MULTIDIMENSIONAL INDICES OF HOUSING DEPRIVATION WITH APPLICATION TO SPAIN

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ABSTRACT

The main aim of this paper is to define a multidimensional index of housing deprivation and identify the main determining characteristics of this phenomenon, using Spain as a point of reference. The paper grounds on the notion of housing deprivation as an insufficiency in the basic functioning of this commodity and uses a latent variable model that attempts to overcome some of the traditional difficulties encountered in multidimensional deprivation studies. The construction of a latent structure model has allowed a set of partial housing deprivation indices to be grouped together under a single index. It has also enabled each individual to be assigned to a different class depending on the level and type of deprivation. The results show that the vector of observed variables (having hot running water, heating, a leaky roof, damp walls or floor, rot in window frames or floors, and overcrowding) and the correlations among such variables can be explained by a single latent variable. Results also show that housing deprivation is not distributed homogenously among the population..

Key words: housing, deprivation, poverty, latent class models.

JEL: I31, I32.

1. INTRODUCTION

The interest in assessing the well-being of households on the basis of direct indicators of the standard of living that complement traditional money income analyses has increased considerably in recent years. Various attempts have recently been made to put forward new ways of analysing the level of multidimensional deprivation suffered by households [Brandolini and D'Alessio (2000), Chakravarty and D'Ambrosio (2003), Atkinson (2003), Bourguignon and Chakravarty (2003), Dutta *et al*. (2003)]. Housing is undoubtedly one of the main components of material well-being. The recognition of the right to an adequate dwelling as a basic element of well-being is explicitly recognised in the Constitutions of most OECD countries. However, no clear consensus has been reached concerning the most appropriate measurements to use when assessing the level to which households enjoy the above-mentioned right. The difficulties encountered when trying to find operational definitions are a result of the wide range of questions that arise when an attempt is made to define an adequate dwelling or the basic consumption of housing services. What conditions must a dwelling meet in order to be considered adequate? Which of these dimensions are relevant? How are these conditions measured? What combination of conditions allows a minimum level of well being to be reached? How can these be summed up by a single index?

Of all these questions, perhaps the most relevant refer to aggregation methods and how thresholds are defined. Different criteria and approaches are available to define the basic conditions of a household's level of well-being. Most of these have to do with a lack of resources and a general insufficiency in a household's basic facilities. The aggregation methods vary from the simple summing up of any commodities that may be lacking to more complex methods that use multivariate analysis techniques. These techniques allow one to sum up a wide range of indicators in a multiple deprivation scale. Nevertheless, various difficulties are encountered when trying to obtain objective indices that consistently sum up the insufficiencies suffered by households as well as their weighting. However, the main constraint lies mainly in the recurrent arbitrariness in the setting of deprivation thresholds.

The main aim of this paper is to make an attempt to overcome these difficulties by defining a multidimensional index of housing deprivation and identifying the main determining characteristics behind this phenomenon by using the situation in Spain as a point of reference. In order to do so, the paper grounds on the notion of housing deprivation as the an insufficient functioning [Sen (1985), (1992), (2000)], and a latent variable model is used as a suitable methodological framework for such a concept. Our main contribution is to provide the possibility of empirically assessing and contrasting whether a specific combina-

tion of conditions constitutes an appropriate structure to measure the latent notion of housing deprivation. Constructing a latent structure model allows us to synthesise a group of indices under a single index and provides the possibility of assigning each individual to a different class depending on the level and kind of deprivation suffered. In this way, the arbitrariness encountered when setting deprivation thresholds can be overcome.

The structure of the article is as follows. The main approaches used to construct housing deprivation indices are reviewed in the first section. The methodology of the latent trait model, which will be the basis of the empirical work, is described in the second section. This model is then estimated using data from the European Community Household Panel in the following section. The socioeconomic patterns of the groups affected by this kind of deprivation are analysed immediately afterwards. Finally, the main conclusions of the paper are put forward.

2. MEASURING HOUSING DEPRIVATION: AN OVERALL FRAMEWORK

2.1. Functionings, capabilities and housing deprivation

The construction of social deprivation indices is closely tied to the notion used to identify those suffering from deprivation. This paper grounds on Sen's proposal of functionings and capabilities [(1985), (1992), (2000)] considering housing deprivation as an insufficient functioning. A broad interpretation of this concept would include both the group of individuals or households that do not have access to housing as well as those who, despite having a dwelling, suffer from insufficiencies in some basic conditions of this commodity. This paper will focus on the latter.

According to Sen, let x_i be a vector of commodities belonging to individual i and $f_i(x_i)$ is the function that transforms this vector of commodities into a vector of functionings b_i. If b_i describes the overall status of a person or household, his well-being can be assessed on the basis of b_i. In order to assess b_i, Sen defines a function v_i so that:

$$v_i = g_i(b_i) = g_i(f_i(x_i)) \qquad (1)$$

Given a commodity vector $\bar{x}_i$, A_i is defined as the feasible set of functionings of individual i due to the fact that individual i can choose any f_i from the set F_i.

$$A_i = \{b_i \mid b_i = f_i(x_i), \forall f_i(.) \in F_i\} \qquad (2)$$

As individual i's choice of commodity vectors is limited by his/her budget X_i, the set of feasible functioning levels is:

$$B_i = \{b_i \mid b_i = f_i(x_i), \forall f_i \in F_i, \forall x_i \in X_i\} \quad (3)$$

In the specific case of a dwelling's functionings, the vector of commodities is a row vector with the dwelling's characteristics ($c(x_i)$). We can define z_i as the personal and social features that have an influence on obtaining the functionings, given the dwelling's characteristics that cannot be controlled by the individual. The function that transforms these characteristics into functionings is:

$$b_i = f_i[c(x_i), z_i] \quad (4)$$

where the vector of functionings of the i^{th} individual is a function of the commodities' characteristics and the uncontrollable factors. This i^{th} individual does not necessarily have to have only one f_i function available. The individual has the possibility of choosing among different functions to transform characteristics and uncontrollable factors into functioning levels. The first set of functionings an individual can attain is given by F_i:

$$P_i(x_i, z_i) = \{b_i \mid b_i = f_i[c(x_i), z_i], \forall f_i \in F_i\} \quad (5)$$

A second set can be more restrictive (Q_i) adding to the previous conditions the availability of limited resources. The vector of commodities an individual can consume is constrained by belonging to a set given by X_i:

$$Q_i(x_i, z_i) = \{b_i \mid b_i = f_i[c(x_i), z_i], \forall f_i \in F, \forall x_i \in X_i\} \quad (6)$$

If the assumptions that the individual wishes to obtain the best level of functionings and that the elements he cannot control (given by z_i) follow a probability distribution known by the individual are accepted, then the problem to be resolved is as follows:

$$\max_{c,f_i} b_i(x_i, E(z_i)) = \max_{c,f_i} f_i[c(x_i), E(z_i)] \quad (7)$$

where the individual considers as elements for decision-making the commodities' characteristics and the function to transform such characteristics (and uncontrollable elements) into functionings. This maximisation exercise is subject to various constraints. The choice of characteristics has to fit in with the constraint of limited resources ($x_i \in X_i$) and the choice of the transformation function has to be limited to the range of functions the individual has at his/her disposal ($f_i \in F_i$). In other words, the maximisation is subject to the functionings belonging to the set $Q_i(f_i, z_i)$. The problem can therefore be formulated as:

$$\max f_i[c(x_i), E(z_i)] \quad \text{subject to} \quad x_i \in X_i, f_i \in F_i$$

