
Working Paper Series

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**ECINEQ WP 2009 – 106**

ECINEQ 2009-106
February 2009

www.ecineq.org

# Income Poverty and Multidimensional Deprivation: Lessons from Cross-Regional Analysis*

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**Abstract**

The study of multidimensional deprivation has become one of the most relevant lines of research in the analysis of low-income households. The search for significant relationships between multidimensional deprivation and income poverty has been a central issue and most empirical studies have found a very weak link. This paper aims at examining the possibility of an aggregation bias in national studies, which could conceal the diversity of experiences and patterns to be found in the different regions. Latent class models are used to define deprivation indices and the Spanish Survey on Income and Living Conditions is used. The results seem to show that the absence of significant relationships between both phenomena also appears when the sample of household is disaggregated regionally. Nonetheless, the decomposition of these two phenomena's determinants reveals some common explanatory factors.

**Keywords**: poverty, multidimensional deprivation, regional analysis, EUSILC.
**JEL Classification**: I31, I32

* The authors would like to thank the Extremadura Government (Junta de Extremadura 3PR05A112) and the Spanish Ministry of Science and Technology (SEJ2007-67911-C03-03/ECON) for the funding they have received.
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## 1. INTRODUCTION

The notion of poverty has undergone significant changes in recent years. These have been due to the constraints and insufficiencies of a notion based solely on income terms. The uni-dimensional approach estimates poverty from an indicator of the household's economic capacity, such as family income adjusted by equivalence scales, and a threshold defined as a percentage of average or median income. The generalized dissatisfaction produced by the use of strictly income-based criteria has given rise to the development of new approaches and measurement procedures that are based on a multidimensional view of poverty.

More than two decades ago, the European Council had already defined as poor "those persons, families or groups of people whose resources (material, cultural and social) are so limited as to exclude them from the minimum acceptable way of life in the Member State to which they belong" (Eurostat, 2000). Such a definition incorporates an idea of poverty more related to each person's or household's standard of living than with a simple inability to fulfil basic needs, thus adding a multidimensional perspective to its interpretation. In the countries of the European Union, this change has led to a much wider set of official social exclusion measures (Atkinson *et al.*, 2002), as well as to the use of multidimensional indicators as a key element in social cohesion policies.

Several proposals have recently appeared in the literature that attempt to measure the level of multidimensional deprivation in a society [Brandolini and D'Alessio (2000), Chakravarty and D'Ambrosio (2003), Atkinson (2003), Bourguignon and Chakravarty (2003), Dutta *et al*. (2003), Deutsch and Silber (2005), Duclos *et al.* (2006)]. This development has made available new aggregation methods for the different determining dimensions of individuals' well-being, as well as a set of more robust properties and axioms to construct synthetic multidimensional deprivation indices[3].

The development of the new procedures to analyze multidimensional poverty has, however, not been enough to contribute decisively to the clarification of what can undoubtedly be considered as the key issue in the economic literature on social

[3] Some articles have attempted to summarize the recent literature's main advances and constraints. See Silber (2007), and Kakwani and Silber (2007).

deprivation. Since Townsend's (1979) groundbreaking contribution and the works of Desai and Shah (1988), the search for significant relationships between multidimensional deprivation and income poverty indicators has become the keystone of the specialised literature. Subsequent studies have made an effort to find this relationship in a wider sample of countries. The results, however, cannot be considered conclusive. For instance, Callan, Nolan and Whelan (1993) differentiated three dimensions of deprivation (basic, secondary and residential) using the European Union Household Panel to find that the use of monetary income produces different poverty measures, as regards both its extension and composition, from those resulting from the use of deprivation indices. The empirical evidence for the United States also places into doubt the possible existence of a point of inflexion in the income distribution from which disadvantages are cumulative [Mayer and Jencks (1989, 1993), Rector *et al*. (1999), Bradshaw and Finch (2003), Iceland and Bauman (2004)].

