Under "monotonicity", social exclusion does not increase if the condition of excluded individuals improves. According to the "principle of population", if we merge two or more identical population, social exclusion does not change. This property is particularly helpful for intertemporal and interregional comparisons. "Symmetry" demands anonymity: social exclusion should depend on the intensity of the individual level of social exclusion but not on the name of the individual. "Continuity" ensures that small changes in the attribute quantities will not imply an abrupt jump in the value of the social exclusion index. Thus, a continuous social exclusion index will not be oversensitive to minor observational errors on basic need quantities. According to "subgroup decomposability", if a population is divided into several subgroups (e.g. defined by geographical regions), then the overall social exclusion is the population share weighted average of the subgroup exclusion levels. This property is particularly interesting from a policy point of view in the sense that it permits us to identify the subgroups that are most afflicted by social exclusion and hence to implement inclusion policies. The "transfer principle" is more difficult to figure out in terms of social exclusion. In fact, we should think of a pure transfer of "something" that can affect the well-being of a person in one dimension, and not of a pure transfer of well-being. For this reason, we use a weak version of the transfer principle: a pure transfer from a not excluded individual to an excluded person must not increase social exclusion[6]. Finally, the last property was defined by Bourguignon and Chakravarty to take care of the essence of the multidimensional measurement through correlation between attributes. In fact, this property stresses the difference between single and multidimensional measures by taking in account the association of attributes, as captured by the degree of correlation between them: an increase in correlation between two attributes should not decrease social exclusion (Bourguignon and Chakravarty 2002).

A multidimensional index that satisfies all the above properties has been suggested by Bourguignon and Chakravarty (1999), and it is the following:

$$SE(x)= (1/N) \sum_i \sum_g \max \{ ((x^*_g - x_{ig})/ x^*_g), 0 \}$$

[6] In the strong version of the transfer principle, such transfer must decrease social exclusion.

The following modification of the above index also satisfies all the properties reported in this section:

$$SE(x)= (1/N) \sum_i \sum_g w_g \max [0, ((x^*_g - x_{ig})/ x^*_g)]$$

where w_g are defined as in section 3.

5. Multidimensional social exclusion index

In this section, we demostrate that the multidimensional index of social exclusion suggested in the previous section is the unique (up to monotonic transformation) index consistent with the social valuation function derived using the capability approach. In particular, we prove that this social valuation order implies a unique normatively social exclusion ordering under the hypothesis that the social valuation function is weakly multi-homothetic. Moreover, the suggested social exclusion index, as seen in the previous section, is particularly appealing from a policy point of view since it satisfies a set of reasonable properties.

Our aim is to explore if a social exclusion ordering can be inferred from the given social valuation function. The latter is continuous, additive and increasing along rays (see Section 3). To establish if we can construct a social exclusion ordering related to a social valuation ordering we need to introduce the concept of consistency. Let SE(x) be an index of social exclusion, V(x) our social valuation function and x the functioning matrix, then we define consistency as follows:

Def. (consistency) We shall say that SE and V are mutually consistent if for all matrices x, $x^1 \in R^{NxN}_{++}$ such that $\sum_i x_{ig}=\sum_i x^1_{ig}$ for all g, we have that

$$SE(x) \geq SE(x^1) \quad \Leftrightarrow \quad V(x) \geq V(x^1).$$

Consistency implies that social value depends on "size" and "distribution" of each functioning, therefore we can write the social valuation function in the following way:

$$V(x)=f(-SE(x), \alpha) \qquad \text{where} \quad \alpha'=(\alpha_1,\ldots,\alpha_G) \text{ and } x \in R^{NxN}_{++}$$

Before we give a functional representation of a social exclusion index, we need to define some properties.

Def. (weak homothetic) V(.) is weak homothetic when $V(x) \Rightarrow V(x^1) \Leftrightarrow V(ax) \Rightarrow V(ax^1)$, for all x, $x^1 \in R^{NxN}_{++}$ such that $\sum_i x_{ig} = \sum_i x^1_{ig}$ for all g and a>0.