The empirical possibilities of this formal development have been widely discussed in Sen's own studies [(1985, 1992 and 2000)], as well as in other works [Nussbaum (2000), Schokkaert and Van Ootegem (1990), Balestrino and Carter (1996), Brandolini and D'Alessio (2000), Klasen (2000), Chiappero (1996, 2000)

and Robeyns (2000)]. Most of these papers coincide in pointing out that the main questions broached by any approach focusing on Sen's capabilities and functionings concern defining the appropriate space to assess well being (capabilities *vs*. functionings), the set of relevant functionings and capabilities, the most appropriate criteria to measure them and the aggregation of the indicators to obtain an overall assessment (Chiappero, 2000). In any case, the key question resides in the difficulty of empirically implementing the notion of capabilities due to the problems encountered to obtain information. As Brandolini and D'Alessio (2000) pointed out, household surveys gather information about events that actually occur and not events that might happen or might have happened.

2.2. Aggregating Functionings

There are various housing characteristics representative of this commodity functionings. It is necessary to construct a synthetic indicator in order to have an overall interpretation of multiple housing deprivation. This task inevitably entails selecting the most relevant characteristics determining individual well-being and developing the procedures that would allow for their aggregation. The development of the specialised literature on multidimensional poverty analyses has brought forth many methods to establish weighting systems. These vary from simple processes of adding up the commodities not possessed by an individual to more complex methods requiring the use of multivariate analysis techniques. In some cases, the union approach is given greater emphasis while more stress is placed on the intersection measures in others (Atkinson, 2003). From the standpoint of statistical analyses, the main distinction can be made by differentiating the studies that synthesise information by means of arithmetic or weighted means from those that use multivariate analysis techniques.

Adding up the commodities not possessed by an individual is the most immediate approach among the many procedures used to aggregate the selected dimensiones. In a seminal contribution, Townsend (1979) chose twelve different indicators on living conditions and constructed a deprivation index based on the arithmetic addition of the commodities that were not present. The condition for choosing those indicators was based on their correlation to income. This method was also used by Mack and Lansley (1985), who included three additional conditions. Any commodities included should be considered as a necessity by most of the households surveyed, a negative correlation was necessary between lacking a commodity and income, and information should exist about the reasons behind the lack of commodities.

Arithmetic addition implicitly imposes a severe value judgement because it does not differentiate the weighting of each material condition or necessity. The next step is to use a *weighted mean* of necessary commodities. It was first pro-

posed by Desai and Shah (1988) and consisted in analysing the times an individual enjoyed consuming a specific commodity. Once the deviation from modal consumption was estimated, the individual's deprivation index resulted from the lineal combination of such deviations. The commodities enjoyed by most of society were given more weight. Various studies have more recently identified individuals suffering from deprivation as those that do not reach a minimum level in at least one of the functionings. The functionings reached by most of the population are given more weight [Brandolini and D'Alessio (2000), Böhnke and Delhey (1999), Martínez and Ruiz-Huerta (2000), Muffels and Fouarge (2001), Tsakloglou and Papadopoulos (2002)].

Another way to construct synthetic multidimensional deprivation indices resides in using multivariate analysis techniques. Some studies use *principal components analysis* [Muffels and Vriens (1991), Hutton (1991) and Kamanou (2000)[1]], which enables an index to be created by the lineal combination of partial indicators. Callan *et al*. (1993) and Layte *et al.* (2001) applied *factor analysis* to a set of deprivation indicators. Their results showed that there are three different dimensions of deprivation: basic, secondary and residential. These results also showed that combining income and deprivation indices in the process of identifying the poor produces differences in the extension and composition of poverty. A less frequently used alternative is the use of *latent variable models.* Gailly and Hausman (1984) used the statistical technique developed by Rasch (1960) that sums up a set of indicators in a multiple deprivation scale. Pérez-Mayo (2002) also proposed identifying households suffering deprivation or poverty from a multidimensional perspective based on the use of latent class models.

A third possibility lies in the path opened up by the *Fuzzy Sets* theory. This theory interprets poverty and deprivation as a phenomenon that appears in different degrees and levels that are difficult to separate and identify instead of as an attribute that one lacks or possesses [Cerioli and Zani (1990), Cheli and Lemi (1995) and Chiappero (1994, 1996)]. Chiappero (2000) constructed a multidimensional well-being index with this methodology based on the capabilities and functionings approach proposed by Sen. The weighting structure assigned greater weight to those functionings that are reached by a wide majority of the population. Betti, D'Agostino and Neri (2000) used the same technique to construct a poverty index based on an indirect indicator (income) and a set of direct indicators (housing conditions and durable goods).

There are therefore various options that can be used to construct synthetic deprivation indices. Despite its greater complexity, the main advantage of multi-

[1] Kamanou (2000) used an alternative version of the principal components analysis based on a standardised uniform transformation of the set of discrete variables comprising the household wealth index. His approach allows to take into account the differences in the variance of the variables used to construct the index.

variate analysis to aggregate the different functionings –in this case housing conditions– into a single indicator is to minimise value judgements without completely eliminating them. Additionally, in so far one of the ideas underlying Sen's approach concerning functionings and capabilities is that functionings are a non-observed concept, some of these models, such as the latent variable models, facilitate an approximation to this notion by developing different combinations of observable housing conditions.

2.3. Housing functionings

Some of the aforementioned studies included specific housing indicators among the dimensions of deprivation. In addition to including not having a toilet and bath as elements of deprivation, Townsend (1979) analysed the problem of housing in a particular way. He added a wider range of indicators, which included structural problems, the lack of basic facilities (bath, toilet, gas or electric cooker, heating), overcrowding and satisfaction regarding housing conditions. Several of these indicators were also used by subsequent studies that followed along the same lines [Mack and Lansley (1985), Hausman (1989) and Nolan *et al.* (1996)]. Brandolini and D'Alessio (2000) specifically defined the dwelling functioning based on indicators such as the lack of heating, overcrowding and subjective quality and location indices to find that the set of a dwelling's functionings had the highest correlation with income. Martínez and Ruiz-Huerta (2000), Muffels and Fouarge (2001), and Tsakloglou and Papadopoulos (2002) also proposed a specific dimension of housing deprivation which included the lack of a bath, overcrowding, a leaky roof, damp and rot in window frames and floors.

Among the studies using multivariate analysis techniques, Kamanou (2000) used the main components analysis technique to construct a wealth index based on a set of housing characteristics. Arévalo (1998) used the principal components analysis to construct a housing quality index that synthesised the main characteristics of dwellings in Spain. Using the fuzzy set theory, Chiappero (2000) obtained the dwelling's functionings based on two indicators: overcrowding and a lack of facilities such as hot running water, heating and a telephone.