An effort has been made to explain the absence of statistically significant relationships between income poverty and multidimensional deprivation based on two kinds of complementary arguments. The first of these focuses its attention on the difference in the type of individual well-being components that each approach aims to reflect. The second one alludes to the need of introducing a dynamic perspective to properly understand the possible relationships. Income poverty is by definition an indicator of a temporary lack of income while the different manifestations of multidimensional deprivation have more to do with permanent income. As Iceland and Bauman (2004) pointed out, persistent poverty could determine multidimensional deprivation through three different channels: it cumulatively increases the differential between the necessary and the available resources to fulfil basic needs, produces long-term deficiencies in the ability to fulfil such needs, like the loss of social relationships or the creation of psychological problems, and gives rise to more erratic incomes.

However, in the empirical field, it is not easy to isolate the relationship between the two phenomena over time. Slight variations in reported incomes and in the information about the lack or not of certain items can give rise to observable changes of some relevance, which are essentially caused by measurement errors. Nevertheless, the empirical evidence seems to point toward the existence, albeit weak, of the correlation. For example, Layte *et al.* (2001a) found, as opposed to the common hypothesis, that an

increase in the poverty of individuals who already had very low income levels did not lead to a greater incidence of deprivation in several EU countries. However, they found that some individuals with medium-low incomes did indeed register increases in deprivation without any great changes in their levels of income. The results of Berthoud *et al.* (2004) for the United Kingdom offer up similar results: only a small percentage of individuals that exit poverty also abandon the situation of multiple deprivation.

The availability of a body of comparative results covering Spain is minimal. Studies that have made an effort to identify possible relationships between income poverty and material deprivation are scarce and have mainly taken static approaches. In a groundbreaking piece of research, Martínez and Ruiz-Huerta (1999) studied the relationship among different deprivation indices and the income distribution to find a negative correlation that, however, was not very high. They also observed that it is not possible to identify a level of income below which a disproportionate increase of deprivation comes about. Ayllón *et al.* (2007) found similar results using more recent data. From a dynamic standpoint, Ayala and Navarro (2007) found that households located in the richer deciles have a greater likelihood of abandoning a situation of housing deprivation than those belonging to poorer deciles, without fluctuations in income levels turning out to be relevant in this kind of transitions.

Despite the fact that the empirical corpus is still limited, the results therefore suggest that the relationship between income poverty and multidimensional poverty in Spain is likewise neither linear nor significant. As in other countries, a reasonable hypothesis would be that these two phenomena reflect different dimensions of households' well-being. Nonetheless, it could also be the case that the search for relationships from an excessively aggregated standpoint might conceal the diversity in which the processes of low income and material deprivation interact in the different geographical areas of Spain. The dispersion of unemployment rates, the different demographic structure of the regions, the differences in the pace of economic growth and in productive diversification or the growing disparity in social policies as a result of the regional decentralization process of a significant part of public intervention could give rise to very different relationships between multidimensional deprivation and income poverty. If this were the case, the aggregation bias could conceal significant relationships between both processes in more restricted geographical areas.

Although some studies have looked into this kind of relationships at an aggregate level, knowledge is very limited about possible regional differences concerning both the incidence of multidimensional deprivation and its relationship with low income. Exploring both realities and their relationship constitutes the main aim of this article, which analyzes differences in multidimensional deprivation and poverty levels by regions and assesses the relationships between both phenomena in different ways. Multidimensional deprivation is estimated through a latent variable model applied using the data from the Spanish Survey on Income and Living Conditions (EUSILC). The relationships between income poverty and multidimensional deprivation are estimated through different statistical procedures, including a decomposition exercise of both variables through non-linear models. Once the aggregation bias is accounted for, our findings show a weak statistical relationship between income poverty and multidimensional deprivation. The decomposition carried out also reveals that the determinants of both phenomena vary from region to region, which could explain the weakness found in the general relationship.