Def. (multiplication of a matrix (NxG) and a vector (Gx1) using the operator $\otimes$ *)* The operator $\otimes$ multiplies the g-th column of the matrix by the g-th element of the vector (g=1…G).

Using the operator $\otimes$ we can define V(.) as weak homothetic if $V(x) \Rightarrow V(x^1) \Leftrightarrow V(x \otimes \alpha) \Rightarrow V(x^1 \otimes \alpha)$, for all x, $x^1 \in R^{NxN}_{++}$ such that $\sum_i x_{ig} = \sum_i x^1_{ig}$ for all g, $\alpha' = a*e$ and a>0. In this case the vector α has all elements equal to a>0. But we can also define α as a vector with positive elements, but not necessarily all equal to each others, in this case we will speak about a new concept: "weak multi-homotheticity".

Def. (weak multi-homothetic) V(.) is weak multi-homothetic when $V(x) \Rightarrow V(x^1) \Leftrightarrow V(x \otimes \alpha) \Rightarrow V(x^1 \otimes \alpha)$, for all x, $x^1 \in R^{NxN}_{++}$ such that $\sum_i x_{ig} = \sum_i x^1_{ig}$ for all g and $\alpha >> 0$ ($\alpha \in R^G_{++}$).

Weak multi-homotheticity implies weak homotheticity. It also implies that each functioning distribution has to be weak homothetic. We are now ready to give the first theorem[7] that will permit us to arrive to the social exclusion index.

Theorem I. $V: R^{NxG} \Rightarrow R$ is weakly multi-homothetic if and only if there exist functions $f: R \times R^G_{++} \Rightarrow R$ strictly increasing in its first argument for any $g: R^{NxG} \Rightarrow R$ s.t.

$$V(x) = f(g(x \otimes \alpha^{-1}), \alpha)$$

Proof (necessity).

Weak multi-homotheticity requires $V(x \otimes \alpha^{-1}) \Rightarrow V(x^1 \otimes \alpha^{-1}) \Leftrightarrow V(x \otimes \alpha^{-1} \otimes \alpha) \Rightarrow V(x^1 \otimes \alpha^{-1} \otimes \alpha)$

for all x, $x^1 \in R^{NxN}_{++}$ such that $\sum_i x_{ig} = \sum_i x^1_{ig}$ for all g and $\alpha >> 0$.

This is equivalent to require that $V(x \otimes \alpha^{-1} \otimes \alpha)$ be an increasing transformation of $V(x \otimes \alpha^{-1})$, that is,

$V(x \otimes \alpha^{-1} \otimes \alpha) = f(V(x \otimes \alpha^{-1}), \alpha)$ where V is strictly increasing in its first argument.

[7] Extension of the Theorem 4 presented in Esteban-Dutta 1992

Choosing ?'=?'=(?$_1$,…,?$_G$), we obtain V(x)=f(V(x? ?$^{-1}$), ?) for all x? R^{NxG}

which clearly implies that exists a function g s.t.

V(x)=f(g(x? ?$^{-1}$), ?) for all x? R^{NxG}

The poof of sufficiency is straightforward.

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This theorem suggests that the natural candidate for the social exclusion index implied by V is simply -V(x? ?$^{-1}$). Moreover, its monotonic transformations are also "good" indices of social exclusion, so we arrive to the social exclusion index as defined in section 4:

$$SE(x)= (1/N) \sum_i \sum_g w_g \max [0, ((x^*_g - x_{ig})/ x^*_g)]$$

Last step is to show that the social exclusion index, implied by our social valuation function, is unique up to monotonic transformations. Since the social exclusion ordering is mean invariant by construction, we apply the following theorem[8]: "Let $?^{SE}$ and $?^{SE1}$ be two social exclusion orderings mean invariant to each other. If $?^{SE}$ and $?^{SE1}$ are consistent with a given $?^{V}$, then $?^{SE}$ and $?^{SE1}$ are identical". Thus, our social exclusion index is unique (up to monotonic transformations).