To sum up, most of the studies that look into different forms of deprivation and focus on housing include basic facilities (hot running water, heating and bath), the presence of structural problems (leaky roof, damp and rot in floors and window frames) and overcrowding as important features of deprivation.

The sensitivity of the results to the aggregation procedures are analysed more deeply by studies that primarily focus on housing deprivation. These studies also incorporate other issues of analysis. For instance, Whitehead (1998) studied the minimum conditions a dwelling should meet for it to be considered as adequate, along with the effects on other aspects of households' well-being.

Dale *et al.* (1996) conducted an analysis on the changes in housing deprivation over two decades. One of the criteria used was the association of some housing deprivation components with health. Marsh *et al*. (1999) also looked into the effects of housing deprivation on individuals' health, but used longitudinal data. The criterion they used to select housing indicators was the association with the state of health and the existing correlations among the indicators.

A certain consensus regarding the basic dimensions of housing deprivation can be gleaned from this review of the different general studies as well as those that focus specifically on housing conditions. These dimensions include: the lack of basic facilities, structural problems and overcrowding. Nevertheless, the set of indicators defined varies among the different studies depending on the criteria used to choose them. Generally speaking, the indicators are chosen according to the existing correlation with the households' level of income. In other cases, however, the decision depends on what the individuals declare as basic needs, which generally coincide with the commodities or conditions enjoyed by the vast majority of society. In other studies, however, the definition of housing deprivation is determined by the conditions that are related to the health of individuals.

3. A LATENT VARIABLE MODEL FOR HOUSING DEPRIVATION

The review of the previous section allows us to have a wide range of characteristics that can be chosen to construct an index of housing deprivation. Once these characteristics are contrasted with the possibilities of the available database, there are three questions the empirical exercise should resolve: what method should be used to verify if a set of indicators is suitable to define the latent notion of housing deprivation, how are the different insufficiencies to be aggregated, and where can the deprivation threshold be set.

The previous review offers different answers concerning the aggregation of indicators. As happens with income poverty, no clear consensus has been reached regarding how to set a deprivation threshold. Some authors set the threshold based on the insufficiency of a specific number of commodities, others suggest that simply lacking a commodity implies deprivation and yet another group of studies set relative deprivation thresholds that are similar to income thresholds.

Latent trait and class models offer a suitable methodological framework to provide a response to the two-fold problem posed by the aggregation of housing conditions and the setting of a threshold. The notion of housing deprivation fits in well with the idea of insufficient functioning. In the Sen's approach functionings are a non-observable concept. Latent variable models use multivariate analysis techniques to measure non-observable concepts based on a set of observable

variables. They allow the latent concept of multiple housing deprivation to be measured through the various basic conditions that can be treated as an imperfect manifestation of the latent structure of deprivation.

In addition to offering a technique that can empirically assess and contrast whether a specific set of indicators constitutes a suitable structure to measure the same latent concept, these models allow us to synthesise a set of partial indicators on the same phenomenon under a single index based on the correlation of such dimensiones and their mutual dependence on the latent variable. These techniques are appropriate for the nature of the set of observed variables and allow different weightings to be assigned to them. These are additive components. A significant advantage of the latent class model is that it can assign each individual to a different class depending on the level and type of deprivation. In this way, the arbitrariness of setting thresholds is overcome.

The key lies in determining whether the correlations among the observed housing conditions can be explained by a small number of latent variables and to contrast whether this set of indicators reveals a previously supposed hypothetical structure. Following along the lines of the studies reviewed above, the hypothetical structure of housing deprivation could be made up of an insufficiency in hot running water, heating, space, a leaky roof, damp and rot in window frames and floors.

3.1. A latent trait model for housing deprivation

Latent trait models are very similar to factor analyses but specifically applied to observed dichotomic variables (Bartholomew and Knott, 1999). When focusing our attention on housing conditions, we can model the probability of a randomly chosen individual suffering deprivation of observed condition x_i, given his/her position with regard to the vector of latent variables y, $P(x_i=1|y)=\pi_i(y)$. This conditional probability can be expressed as a linear function of the latent variables:

$$\pi_i(y) = \alpha_{i0} + \alpha_{i1} y_1 + \ldots + \alpha_{iq} y_q + \varepsilon_i \qquad i = 1, \ldots, p \tag{8}$$

The hypothesis of linearity is subject to two important constraints. In (1), $\pi_i(y)$ is a probability that takes on values between zero and one, while no constraints have been imposed on the right-hand side of the equation. In addition, it is to be expected that the rate of change in the probability of a positive response (deprivation) is not the same for the whole range of y. In this case, a curvilinear relationship could be more suitable. A nexus linking probability and the latent variables needs to be introduced in order take these constraints into account. This nexus should project the range [0,1] in the range $(-\infty,+\infty)$ and should be *s*-shaped. The two commonly used nexus are the logit and probit functions. In our model, the latent variable is related to each observed housing condition through a logistic regression model.

The latent variable obtained, which represents housing deprivation, can be discrete or continuous. If the latent dimension or space is considered continuous, a latent trait model will be estimated. If this latent space is considered as discrete, then a latent class model will be estimated. The latent trait model is defined as follows:

$$\text{logit}\,\pi_i(y) = \log\frac{\pi_i(y)}{1-\pi_i(y)} = \alpha_{i0} + \sum_{j=1}^{q}\alpha_{ij}\,y_j \qquad (9)$$

where

$$\pi_i(y) = \frac{\exp\left(\alpha_{i0} + \sum_{j=1}^{q}\alpha_{ij}y_j\right)}{1+\exp\left(\alpha_i + \sum_{j=1}^{q}\alpha_{ij}y_j\right)} \qquad (10)$$

The unidimensional latent model is expressed as follows:

$$\pi_i(y) = \frac{\exp(\alpha_{i0} + \alpha_i y)}{1+\exp(\alpha_{i0} + \alpha_i y)} \qquad (11)$$

In the first model, each observed housing condition would correspond to q+1 parameters (α_{i0} and the factor loadings $\alpha_{i1},\ldots, \alpha_{iq}$) to be estimated. If $y_1=\ldots=y_q=0$, $\pi_i(0)=[\exp(\alpha_{i0})/(1 + \exp(\alpha_{i0}))]$. Parameter α_{i0} represents the probability of the average individual suffering deprivation of the observed condition, while α_{ij} are discrimination parameters. The higher the value of α_{ij} is for an observed condition, the greater the difference in the probability of obtaining a positive response between two individuals situated at certain apart on the latent dimension. The higher the parameter is, the easier will it be to discriminate between two individuals depending on their deprivation concerning each observed condition.

A special case of the unidimensional latent trait model is the model developed by Rasch when all the discrimination parameters are equal:

$$\pi_i(y) = \frac{\exp(\alpha_{i0} + \beta_j)}{1+\exp(\alpha_{i0} + \beta_j)} \qquad (12)$$

The latent variable y is substituted by β_j, with j=1,...,n and, as in the general case, α_i represents the probability that the average individual will suffer deprivation of the observed variable. This model meets the requirement that the values obtained for the latent variable based on $\sum_{i=1}^{p} x_{ij}$ are sufficient for β_j and that the total number of positive responses for the observed condition x_i, $\sum_{j=1}^{n} x_{ij}$ are sufficient for α_i.