The paper is structured as follows. The main issues concerning multidimensional poverty measurement are reviewed first. Then the main characteristics of the database used are presented. An analysis is subsequently made on the regional distribution of multidimensional deprivation and income poverty. This is followed by an examination of the relationship between both phenomena in the regions through different statistical tests. Then both variables are decomposed in each region through an adaptation of the traditional methodology for wage decomposition, which allows us to discern which part of poverty and multidimensional deprivation is explained by the differences in household characteristics in the various regions and which part is due to the differing effect of such characteristics in each geographical area. The article ends with a brief list of conclusions.

## 2. METHODOLOGY AND DATA

### 2.1. *Methodology*

The analysis of the relationships between income poverty and multidimensional deprivation requires the construction of composite indices for both phenomena. Given the overall goal of testing how traditional measures may turn out to be insufficient to account for a multidimensional notion of poverty, we basically opted to follow a traditional approach to measure income poverty, choosing a cut-off point in the income distribution defined as a percentage of median income. As is well known, there are many methodological options to obtain poverty indicators within this relative approach and their results are highly sensitive to the methodological decisions taken. The range of options includes choosing the reference variable, the unit of analysis, the equivalence scale, taking average or median income, defining the relative threshold and selecting a synthetic measure. In this study, we opted to consider 60% of median income adjusted by the OECD modified equivalence scale as the threshold.

We chose to use the most commonly used indices to analyze two different aspects of income poverty: namely its incidence and intensity. In order to have different approaches, the family of indices proposed by Foster, Greer and Thorbecke (1984) was used:

$$FGT(\alpha) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^{\alpha}, \text{ with } \alpha \geq 0 \qquad [1]$$

where $FGT_0$ is equivalent to the poverty rate or percentage of households below the threshold ($z$) and $FGT_1$ is equivalent to the poverty gap or the income differential of poor households with respect of the threshold multiplied by the poverty rate. The parameter $\alpha$ can be interpreted as the level of aversion to inequality among the population below the poverty threshold. The relative incidence of poverty can be approximated by giving a value of 0 to the $\alpha$ parameter. Intensity can be approximated through the relative size of the distances between poor families' income levels and the poverty threshold ($\alpha$=1).

As opposed to the standardization of relative measurement procedures for income poverty, the range of options for multiple deprivation composite indices is considerably broader. Since Townsend's (1979) seminal contribution, there has been a great number of proposals for weighting systems[4]. The most obvious would be to grant an equal weighting to each partial indicator. Such a procedure is followed by some of the classical studies on multidimensional deprivation, such as Townsend (1979), Mack and Lansley (1985), and Mayer and Jencks (1989). On the one hand, this weighting scheme could be justified by the attempt to reduce to a minimum the interferences caused by the researcher's decisions on the results and, on the other, by a lack of information regarding whether or not to take into consideration the different kinds of items or activities are considered necessary. The drawback of following this strategy resides in the absence of differentiation among some components, which clearly differ as to their contribution to overall deprivation.

Alternatively, one could opt for extracting the weightings from the observed frequencies. Halleröd (1994), for instance, gives greater importance to the absence of goods considered as necessary by the majority of the population, while Desai and Shah (1988) give a different weight to each attribute in accordance with the proportion of individuals or households that possess them at a greater value than the modal when constructing their deprivation index. Other studies use alternative structures, particularly when the information that serves as a basis for the empirical exercise does not reflect social perceptions on the need for items or activities. Martínez and Ruiz-Huerta (1999 and 2000) apply a weighting to each attribute that is calculated as the coefficient between the proportion of the population that does not lack each item and the sum of the proportions for each indicator. Whelan *et al.* (2001, 2002) and Muffles and Fouarge (2001) give a weighting to each item in keeping with the proportion of individuals that possess them. They justify their choice through Runciman's (1966) definition of

[4] Although bringing together all the attributes in a single index offers the advantage of summarizing the complexity of the problem in a simple way, such aggregation could lead to a loss of information. The alternative lies in constructing deprivation subclasses that indicate the different dimensions of deprivation. Nolan and Whelan (1996), Layte *et al.* (2001a, 2001b), Martínez and Ruiz-Huerta (1999, 2000) and Whelan *et al.* (2001, 2002) consider different dimensions when analyzing multidimensional poverty. These dimensions correspond to different aspects, such as basic needs, secondary needs or housing conditions.

deprivation which states that a person feels poorer the better he/she sees the rest of the population is doing.