Now we are ready to state a second theorem:

Theorem II. Let the social valuation function be the one represented in (1), then the consistent and unique (up to monotonic transformations) index of social exclusion is:

$$SE(x)= (1/N) \sum_i \sum_g w_g \max [0, ((x^*_g - x_{ig})/ x^*_g)]$$

Resuming, we proved that the above index, an index satisfying a set of reasonable properties, is the unique (up to monotonic transformation) measure of social exclusion consistent with the social valuation function constructed using the capability approach. In next section, we present an empirical application of such index.

[8] Esteban-Dutta 1992, Theorem 2

3. Empirical Analysis

In the previous sections, we examined the problems related to the measurement of social exclusion and we indicated a practical method that will be applied in this section to 1998 Spanish data from European Community Household Panel (ECHP). The ECHP is a multi-country comparative household panel survey conducted annually by following the same sample of households and persons in Member States of European Union.

We select the G functionings that in our opinion are relevant to analyze social exclusion. These functionings are chosen to be representative of the economic and social dimensions of exclusion. We would also like to analyze the political dimension of social exclusion but, unfortunately, we do not have data about it. Using the available variables, we select the commodities and transform them in the G functionings. Then, the functionings are aggregate in the social exclusion index using the construction proposed in the previous section.

Functionings

We need to select the dimensions of analysis: the G functionings that represent the 'normal activities of the individual in the society'. Thus, vectors of items, characterizing a person, have to be converted into functionings by an individual function and social exclusion can be seen as an evaluation of the inability to achieve a valuable vector of functionings.

The identification of functionings is a key point of our analysis, and has to be done having in mind the fully-fledged characterization of well-being[9]. Moreover, we have to underline that a complete list of functionings cannot be unequivocally compiled. However, some guidance is offered by Sen (2001) and by the "Scandinavian approach to welfare" as proposed by Brandolini-D'Alessio (1998). Moreover, Tsakloglou-Papadopoulos suggested a list of functionings in their analysis of social exclusion. Thus, following the indications of the above literature we select three functionings to describe the economic features of social exclusion, and four functionings to emphasize the social dimensions of exclusion.

The selected functionings are the following:

[9] Brandolini-D'Alessio

- "the basic need fulfillment",
- "to reach a certain quality of life",
- "to have an adequate house",

- "the ability to have social relationships",
- "being healthy",
- "living in a safe and clean environment",
- "being able to perform a work activity" and "social status".

The first three functionings describe the economic dimensions of exclusion and they can be also used to compute measures of deprivation. Instead, the other functionings emphasize the social and political dimensions typical of social exclusion.

It is important to underline that every functioning results from the transformation of a vector of items chosen as representative of such functionings. Following the suggestion of the literature, [10] we selected the vectors of items as indicated in Table 1.

Using 1999 Spanish data, we identify 25 items that could be converted into functionings that we are interested in. We considered 21 household items to be converted in the following functionings: "Basic need fulfillment", "To reach a certain quality of life", "Having an adequate house", and "Living in a safe and clean environment". Moreover, we considered 4 individual items to be converted into functionings "Ability to have social relationships", "Being healthy" and "being able to perform a work activity". Notice that our unit of measurement is the individual and the sample is composed by individuals aged 16 or more.