3.2. Types of housing deprivation

One of the advantages of this model is the possibility of stratifying different forms of deprivation. The specific objective of the latent class model is to reduce

the dimensionality of the observed conditions by using a number of mutually exclusive classes and assigning each individual to the relevant class depending on the deprivation for each observed condition. The probability of a randomly chosen individual suffering deprivation of one the observed housing conditions can be defined on the basis of the *j* latent classes with *j* = 1,..., *K*, where *K* represents the number of classes.

$$\pi_{ij} = P(x_i = 1|j), \qquad j = 1, ..., K \tag{13}$$

Each household has a prior probability η_j of belonging to one of the *j* types of deprivation defined, given that *j* = 1,...,*K* and $\sum_{j=1}^{K} \eta_j = 1$.

The latent trait and class models meet the requirements set out to construct a housing deprivation index. On the one hand, they allow a set of housing conditions to be synthesised into a single index based on the correlation of these characteristics and their mutual dependence on the latent variable. On the other, these techniques are suitable for the nature of observed conditions and allow us to assign different weightings to them. Lastly, the latent class model has the advantage of assigning each individual to a different class of housing deprivation depending on the level and type of deprivation.

4. HOUSING DEPRIVATION: AN ESTIMATION FOR SPAIN

4.1. Housing dimensions

Attempting to know the scope of housing deprivation in Spain along with the socio-economic patterns of households suffering this problem makes it necessary to search for a database containing enough information on housing conditions and household characteristics. The *European Community Household Panel* (ECHP) contains valuable information on the facilities and specific problems of each dwelling. Furthermore, it offers a wide range of household socioeconomic characteristics. It includes information on each household's basic facilities (having a separate bath or shower, indoor flushing toilet, separate kitchen, hot running water, heating, terrace, courtyard or garden, number of rooms), the presence of specific structural problems (having noise problems, being too dark, a leaky roof, damp walls or floors and rot in window frames or floors), as well as the existence of problems in the surrounding areas such as environmental problems or crime and vandalism in the area.

The unit of analysis is the household. However, in some cases, the need to analyse personal and socioeconomic characteristics associated with running a

greater risk of suffering housing deprivation has made it necessary to consider the head's information. The data used in this paper are from 1998 and comprise a sample made up of 5476 households. The choice of indicators was made by taking into account three criteria, namely: the correlation between income and housing conditions, the choice of conditions enjoyed by most of society and the lack of those conditions that harm the health of individuals.

Table 1

ASSOCIATION OF HOUSING DEPRIVATION WITH INCOME AND HEALTH

Housing conditions	Frequencies (%)		Cramer's V (χ^2)	
	Deprivation	No Deprivation	Equivalent income (deciles)	Health
Separate kitchen	1,4	98,6	0,041 (0,411)	0,028 (0,493)
Separate bath	1,1	98,9	0,080 (0,000)	0,058 (0,000)
Indoor flushing toilet	0,6	99,4	0,056 (0,053)	0,038 (0,156)
Hot running water	2,1	97,9	0,109 (0,000)	0,109 (0,000)
Heating	42,3	57,7	0,213 (0,000)	0,083 (0,000)
Place to sit outside	24,8	75,2	0,080 (0,000)	0,056 (0,004)
Noise problems	30,7	69,3	0,041 (0,414)	0,030 (0,461)
Too dark	14,5	85,5	0,065 (0,000)	0,040 (0,063)
Leaky roof	8,9	91,1	0,151 (0,000)	0,096 (0,000)
Damp	17,6	82,4	0,175 (0,000)	0,098 (0,000)
Rot in window frames or floor	5,3	94,7	0,122 (0,000)	0,084 (0,000)
Overcrowding	7,5	92,5	0,130 (0,000)	0,040 (0,115)
Pollution	13,5	86,5	0,064 (0,001)	0,028 (0,582)
Vandalism	17,7	82,3	0,048 (0,122)	0,061 (0,000)

Note: Weighted data based on the variable representing cross-sectional weighting for the last wave of the ECHP.

Applying the aforementioned criteria allowed us to obtain a set of limiting conditions regarding a dwelling's functioning that can be grouped together under the insufficiency of basic facilities (hot running water, heating and overcrowding) and under structural problems (leaky roof, damp walls/floors and rot in window frames and floors). As Table 1 shows, the indicators chosen have a significant relationship with the households' equivalent income[2]. The correlation

[2] The modified OECD scale is applied (taking a single-person household as a reference and giving a weighting of 0.5 to the rest of the adults belonging to the household and 0.3 to children under 14 years of age).

coefficient is significant and the Cramer's association coefficient is greater than 0.1. The set of indicators chosen also groups together the housing conditions enjoyed by most of society. Apart from heating, between 85% and 90% of the households in Spain do not suffer from insufficiencies in the characteristics chosen. Concerning the third criterion, it can also be observed that the households lacking hot running water or heating, or those suffering from structural problems such as damp or rot in window frames or floors also concentrate the greatest disadvantages concerning health[3].

Of the set of housing conditions chosen, the ones that give rise to controversy are those representing the lack of heating and overcrowding. There are doubts about whether the lack of heating in some households really constitutes a problem of deprivation due the benign climate in some regions of Spain. For this reason a specific analysis of the households stating that they lacked this commodity was conducted. The results showed that most households lacking heating (around 70%) stated they could not afford it. Nevertheless, an analysis of the relationship between the lack of heating and the geographical location of households revealed that most households located in regions with high temperatures did not have heating. This fact meant that the indicator had to be redefined. We therefore chose to consider that the lack of heating in these regions did not imply a state of deprivation in the empirical work.

Secondly, establishing the space a person needs to live is necessarily a subjective question. The most common overcrowding threshold is having less than one room per person or more than one person per room (Dale *et al.*, 1996). A space smaller than that can lead to health or psychological problems. In general, having a number of rooms less than the number of adults in the household is used as a general indicator of overcrowding in this paper[4]. However, the contrast between the self-assessment of overcrowding made by households and the indicator above is striking. Only 25% of households that stated they lacked space in their dwellings actually suffered from overcrowding as defined herein. This makes it necessary to interpret the results of this variable with caution. As will be seen further below, it also suggests the need of estimating the sensitivity of alternative measurements that take into account the composition and size of the household.

4.2. Results

Different combinations of the housing conditions chosen give rise to different levels of deprivation. Applying the latent variable model to the ECHP data

[3] The state of health is defined based on a self-assessment made by the individuals themselves: very bad, bad, regular, good and very good.

[4] Another possible way of defining overcrowding could be to consider the number of rooms available corrected by an equivalence scale (Chiappero, 2000).

makes it possible to have a housing deprivation index. The partial indicators chosen make up the hypothetical structure that will be contrasted.