The main alternative to using arithmetic or weighted means is to construct weighting schemes based on the use of multivariate statistical techniques like factor analysis (Nolan and Whelan, 1996; Layte *et al.*, 1999, 2001), principal component analysis (Ram, 1982; Maasoumi and Nickelsburg, 1988; and Klasen, 2000), cluster analysis (Hirschberg *et al.*, 1991; Ferro *et al.*, 2008), multiple correspondence analysis (Asselin and Tuan, 2008) or the latent variable model (Gailly and Hausman, 1984; Pérez-Mayo, 2005; Ayala and Navarro, 2007).

This study opts for employing a latent class model along the lines of this latest trend of approaches. In as much as the notion of multidimensional deprivation is not directly observable, the latent variable model may turn out to be appropriate as it is a multivariate statistical method that measures an unobserved variable (multidimensional deprivation) on the basis of the information gathered in a set of observable variables (the living standards indicators). Among the different possible options, the fact that the available indicators are categorical variables (most of them dichotomous variables) makes the use of the latent class model necessary, which was initially proposed by Lazarsfeld (1950) and Lazarsfeld and Henry (1968). Additionally, the stratification of deprivation in latent class models enables the common problem of arbitrariness when setting poverty thresholds to be resolved.

To start off with, let us suppose the existence of a set of partial deprivation indicators $(x_1,\ldots,x_p)$ with a respective number of multidimensional deprivation categories $I_1,\ldots,I_p$. In addition, $x_q$ is a latent variable that represents deprivation with a total of *J* classes. The model's basic equations are as follows:

$$\pi_{i_1\cdots i_p} = \sum_{j=1}^{J} \pi_{i_1\cdots i_p j} \,, \qquad [2]$$

where

$$\pi_{i_1\cdots i_p j} = \pi_j \pi_{i_1\cdots i_p|j} = \pi_j \pi_{i_1|j} \cdots \pi_{i_p|j} \,. \qquad [3]$$

and $\pi_{i_1\cdots i_p j}$ represents the likelihood of the joint distribution $x_1,\ldots,x_p,x_q$. Furthermore, $\pi_j$ is the probability of belonging to the latent class *j* and $\pi_{i_1\cdots i_p|j}$ is the likelihood of having a specific response pattern given that $x_q=j$. The rest of the $\pi$ parameters are conditional probabilities.

The parameters of the latent class model are the conditional probabilities and the probabilities of latent classes, which would be subject to the following constraints:

$$\sum_{i_1=1}^{I_1} \pi_{i_1|j} = \cdots = \sum_{i_p=1}^{I_p} \pi_{i_p|j} = 1 \text{ y } \sum_{j=1}^{J} \pi_j = 1 \qquad [4]$$

The latent class model can be estimated through the EM algorithm (Dempster, Laird and Rubin, 1977). This algorithm is an iterative procedure that consists of two steps. All the expected values given the observed values and the model's current parameters are calculated in the first step. Then in the second step, the likelihood function of all the data is maximized based on the expected values calculated in the previous step. This implies calculating the updated estimations of the model's parameters, as if no data were lacking. The iterations continue until convergence is achieved. Finally, maximum likelihood estimates can be obtained:

$$\hat{\pi}_{i_1|j},\cdots,\hat{\pi}_{i_p|j} \text{ y } \hat{\pi}_j \,. \qquad [5]$$

From these it is possible to calculate the probabilities:

$$\hat{\pi}_{i_1\cdots i_p j} \text{ y } \hat{\pi}_{i_1\cdots i_p} = \sum_{j=1}^{J} \hat{\pi}_{i_1\cdots i_p j} \,. \qquad [6]$$