According with Sen (2000), some functioning deprivations can be themselves causes of exclusion, while others functioning deprivations are only instrumentally causes of exclusion. In this second case, deprivations may not be impoverishing in themselves but they can lead to impoverishment of life through their causal consequences. Therefore, the environment conditions and ill health become important dimensions to analyze social exclusion, even if they are not constitutive causes of exclusion. Finally, we headlight that educational qualifications are also instrumentally causes of exclusion. However, we

[10] Sen, Brandolini-D'Alessio, Tasakloglou-Papadopoulos, Nolan-Whwlan-Layte-Maitre, Eurostat (2000)

observed that around 70% of the individuals in the sample have less than second stage of education.[11] Therefore, we do not consider this dimension.

For each selected item, we assigned to each individual a score ranging from zero to one. A score of one means that the individual can afford the item, has the item or does not have 'the problem'.[12] Instead, a score equal zero means that the individual is deprived in that item. All the values between zero and one mean an intermediate situation. No cut-points are computed.

We converted the selected items into functionings: this is our first aggregation. We sum up the score of each item representing the same functioning and we gave equal weights to the items. We divided each functioning score by the number of items belonging to such functioning in order to be able to compare the distribution of different functionings. Thus, for each functioning, an individual receives a score between zero and one. A score equal one means that the functioning has been fully achieved.

Table 6 shows the correlation coefficients among the items, and among functionings, show low degrees of association. This indicates that all of them are necessary to capture the different aspects of social exclusion. In facts, most coefficients are, in absolute value, below 0.25. We only observe a little stronger degree of association between the functionings "basic need fulfillment" and "to reach a certain quality of life".

Cut-points

The purpose of this sub-section is to find the cut-point that splits the population into two clusters in every dimension. Thus, in every dimension, we identify the group of excluded individual (the ones that do not achieve the functioning) and the group of not-excluded people (the ones that achieve the functioning). Using the cut-points, first we compute the level of exclusion in every dimension, and then, we aggregate the results in order to determine the level of individual exclusion and the average social exclusion. We define a cut-point for every dimension as the 50% of the distribution mean of such dimension. This definition of the cut-points is inspired by definitions used in Britain's official income statistics.

[11] Definition by ECHP

Empirical results

In this section, we compute the exclusion distribution for every dimension using the index proposed in the previous section. In every dimension, we computed the absolute distance between the individual position and the cut point. We assess this positive value to the individual if he is below the threshold, and a value equal to zero if he is above the threshold. Then, we aggregate these individual values in order to obtain individual social exclusion values, an the respective social exclusion distribution. The level of social exclusion in the Spain in 1999 is also computed.

Table 3 shows the proportion of people excluded in every dimension (headcount ratios), and Table 2 gives information about the individual distributions relative to the cut points. Thus, the distribution mean, the standard deviation and the average exclusion are reported for every dimension and in aggregate. More details about the social exclusion distribution are showed in table 4, a social exclusion graph is also reported. In Spain in 1999, the average social exclusion is particularly low, about 0.27, [13] and the percentage of the population with a social exclusion value bigger than zero is about 42%. We notice that there is a big group of individuals with individual social exclusion values close to zero, and only a small group with individual exclusion values really greater than zero. Thus, we found that a bit less than half of the population results in some way a excluded in at least one functioning, but the average social exclusion of the population is quite low. The same results are found if we look separately to every dimension: the excluded individuals have individual exclusion values very close to zero in every dimension and the average exclusion results very low for the majority of dimensions. Only for the following functionings average social exclusion results quite high: in the functioning "being able to perform a work activity" we registered an average social exclusion about 0.7, in "living in a safe and clean environment" and in "having an adequate income" it is about 0.5.

In table 5, we divide the population in sub-groups according to social and geographic individual characteristics. We observe that females have a higher average social exclusion than the population average exclusion. Individuals with less than second stages of education, single parents and couples with

[12] For example, he can afford a durable or he has an indoor flushing toilet or he does not have pollution in the area he lives.
[13] The social exclusion index range between 0 and 1. A value of one represents the maximum exclusion.

three or more children have also a higher average social exclusion. Moreover, we observe that the social exclusion average in Canarias and in South Spain is higher than the national average.