Table 2

MAXIMUM LIKELIHOOD ESTIMATES

Indicators	α_{0i}	Standard Error	α_{1i}	Standard Error	Standardised α_{1i}	P(X=1/Z=0)
Hot running water	-4.997	0.209	1.612	0.142	0.850	0.007
Heating	-0.395	0.029	0.406	0.044	0.376	0.402
Leaky roof	-4.521	0.284	2.859	0.246	0.944	0.011
Damp	-3.530	0.352	3.431	0.415	0.960	0.028
Rot in window frames or floor	-4.365	0.181	2.037	0.139	0.898	0.013
Overcrowding	-2.639	0.056	0.205	0.076	0.201	0.067

% of G^2 explained: 89.5.
Likelihood Ratio Statistic: 90.128.
χ^2 (22) for observed response patterns: 52.904.
χ^2 (22) for all response patterns: 71.736.
Total expected frequency: 5457.

Estimating the latent trait model shows that the vector of observed variables (having hot running water, heating, a leaky roof, damp walls or floor, rot in window frames and floors, and overcrowding) and the correlations among such variables can be summed up by a single latent variable (Table 2). The goodness-of-fit measurements show acceptable values. The last column of the table shows the probabilities of an average individual suffering deprivation of the six housing indicators. The estimations of the discrimination parameters α_{ij} are shown in the fourth column. These represent the weight given to each of the observed variables. The values of these parameters show that the heating and overcrowding indicators have been given less weight than the others. To a certain extent, the reason for this lies in the fact that the latent variable constructed assigns greater weight to those conditions that only a very small percentage of the population lacks. Hence, estimated deprivation contains a component that is markedly relative.

Once the housing deprivation index is obtained, two especially relevant questions arise. Firstly, an attempt is made to analyse whether there are different types of deprivation, such as an insufficiency in basic facilities or the presence of structural problems. Secondly, an effort is made to enquire whether there are differences in the households' socioeconomic characteristics. In order to provide a response to the first question, a latent class model can be estimated. This would allow us to differentiate the results into four different kinds of housing deprivation (Table 3).

Table 3

CLASSES OF HOUSING DEPRIVATION:
CONDITIONAL PROBABILITIES AND PRIOR PROBABILITIES

Indicators	$\hat{\pi}_{i1} = P(x_1 = 1 \mid 1)$	$\hat{\pi}_{i2} = P(x_2 = 1 \mid 2)$	$\hat{\pi}_{i3} = P(x_3 = 1 \mid 3)$	$\hat{\pi}_{i4} = P(x_{41} = 1 \mid 4)$
Hot running water	0.0000	0.0500	0.0307	0.3366
Heating	0.2963	0.6276	0.5620	0.7166
Leaky roof	0.0155	0.0764	0.3657	0.8710
Damp	0.0000	0.0587	0.9679	0.9998
Rot in window frames / floors	0.0064	0.0698	0.1799	0.6339
Overcrowding	0.0602	0.0926	0.0641	0.1054
	$\hat{\eta}_1$	$\hat{\eta}_2$	$\hat{\eta}_3$	$\hat{\eta}_4$
	0.6901	0.1660	0.1172	0.0266
Test $\chi^2(21) = 33.40$ $G^2(21) = 46.14$				

The estimated matrix $\pi(\pi_{i1}, \pi_{i2}, \pi_{i3}, \pi_{i4})$ shows the probability of a randomly chosen household suffering deprivation of each one of the six housing indicators given its situation in the different latent classes. It can be seen that Class 1 includes the households having the lowest probability of suffering housing deprivation given the small number of conditions for which they lack a favourable situation (69 percent). On the other hand, households with the greatest probability of suffering multiple deprivation belong to Class 4 (3 percent). It is also very interesting to highlight the difference between the households included in Classes 2 (16 percent) and 3 (12 percent). The former includes households having a greater probability of suffering a lack a basic housing facilities (such as hot running water, heating or space) than having structural problems. On the other hand, the households included in Class 3 have a very high probability of suffering structural problems and a very small, almost negligible, probability of lacking basic facilities.

5. THE DISTRIBUTION OF HOUSING DEPRIVATION

Various questions arise from the estimation carried out in the previous section. Is housing deprivation homogenously distributed among the population? Which demographic groups run a greater risk? How does this risk increase with changes in specific socioeconomic characteristics? Table 4 gathers information

on the statistical associations among the different housing deprivation indicators and a set of socioeconomic characteristics. Most of the partial housing deprivation indicators have a significant relationship with the various socioeconomic factors considered. As was mentioned previously, the housing deprivation indicators have a significant relationship with the households' income. Likewise, the income source, the ability to make ends meet, housing tenure, its geographical location and the household's composition and size, as well as the head's educational level, health, age and marital status all have a significant relationship with the housing deprivation indicators. The relationship with the head's social relationships, however, is limited.

Table 4

ASSOCIATION COEFFIENTES AMONG HOUSING CONDITIONS AND HOUSEHOLD CHARACTERISTICS

	Cramer's V (χ^2)					
	Housing Conditions					
	Hot running water	**Heating**	**Leaky roof**	**Damp**	**Overcrowding**	**Rot in window frames or floors**
Region	0.085 (0.000)	0.567 (0.000)	0.139 (0.000)	0.242 (0.000)	0.105 (0.000)	0.127 (0.000)
Normalized Equivalent Income	0.046 (0.004)	0.153 (0.000)	0.083 (0.000)	0.116 (0.000)	0.103 (0.000)	0.061 (0.000)
Equivalent Income (deciles)	0.109 (0.000)	0.213 (0.000)	0.151 (0.000)	0.175 (0.000)	0.130 (0.000)	0.122 (0.000)
Main Source of Income	0.119 (0.000)	0.135 (0.000)	0.124 (0.000)	0.108 (0.000)	0.103 (0.000)	0.094 (0.000)
Able to Make Ends Meet	0.141 (0.000)	0.114 (0.000)	0.163 (0.000)	0.171 (0.000)	0.105 (0.000)	0.141 (0.000)
Tenure status	0.081 (0.000)	0.103 (0.000)	0.047 (0.000)	0.099 (0.000)	0.022 (0.275)	0.115 (0.000)
Education	0.091 (0.000)	0.200 (0.000)	0.095 (0.000)	0.117 (0.000)	0.027 (0.264)	0.066 (0.000)
Health	0.109 (0.000)	0.083 (0.000)	0.096 (0.000)	0.098 (0.000)	0.040 (0.115)	0.084 (0.000)
Chronic condition	0.077 (0.000)	0.065 (0.000)	0.098 (0.000)	0.071 (0.000)	0.042 (0.008)	0.062 (0.000)
Social Relationships	0.034 (0.286)	0.035 (0.232)	0.039 (0.133)	0.058 (0.002)	0.046 (0.041)	0.034 (0.291)
Sex	0.058 (0.000)	0.028 (0.039)	0.055 (0.000)	0.061 (0.000)	0.005 (0.714)	0.050 (0.000)

(*Keep*.)

(*Continuation*.)