The next step in the analysis consists of assigning each individual to the different classes of the latent variable $x_q$. In order to do so, the conditional probability of an

individual situated in the $(i_1,\ldots,i_p)$ categories of the manifest variables $x_1,\ldots,x_p$ of belonging to class *j* of the variable $x_q$ is calculated as follows:

$$\hat{\pi}_{j|i_1\cdots i_p} = \frac{\hat{\pi}_{i_1\cdots i_p j}}{\sum_{j=1}^{J} \hat{\pi}_{i_1\cdots i_p j}}. \qquad [7]$$

In our specific case, this formula reflects the likelihood of belonging to a deprivation category based on the situation observed in the living conditions indicators.

2.2. *Data*

The availability of territorially disaggregated household microdata containing information on income and living conditions has traditionally been very limited for Spain. Until recently, the alternatives were basically to the Continuous Family Budgets Survey after the sample was enlarged in 1997 and the European Community Household Panel (ECHP). For the kind of analysis proposed in this study, the latter had the advantage over the ECPF of dealing with incomes in a more detailed way, as well as including a wide variety of representative variables on living conditions. Nevertheless, it was not an appropriate source in most of the waves carried out due to its limited territorial disaggregation, as it was based on the notion of super-regions or NUTS-1. Aggregating regions having very different socio-economic patterns could lead to misconceptions when determining the influence of territorial issues on the relationship between income poverty and deprivation.

The Survey on Income and Living Conditions (EUSILC) replaced the European Community Household Panel in 2004. The main aim sought by EUROSTAT when it created this database was to attain the comparability of the results from different Member States of the European Union. More specifically, an effort was made to have a source that would allow income distribution and social exclusion to be compared within the European context. In order to achieve this, the questionnaires, data gathering, coding and weighting systems were harmonized as much as possible. The Spanish sample for 2005 of the Survey on Living Conditions was used in this study to carry out the

empirical analysis. The sample included 36,678 observations and adopted the individual as the unit of analysis.

The design of the Survey on Income and Living Conditions allows one to gather detailed information about the income of each household member, along with different aspects related to material and demographic conditions, additionally including some subjective assessments on the financial difficulties faced by households. As opposed to the ECHP, the Survey on Living Conditions contains a territorial disaggregation by NUTS-2 or regions, which constitute the ideal unit of analysis to study territorial differences in countries like Spain. Moreover, information about material well-being indicators is abundant, which can serve as a basis to construct multidimensional deprivation indices.

Hence, data appears in the survey on issues like subjective assessments on the capacity to meet a wide range of needs concerning both items and activities (eating meat or fish every two days, a week of paid holidays at least once a year or keeping the dwelling at an appropriate temperature in winter), difficulties encountered in covering ordinary costs (mortgage repayments, rent, utility bills or hire purchase instalments), household amenities (the existence of a bath, shower and toilet, among others), the presence of housing problems (lack of space, insufficient natural light or leaks and damp) and possessing some items (automobile, colour television, washing machine, telephone, etc.), along with information about the reasons for lacking an item. This latter point is highly important given that it allows one to apply the principle of "forced lack" when assessing the indicators.

These advantages over the above-mentioned sources, however, come with some disadvantages. The survey does not contain information about household consumption, which prevents the description obtained through income and living conditions from being completed. If consumption patterns were known, the influence exerted by the structure of preferences in the responses to some questions on economic capacity could be eliminated. Likewise, the information on the economic situation and living conditions only refers to the capacity to acquire items or do activities, without measuring how many times such items and activities are acquired or carried out.