4. Conclusion

We constructed a measure of the "state" of social exclusion starting from an appropriate theoretical background. According to Sen, we define social exclusion as the impossibility to achieve some relevant functionings (impossibility to reach a certain level of well-being). Since there exists a strict relationship between well-being and social exclusion, we set down a social valuation function and we proposed the unique social exclusion measure consistent with our social valuation function that satisfies some reasonable properties.

The theoretical framework on which the index is constructed represents the principal advantage of our method. It is not only an intuitive index, but also it is justified by a theoretical construction and it satisfied a series of "meaningful" properties. The relationships between the chosen index and the welfare structure, as well as the properties below the index construction, result completely specified as consequence of our analysis.

The obtained index permits to analyse the multi-dimensional aspects of social exclusion, and to construct the distribution of social exclusion corrisponding to the society. This is indeed an advantage in the empirical analysis since it permits to compare distribution across time and space. Moreover, it is possible to evaluate the effects of specific policies observing the changes in the distribution, and not only comparing summary values of exclusion.

We presented an empirical application to 1999 Spanish data from the European Community Household Panel (ECHP) and we made some conclusions. We found a high number of people excluded at least in one functioning (42%) but we observed a very low average social exclusion (about 0.27). The distribution shows a high number of individuals with social exclusion values very close to zero. An eventual policy addressed to reduce social exclusion could focus on these individuals reducing exclusion with a relative low cost. Instead, to force out from exclusion individuals with a greater value of social exclusion could be much more costly.

We also emphasize which individuals characteristics affect more the probability of being socially excluded. For example, individuals with a high, or medium, level of education have an average social

exclusion lower than the one observed for the overall society. Moreover, individuals living in South Spain and Canarias Isles have an higher average social exclusion than the one of the overall society. Thus, policies addressed to reduce social exclusion could focus on improving education levels or they could focus on some geographical zones.

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Table 1. Functionings

Basic needs fulfillment (BASIC)
Not eating meat or like every second day (food)
Being unable to buy new, rather than second hand clothes (clothes)
Being unable to pay bills, rents, etc. (afford1)
Having an adequate income (INCOME)
Income
To reach a certain quality of life (QUALITY)
Car or van (car1)
Color TV (tv1)
Video recorder (vcr1)
Telephone (tel1)
Having friends or family for a drink/meal at least once a month (friends)
Having an adequate house (HOUSING)
Not having indoor flushing toilet (toilet)
Not having hot running water (water)
Not having enough space (space)
Not having enough light (light)
Not having adequate heating facility (heating)
Not having damp walls, floors, foundation... (damp)
Not having leaky roof (roof)
Not having rot in windows frame, floors (rot)
Ability to have social relationships (SOCIAL)
Frequency of talk to the neighbors (talk)
Frequency of meeting people (meet)
Being healthy (HEALTH)
Health of the person in general
Living in a safe and clean environment (LIVING)
Noise from neighbors or outside (noise)
Pollution, grime or other environment problems caused by traffic or industry (poll)
Vandalism or crime in the area (crime)
Being able to perform a paid or unpaid work activity (WORK)
Being unemployed (unemp1)

Note: the variable's name is in bracket.