	Cramer's V (χ^2)					
	Housing Conditions					
	Hot running water	**Heating**	**Leaky roof**	**Damp**	**Overcrowding**	**Rot in window frames or floors**
Age	0.094 (0.000)	0.125 (0.000)	0.077 (0.000)	0.052 (0.002)	0.165 (0.000)	0.049 (0.005)
Satisfaction with housing	0.170 (0.000)	0.142 (0.000)	0.212 (0.000)	0.268 (0.000)	0.128 (0.000)	0.276 (0.000)
Household Size	0.152 (0.000)	0.164 (0.000)	0.096 (0.000)	0.111 (0.000)	0.554 (0.000)	0.099 (0.000)
Household Typology	0.154 (0.000)	0.184 (0.000)	0.131 (0.000)	0.132 (0.000)	0.327 (0.000)	0.133 (0.000)
Marital Status	0.120 (0.000)	0.132 (0.000)	0.124 (0.000)	0.093 (0.000)	0.127 (0.000)	0.114 (0.000)

The overcrowding indicator throws up different results from the rest of the housing conditions. As was mentioned above, establishing the amount of space a person needs to live is an issue permeated by value judgements. It is for this reason that we estimate alternative indicators in order to assess the consistency of the definition that was initially adopted. Most of the studies focusing on housing deprivation use a value of less than one room per person as a criterion to measure overcrowding. Other studies, however, criticise this definition and propose different options that are more sensitive to a household's composition [Murie (1983), Chiappero (2000)]. We define two alternative overcrowding indicators:

$$H_d = 1 + \frac{(S - Z)}{2} \quad \text{and} \quad H_v = 2 + \frac{(S - Z)}{2} \qquad (14)$$

where *S* represents the household's size and *Z* indicates whether a household is composed of a couple or an adult. The first indicator would reflect problems of overcrowding when there are two or more people per room. One of the rooms would belong to the couple making up the household or the adult in single-parent households. However, this indicator only takes into account the number of bedrooms without designating any room as a "common living area". The second indicator is constructed in the same way as the first. In this case, however, a room is designated as the family's common living area. To a certain extent, these indicators define overcrowding problems more strictly, as the threshold below which a dwelling is considered as overcrowded is having two or more people per room. The estimations carried out with these alternative indicators generally confirm the peculiarities of overcrowding when compared

to other housing deprivation indicators[5]. Due to this, the initial definition will therefore be adopted hereinafter with the necessary caution.

Once the intensity of the possible relationships between housing deprivation and the household's characteristics, as well as those of the household's head, have been analysed, the most immediate question that arises is which categories of the population run a greater risk of suffering this problem. In order to identify the concrete effect of each of these variables on housing deprivation independently of the other variables, it is necessary to estimate an empirical model that integrates the different dimensions set out previously.

The different classes of deprivation identified by the latent class model were chosen as the dependent variable in this model. Due to its very nature, this variable requires the estimation of a multinomial logistic regression model with four alternatives. Alternative 1 represents the first latent class (very low or negligible levels of housing deprivation). Alternative 2 represents the second latent class (notable insufficiency in basic housing facilities). Alternative 3 represents the third latent class (large presence of structural problems in housing). And alternative 4 represents the fourth latent class (multiple housing deprivation). The probability of a household belonging to a specific class is compared to the probability of belonging to another class. More concretely:

$$y_i = \beta' x_i + \varepsilon_i \qquad (15)$$

where y_i is a latent variable indicating the probability of belonging to each class, β is the vector of parameters corresponding to the x explanatory variables and ε is the random error, which is assumed to follow a logistic distribution.

This model provides a set of probabilities for the $J + 1$ possible alternatives for each household having x_i individual characteristics. If the J perturbations are independent and distributed identically with a log-Weibull function, $F(\varepsilon_{ij}) = \exp\left(-e^{\varepsilon_{ij}}\right)$, and the β_1=0 normalization rule is applied, then:

$$\Pr(Y = j) = \frac{e^{\beta_j x_i}}{1 + \sum_{k=1}^{J} e^{\beta_k x_i}} \quad \text{for} \quad j = 2, ..., J, \qquad (16)$$

$$\Pr(Y = 1) = \frac{1}{1 + \sum_{k=1}^{J} e^{\beta_k x_i}} \qquad (17)$$

Alternative 1, corresponding to the first latent class of housing deprivation, is the category of reference.

[5] Other studies have also found that the behaviour of the overcrowding variable is different from the other housing indicators (Marsh *et al*., 1999).

This model's coefficients cannot be interpreted as the derivative of the probability of suffering a specific kind of deprivation in the face when one of the explanatory variables changes. They show the effect of the variables on the probability of a specific deprivation class when compared to the reference. The sign of these coefficients does not necessarily have to coincide with the sign of the marginal effects. The individual characteristics' marginal effects on the probabilities can be estimated as follows:

$$\delta_j = \frac{\partial P_j}{\partial x_i} = P_j\left[\beta_j - \sum_{K=1}^{J} P_K \beta_K\right] = P_j\left[\beta_j - \overline{\beta}\right] \qquad (18)$$

As in the descriptive analysis above, the explanatory variables included in this model offer information about the households' income, work, social and, in general, living conditions. More specifically, the variables included are the income deciles, the main source of income, whether the dwelling is rented, freely ceded or owned, the region of residence, the household's size and composition, the frequency of social relations and the head's educational level, age, sex and marital status.

Table 5

MULTINOMIAL LOGISTIC MODEL

Variables	Odds-ratio	Standard Error	z	P > z
Class 2				
Income				
Income (decile 7)	.450	.112	-3.180	0.001
Income (decile 8)	.643	.158	-1.790	0.073
Income (decile 9)	.435	.120	-3.000	0.003
Income (decile 10)	.349	.108	-3.380	0.001
Education				
< 2nd stage (isced 0-2)	1.457	.268	2.050	0.041
Household Size	1.180	.071	2.760	0.006
Household Typology				
Couple 1 kid < 16	.330	.127	-2.860	0.004
Couple 2 kids < 16	.464	.169	-2.110	0.035
Couple 3 or more kids < 16	.387	.218	-1.680	0.092
Couple 1 or more kids >	.388	.122	-3.010	0.003
Tenure status				
Rent	2.490	.358	6.340	0.000
Accommodation provided free	2.944	.512	6.210	0.000
Main Source of Income				
Other benefits	1.694	.394	2.270	0.023

(*Keep*.)

(*Continuation*.)