## 3. INCOME POVERTY AND MULTIPLE DEPRIVATION: A CROSS-REGIONAL ANALYSIS

### 3.1. *Poverty and Multidimensional Deprivation in the Spanish Regions*

Once the methodology and the database used have been presented, it is possible to arrive at an overall approximation on the incidence of income poverty and multidimensional deprivation in each region and to subsequently analyze the existence of regional differences regarding both phenomena. Before commenting on the results, it is necessary to point out some of the definitions that have been adopted. As in other studies (Martínez and Ruiz-Huerta, 1999, 2000) aspects like subjective perceptions on the state of health, social relationships or the employment situation have not been included among the deprivation indicators' components. Concerning the level of analysis, although some authors like Layte *et al.* (1999) or Whelan *et al.* (2001, 2002) differentiate between the surrounding's quality (pollution, noise, vandalism and crime) and the dwelling's quality (lack of light or space, leaks, rot in floors or window frames, damp and lack of household amenities) within the dwelling's conditions, some prior studies (Pérez Mayo, 2003) have, nonetheless, shown that aspects of the surroundings do not seem to discriminate among households in Spain.

The indicators selected to construct the multidimensional deprivation index include matters like not being able to afford a week's paid holiday, eating meat or fish every two days, having a car, telephone, colour television, computer, washing machine, or not being up-do-date with ordinary payments[5], along with living condition deficiencies like a lack of space or light, the presence of leaks or damp, or problems in keeping the dwelling at an appropriate temperature during the winter. The aggregate deprivation index therefore measures a notion of poverty that goes beyond basic needs, as it includes some questions related to lifestyles.

The multidimensional deprivation and income poverty results estimated for the different regions are shown in Table 1. The most relevant result concerning the first of these phenomena is the existence of a significant territorial dispersion of the

[5] We suppose that a household is late with ordinary payments if it is late concerning at least one of the following kinds of payments: rent, mortgage repayments, utility bills or other loan repayments.

multidimensional deprivation index proposed. The rates for the Canary Islands, for instance, almost double the national average, while just the opposite happens for La Rioja and Navarre. The situation of Madrid and the Valencia Region, which have higher rates than those that should correspond to their average income levels, also stand out.

As regards income poverty, the rates were calculated by taking 60% of median household income adjusted by the modified OECD scale as a reference[6]. Table 1 shows the results of the two poverty indicators proposed —incidence and intensity— by regions. Two results are worth highlighting among other relevant results. Firstly, the ranking and dispersion resulting from the poverty indicators is fairly similar to those obtained from the deprivation rates estimated, apart from a small number of cases[7]. This similarity could be the first indication of a possible statistical relationship between the two kinds of measures. Secondly, a certain correspondence between the poverty incidence and intensity rankings stands out in most of the regional authorities. Although there are a priori factors that cause a possible differentiation, like the different level of ageing among the population –a phenomenon associated to a great deal of incidence but of little intensity in Spain–, re-orderings are scarce and in no case does a region having a low incidence encounter problems of high intensity. Furthermore, a clear linear relationship with the regional average level of income can be detected for the two kinds of poverty indicators, with the richest regions having substantially lower values[8].

Despite the similarities pointed out in the rankings depending on whether one opts for a measure of intensity instead of incidence, there are some changes in the regional authorities' relative rankings that suggest a possible relationship with multiple deprivation should be analyzed taking into account both dimensions. A study limited to comparing the incidence of poverty with multidimensional deprivation would conceal any possible statistical relationships between the intensity of poverty and the level of deprivation suffered.

[6] The income used was net total income for the calendar year prior to the survey.
[7] The variation coefficients in the regional authorities are 2.67, 2.50 and 2.14 respectively for FGT ($\alpha$=0), FGT ($\alpha$=Y) and the multidimensional deprivation index.
[8] The close link between average income and well-being also appears when, instead of focusing our attention on the lower end of the income distribution, abbreviated well-being function are used to verify the differences among regional authorities . See Ayala *et al.* (2006).

### 3.2. *The Relationship between Income Poverty and Multidimensional Deprivation*

The findings showing some re-orderings among the regional authorities without any great changes in general, depending on whether one or the other approach to poverty is adopted, are relatively different from the empirical evidence reviewed in some of the sections above. Numerous studies focusing on poverty and living conditions in some developed countries have reached the conclusion that low income levels do not necessarily entail insufficient living conditions. As was pointed out above, the available studies for Spain (Martínez and Ruiz-Huerta, 1999; Ayllón *et al.*, 2007) show a weak relationship between income and multidimensional deprivation indices.