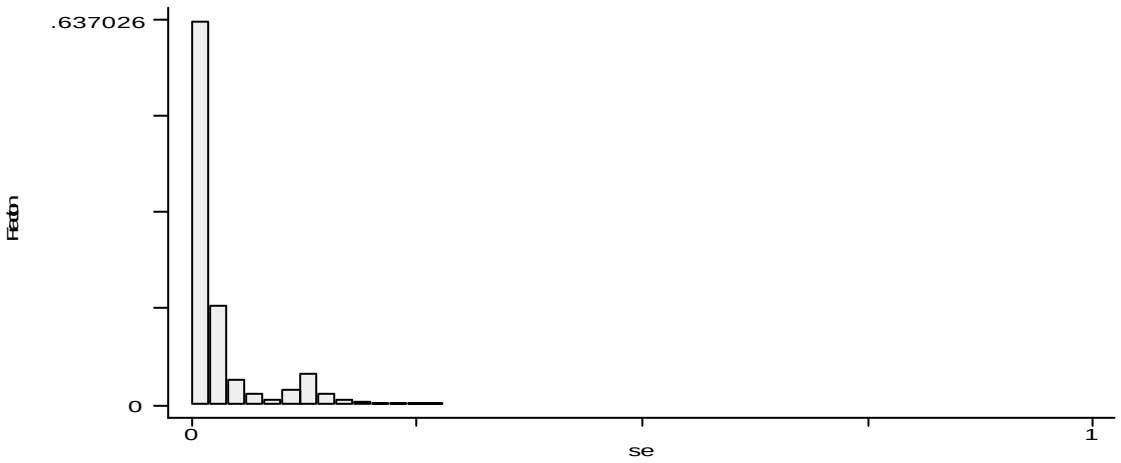
Table 2. Exclusion distribution of every functioning and in aggregate

Variable	Obs	Mean	Std. Dev.	Min	Max		Average exclusion
Basic	13083	.006581	.0524877	0	0.66		.0041836
Quality	13076	.0047898	.0423485	0	1.00		.0050604
Housing	13028	.0022742	.0251666	0	0.73		.0017443
Social	13041	.0065422	.0564945	0	1.00		.0062107
Health	13045	.0364848	.1372905	0	1.00		.0395965
Living	13092	.0527609	.1840817	0	1.00		.0492432
Work	13104	.0746352	.2628118	0	1.00		.0708944
Income	13078	.0587416	.1622698	0	1.00		.0521966
SE	12899	.0293329	.0521904	0	0.43		.0273649

Table 3. Headcount Ratios

Variable	Exclusion >0 (headcount ratio)
Basic	1.75
Quality	2.02
Housing	1.02
Social	2.03
Health	9.65
Living	13.70
Work	7.46
Income	17.97
SE	42.26

Table 4. Social Exclusion Distribution in Spain (1999)



Percentiles			Main statistics	
1%	0		mean	.02933
25%	0		Variance	.00272
50%	0		Skewness	2.3235
75%	.03274		Kurtosis	9.2956
99%	.22902			

Table 5. Average social exclusion
(cross-sectional weights)

Average social exclusion for the total population	**.0273649**

	% tot	Average social exclusion for the population sub-group
Sex		
Female	47.98	.030458
Male	52.02	.0238124
Age		
16-35	38.40	.029937
36-55	30.75	.0216261
55+	30.84	.0261675
Education		
Third stage of education	18.46	.0202118
Secon stage of education	18.90	.0235594
Less of second stage of education	62.64	.0304580
Household type ✍ single adults		
One person aged 65 or more	3.17	.0245776
One person aged 30-64	1.98	.0229692
One person aged less than 30	0.61	.0355753
Single parent with one or more children (all children aged less than 16)	0.22	.0750135
Single parent with one or more children (at least one child aged 16 or more)	6.92	.0345452
Household type ✍ couples		
Couple without children (at least one person aged 65 or more)	7.41	.0241445
Couple without children (both persons aged less than 65)	5.72	.0213514
Couple with one child (child aged less than 16)	4.30	.0205958
Couple with two children (all children aged less than 16)	6.95	.0240436
Couple with three children or more (all children aged less than 16)	1.79	.0400031
Couple with one or more children (at least one child aged 16 or more)	41.57	.0273587
Other households	19.35	.0294666
Region		
North-west	12.44	.0257706
North- east	10.53	.0185147
Comunidad the Madrid	12.68	.0264829
Centre	13.49	.0262209
East	26.41	.0247714
South	19.81	.0343219
Canaria isles	4.06	.038137