Variables	Odds-ratio	Standard Error	z	P > z
Class 2				
Social Relationships				
Less often	1.956	.539	2.430	0.015
Regions				
Northeast Region	.359	.064	-5.730	0.000
Madrid Region	.123	.040	-6.410	0.000
Central Region	.437	.070	-5.100	0.000
Eastern Region	.479	.070	-5.010	0.000
Southern Region	.153	.031	-9.170	0.000
Canary Is. Region	.568	.115	-2.770	0.006
Marital Status				
Never married	1.613	.322	2.400	0.016
Class 3				
Income				
Income (decile 7)	.357	.115	-3.190	0.001
Income (decile 8)	.378	.123	-2.980	0.003
Income (decile 9)	.510	.160	-2.140	0.033
Income (decile 10)	.316	.127	-2.860	0.004
Education				
< 2nd stage (isced 0-2)	1.555	.375	1.830	0.068
Household Sociological typology				
Couple, no kids, both < 65	.391	.175	-2.090	0.037
Tenure status				
Rent	1.506	.292	2.110	0.035
Accommodation provided free	2.227	.475	3.750	0.000
Social Relationships				
Less often	1.536	.388	1.700	0.090
Regions				
Northeast Region	.483	.131	-2.670	0.008
Madrid Region	.462	.157	-2.260	0.024
Central Region	1.788	.364	2.850	0.004
Age				
Aged 50-65	1.873	.575	2.040	0.041
Marital Status				
Separated	2.351	.937	2.140	0.032
Never married	1.850	.471	2.420	0.016

(*Keep*.)

(*Continuation*.)

Variables	Odds-ratio	Standard Error	z	P > z
Class 4				
Income				
Income (decile 7)	.410	.200	-1.820	0.069
Income (decile 8)	.192	.127	-2.490	0.013
Income (decile 9)	.186	.124	-2.510	0.012
Income (decile 10)	.268	.171	-2.060	0.039
Household Size	1.210	.124	1.860	0.063
Household Sociological typology				
Couple 2 kids < 16	.058	.066	-2.480	0.013
Couple 1 or more kids > 16	.288	.158	-2.260	0.024
Tenure status				
Rent	3.020	.774	4.310	0.000
Accommodation provided free	2.151	.774	2.130	0.033
Regions				
Northeast Region	.489	.160	-2.180	0.029
Madrid Region	.399	.175	-2.080	0.037
Central Region	.532	.164	-2.040	0.041
Eastern Region	.208	.076	-4.270	0.000
Southern Region	.350	.113	-3.250	0.001
Marital Status				
Divorced	3.951	2.746	1.980	0.048
Never married	2.976	1.124	2.890	0.004

Note: Categories of reference: one person aged +65 household, resident in northeast region, in first decile of equivalent income scale, with owned dwelling, male household head, married, wages and salaries, to meet friends or relatives on most days, 3rd level (isced 5-7) education completed, less than 30 years of age.

Table 5 shows the estimated model's variables that are significant. Similarly to the previous descriptive analysis, it can be seen that household income is one of the variables exerting the greatest influence on the risk of suffering housing deprivation. Nevertheless, it is worth differentiating the impact income has on the risk of belonging to one or another of the housing deprivation classes. The households with the highest income levels (ninth decile) could be an example. They suffer a relative risk of belonging to the second class that is 57% lower than that of the households in the first decile. This percentage falls to 49% for the third class and rises to 81% for multiple deprivation. Concerning insufficiencies in basic facilities, the source of income constitutes a significant influencing factor. Households whose primary source of income is made up of social transfers have a greater probability of belonging to the aforementioned class when compared to households with earnings as the main source.

The factor having the greatest influence in quantitative terms is housing tenure. The relative risk of lacking basic facilities, suffering from structural problems or suffering from multiple housing deprivation is greater for households living in rented or provided free than those living in owned properties.

There are also significant differences in the possibility of belonging to one or other category depending on the household's composition. The relative risk run by couples with children of suffering an insufficiency in basic facilities or suffering multiple deprivation as opposed to not suffering any kind of deprivation at all is lower than the risk run by people over 65 years of age living alone. Single people run a greater relative risk of suffering some kind of housing deprivation. The same can be said for divorced people. Age also constitutes an influencing factor in the probability of suffering structural housing problems. The head's educational level and the degree of social integration only appear to be significant for the relative risk of lacking basic housing facilities.

Lastly, the regions running the greatest relative risk of suffering housing deprivation differ depending on the kind of housing deprivation considered. Most regions have a lower probability of suffering some kind of housing deprivation than the Northeastern region (Galicia, Asturias and Cantabria), except for the central area (Castilla y León, Castilla-La Mancha and Extremadura), which has a greater probability of suffering structural housing problems.

6. CONCLUSIONS

Housing constitutes one of the basic commodities that determine the well-being of citizens. However, defining what an adequate dwelling is raises numerous questions. Among others, these include what conditions must housing meet, what dimensions are relevant, how should they be measured and what combinations of conditions allow one to reach a minimum level of well-being. This paper offers a methodology, the latent variable models, which has been rarely used until now to offer a response to these questions. These models allow one to respond to the two-fold problem of aggregating and setting a threshold. Assigning each individual to a different class depending on the level and kind of deprivation they suffer has enabled the habitual arbitrariness of establishing thresholds to be overcome.

Applying these models to the ECHP data has allowed us to estimate and characterise housing deprivation in Spain. The results show that the vector of observed variables (having hot running water, heating, a leaky roof, damp, rot in window frames or floors and overcrowding) and the correlations among them can be explained by a single latent variable of housing deprivation. They also corroborate that these housing conditions are satisfactory indicators of insuffi-

ciencies in the housing functioning. Estimating the latent traits model's parameters shows that the lack of heating and, to a lesser extent, suffering overcrowding are generalised problems throughout society. Additionally, the results obtained have allowed us to differentiate among different kinds of deprivation.

One of the important implications of the empirical analysis carried out is to provide a response to the question whether housing deprivation is homogenously distributed among the population or whether there are specific characteristics that differentiate the households affected from the rest of the population. One can deduce from the results that the incidence of housing deprivation is strongly tied to a household's level of income and the head's position in the labour market. It is also very clear that the incidence of the different kinds of deprivation is greater among households that rent dwellings, single and high-sized households, old people and heads with a low educational level.

These results lead one to reflect on the design of some policies aimed at aiding the least favoured groups. The heterogeneity found in the results concerning both the kind of deprivation suffered, as well as the different kinds of households affected by each problem, place into question the general measures put into place and suggest the need for designing policies that are differentiated according to the classes of problems and the social groups affected.

BIBLIOGRAPHY

ARÉVALO, R. (1999): "Construcción de un índice de calidad de la vivienda", *Investigaciones Económicas*, 23: 267-280.

ATKINSON, A. B. (2003): "Multidimensional Deprivation: Contrasting Social Welfare and Counting Approaches", *Journal of Economic Inequality*, 1: 51-65.

BALESTRINO, A., and CARTER, I (eds.): "Functioning and Capabilities: Normative and Policy Issues", *Notizie di Politeia*, XII.

BARTHOLOMEW, D. J., and KNOTT, M. (1999): *Latent Variable Models & Factor Analysis*. 2.nd ed., Griffin.

BARTHOLOMEW, D. J., and TZAMOURANI, P. (1999): "The goodness-of-fit of latent trait models in attitude measurement". *Sociological Methods and Research*, 27.

BETTI, G.; D'AGOSTINO, A., and NERI, L. (2000): "Panel Regresión Models for Measuring Poverty Dynamics in Great Britain", *ISER Working Paper* 2000-42, Colchester: University of Essex.

BÖHNKE, P., and DELHEY, J. (1999): "Poverty in a Multidimensional Perspective: Great Britain and Germany Comparison" FS III 99-413, *WZB- papers*, Berlin.

BOURGUIGNON, F., and CHAKRAVARTY, S. R. (2003): "The Measurement of Multidimensional Poverty", *Journal of Economic Inequality*, 1: 25-49.

BRANDOLINI, A., and D'ALESSIO, G. (2000): "Measuring Well-Being in the Functioning Space". *26th General Conference of The International Association for Research in Income and Wealth*, Cracow, Poland, 2000.

CALLAN, T.; NOLAN, B., and WHELAN, C. T. (1993): "Resources, Deprivation and the Measurement of Poverty". *Journal of Social Policy*, 22: 141-172.

CERIOLI, A., and ZANI, S. (1990): "A Fuzzy Approach to the Measurement of Poverty", in DAGUM-ZENGA (eds.), *Income and Wealth Distribution, Inequality and Poverty*, Berlin: Springer-Verlag.

CHAKRAVARTY, S. R., and D'AMBROSIO, C. (2003): "The Measurement of Social Exclusion", *DIW Discussion Paper* n.º 364, Berlin.

CHELI, B., and LEMI, A. (1995): "A Totally Fuzzy and Relative Approach to the Multidimensional Analysis of Poverty", *Economics Notes*, 1: 115-134.

CHIAPPERO, E. (1994): "A New Approach to Evaluation of Well-being and Poverty by Fuzzy Set Theory", *Giornale degli Economisti e Annali di Economia*, 7-9: 367-388.

– (1996): "Standard of Living Evaluation Based on Sen's Approach: Some Methodological Suggestions" in A. BALESTRINO, and I. CARTER (eds.), "Functioning and Capabilities : Normative and Policy Issues", *Notizie di Politeia*, 12: 37-54.

CHIAPPERO, E. (2000): "A Multidimensional Assesment of Well-being Based on Sen's Functioning Approach", *Rivista Internazionale di Scienze Sociali*, 2, Anno CVIII: 207-239.

DALE, A.; WILLIAMS, M., and DODGEON, B. (1996): *Housing Deprivation and Social Change: A report based on the analysis of individual level census data for 1971, 1981 and 1991 drawn from the Longitudinal study and the Samples of anonymised records*. Office For National Statistics, Series LS No. 8. London: HMSO.

DE MENEZES, L. M. (1999): "On Fitting Latent Class Models for Binary Data: The Estimation of Standard Errors" *British Journal of Mathematical and Statistical Psychology*, 52: 149-168.

DESAI, M., and SHAH, A. (1988): "An Econometric Approach to the Measurement of Poverty", *Oxford Economic Papers*, 40: 505-522.

DUTTA, I.; PATTANAIK, P. K., and XU, Y. (2003): "On Measuring Deprivation and the Standard of Living in a Multidimensional Framework on the Basis of Aggregate Data", *Economica*, 70: 197-221.

GAILLY, B., and HAUSMAN, P. (1984): "Desavantages relatifs a une Mesure Objetive de la Pauvrete" en SARPELLON G. (ed.), *Understanding Poverty*, Milan: Franco Angeli.

HUTTON, S. (1991): "Measuring Living Standards Using Existing National Data Sets". *Journal of Social Policy*, 20: 237-257.

KAMANOU, G. (2000): "Poverty and Valuation: a Review of Definitional Issues and their Implications on Statistical Methodologies for Poverty Measurements", *Session C-Pa 6a Montreux 2000*. Statistics Development and Analysis Section, United Nations Statistics Division-UNSD.

KLASEN, S. (2000): "Measuring Poverty and Deprivation in South Africa", *Review of Income and Wealth*, 46: 33-58.

LAYTE, R.; NOLAN, B., and WHELAN, C. T. (2001): "Reassessing Income and Deprivation Approaches of Poverty in Ireland", *The Economic and Social Review*, 32: 239-261.

MACK, J., and LANSLEY, S. (1985): *Poor Britain*, London: Allen and Unwin.

MARSH, A.; GORDON, D.; PANTAZIS, C., and HESLOP, P. (1999): *Home Sweet Home? The Impact of Poor Housing on Health,* Bristol: The Policy Press.

MARTÍNEZ, R., and RUIZ-HUERTA, J. (2000): "Income, Multiple Deprivation and Poverty: An Empirical Analysis Using Spanish Data", *26th General Conference of The International Association for Research in Income and Wealth*, Cracow, Poland, 2000.

MUFFELS, R., and FOUARGE, D. (2001): "Do European Welfare Regimes Matter in Explaining Social Exclusion? Dynamic Analyses of the Relationship Between Income Poverty and Deprivation: A Comparative Perspective", *ESPE Conference at Athens University*, June 14-16, 2001.

MUFFELS, R., and VRIENS, M. (1991): "The Elaboration of a Deprivation Scale and the Definition of a Subjective Poverty Line". *Annual Meeting of the European Society for Population Economics*, Italy.

MURIE, A. (1983): *Housing Inequality and Deprivation*. London: Heinemann.

NOLAN, B., and WHELAN, T. (1996): "Measuring Poverty using Income and Deprivation Indicators: Alternative Approaches". *Journal of European Social Policy*, 6: 225-240.

Nussbaum, M. (2000): *Women and Human Development. The Capability Approach*, Cambridge: Cambridge University Press.

PÉREZ MAYO, J. (2002): *Modelos dinámicos de variables latentes aplicados a la construcción de indicadores económicos y sociales*. Doctoral Thesis, Universidad de Extremadura.

RASCH, G. (1960): *Probabilistic Model for some Intelligence and Attainment Tests*. Chicago: University of Chicago Press (reprinted 1980).

ROBEYNS, I. (2000): "An Unworkable Idea or a Promising Alternative? Sen's Capability Approach Re-Examined", Faculty of Economics and Politics, Cambridge.

SCHOKKAERT, E., and VAN OOTEGEM, L. (1990): "Sen's Concept of the Living Standard Applied to the Belgian Unemployed", *Recherches Economiques de Louvain*, 46: 429-450.

SEN, A. K. (1985): *Commodities and Capabilities*. Amsterdam: North Holland.

– (1992): *Inequality Re-Examined*, Oxford: Clarendon Press.

– (2000): "Social Exclusion: Concept, Application and Scrutiny", *Social Development Papers,* n.º 1, ADB.

TOWNSEND, P. (1979): *Poverty in the United Kingdom*, Harmondsworth: Penguin.

TSAKLOGLOU, P., and PAPADOPOULOS, F. (2002): "Poverty, Material Deprivation and Multidimensional Disadvantage during Four Life Stages: Evidence from ECHP" in M. BARNES; C. HEADY; S. MIDDLETON; J. MILLAR; F. PAPADOPOULOS; G. ROOM, and P. TSAKLOGLOU (eds.): *Poverty and Social Exclusion in Europe*, London: Edward Elgar.

WHITEHEAD, C. (1998): *The Benefits of Better Homes: The Case for Good Quality Affordable Housing*. London; Shelter.

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