Table 6. Correlation matrices

basic	quality	housing	social	healthy	living	work	
basic	1.0000						
quality	0.4171	1.0000					
housing	0.2010	0.2563	1.0000				
social	0.0430	-0.0028	0.0192	1.0000			
healthy	0.1275	0.1701	0.1129	0.0443	1.0000		
living	0.0803	0.0278	0.2045	0.0803	0.0258	1.0000	
work	0.0768	0.0801	0.0700	-0.0156	-0.0696	0.0234	1.0000
income1	0.1625	0.2382	0.1404	-0.0936	0.0868	-0.0070	0.1050

	clothes	food	afford1
clothes	1.0000		
food	0.2840	1.0000	
afford1	0.1762	0.1243	1.0000

	car1	tv1	vcr1	tel1	friends
car1	1.0000				
tv1	0.0832	1.0000			
vcr1	0.2918	0.1543	1.0000		
tel1	0.1564	0.0935	0.2213	1.0000	
friends	0.1742	0.0685	0.1786	0.1312	1.0000

	toilet	water	space	light	roof	damp	rot
toilet	1.0000						
water	0.2719	1.0000					
space	0.0115	0.0422	1.0000				
light	0.0545	0.0435	0.1902	1.0000			
roof	0.1001	0.1246	0.1008	0.1168	1.0000		
damp	0.0741	0.1353	0.1210	0.1311	0.4166	1.0000	
rot	0.1312	0.1447	0.1074	0.1038	0.3569	0.4006	1.0000
heating	-0.0072	-0.0169	0.0134	0.0478	-0.0100	-0.0103	0.0158

	talk	meet
talk	1.0000	
meet	0.2634	1.0000

Appendix 1. Variable construction

We selected the items that will be transformed in functionings as follows.

The general health condition (HEALTH) is self-assessed on the scale form "very bad" to "very good". Thus, a value one is assessed if the individual answers "very good", and a value zero if he answers "very bad". Intermediate values are assessed for the answers "good", "fair" and "bad".

The frequency of talk with people (TALK) and the frequency of meeting people (MEET) are assessed on the scale from "on most days" to "never". Thus, a value one is assessed if the individual answers "on most days", and a value zero if he answers "never". Intermediate values are assessed for the other answers.

The variable INCOME is the transformation of the median equivalent income that assesses the value one to the richest individual and zero to the poorest. The income concept is the net equivalent household income over a full calendar year, and the equivalent scale used is the OECD scale. Moreover, the amounts specified in national currency have been converted to a common units using the PPP for a periods concerned published by Eurostat. In facts, even if our study refers to a single country, we paid special attention to the comparability, over time and across countries, of the results obtained.

The variable AFFORD1 indicates if an individual is able (unable) to pay scheduled mortgage payments, rent, utility bills or hire purchase installments during the past twelve months[14]. We assessed a value one if he is able to pay all of them, and value zero if he is unable to pay all of them. Intermediate values are assessed for the intermediate situations.

The variable UNEMP1 is constructed using the 'main activities status' of the individual. It assumes value one if the individual is unemployed, and zero otherwise.

The level of education (EDUC) is assessed on the following scale: "recognized third level (ISED 5-7)", "second stage or secondary level education (ISED 3)", "Less then second stage of secondary education (ISED 0-2)".

All the other variables are binary. So, they are transformed in order to assume value one if the individual can afford[15] the item and zero otherwise. If the item is a problem (or a negative situation) that the individual wish to avoid, the value one is assessed if he has not the problem.

[14] It is constructed following the idea proposed by Nolan-Whelan-Maitre-Laype 2001

[15] If this information is not available, value one is assessed if the individual has the item

For the variables that refers to durables (as CAR, TV, …), we assessed value zero if the individual cannot afford the item, and one otherwise. However, we considered the use of durable as ‘normal activities of the citizen’ only if at least half of the individuals have the durable.