An aggregate procedure to study general relationships between the incidence of multidimensional deprivation and household income consists of observing how deprivation is distributed by income percentiles. If there were a clear relationship, a monotonous decreasing trend would be expected. Graph 1 shows the unequal distribution of multidimensional deprivation by income deciles for the entire Spanish population. Although the graphic representation seems to show a moderately curved trend, it clearly demonstrates that the incidence of deprivation is much higher in the first two deciles.

Therefore, it can be expected a significant level of statistical association between income poverty and overall deprivation indices. A direct approach to analyze the correspondence between both indictors lies in establishing a matrix summarizing the possible states of the households, along the lines laid down by Halleröd (1994) and Nolan and Whelan (1996). Table 2 shows that the "consistently poor" –in other words, those who are considered as poor by both income as well as by deprivation criteria– are relatively few (around 7% of households). The results obtained do not appear to be particularly sensitive to the methodology used to measure deprivation. Simulations were conducted with other deprivation indices put forward in the literature, such as the indices of Nolan and Whelan (1996) and of D'Ambrosio and Peragine (2001). These were compared with the households' equivalent income (in logarithms) and very similar results were obtained. In any case, it is worth highlighting that the size of the group of poor households which are not in a situation of multidimensional poverty is similar to

the number of households that are not poor which find themselves in a situation of deprivation.

The search for significant relationships lies in using suitable measures of statistical association. If the most common statistics are used to explore the relationship between both variables, the same conclusion is reached. Though some level of relationship does indeed exist, given that the hypothesis of independence is rejected, it is confirmed that such a relationship is not very significant. The respective coefficients are, in general terms, low (Table 3).

Once the relationship at a national level has been analyzed, the key question is whether or not regional differences exist that the level of aggregation could be concealing. The search for aggregate relationships could be concealing the possible effect produced by the heterogeneity affecting household characteristics. Asymmetries in processes of economic growth with a high dispersion in wealth and employment levels, along with differences in the patterns of demographic change and in regional labour characteristics could be concealing the existence of very different models that translate low income into insufficiencies in the households' living conditions. The aforementioned decentralization of some public services having a significant redistributive capacity or of some guaranteed income programmes that have an effect on the intensity of poverty, like some regional minimum income schemes which have a very patchy coverage nation-wide, is also linked to this.

Heterogeneity is visibly manifested in the graphic representation of the distribution of deprivation by income deciles in each region (Graph 2). The trend is very similar concerning both the distribution by income deciles of each region (Graph 2.a) as well as when, as an alternative, each region's distribution of households by deciles is defined according to national income (Graph 2.b). The most outstanding feature to highlight is the marked lack of uniformity in the regional patterns. Though there seems to be a negative linear relationship between income levels and multidimensional deprivation in most regions, the profile is clearly decreasing in some cases while in others the trend is much more horizontal. The differences widen when the deciles are defined as per national income.

As a result of this diversity of relationships, the measures of statistical association show a great range of variation among the regions[9] (Table 4). There does not appear to be a definite pattern of differences given that some regions with high poverty and deprivation rates are included within the group having a greater relationship, as well as others that have lower rates than the nation as a whole.

## 4. TERRITORIAL DECOMPOSITION OF INCOME POVERTY AND MULTIDIMENSIONAL DEPRIVATION

### 4.1. *Methodology*

The apparent absence of strong linear relationships between income poverty and multidimensional deprivation in the different regions suggests the need for a more detailed and thoroughgoing analysis of the roots of such divergences. A possible way of analyzing these lies in attempting to identify whether both realities respond similarly to the households' different socio-economic characteristics in each territory. The varying sensitivity of both phenomena to changes in the labour environment or to changes in household types could be the cause behind the differences observed in the relationships found for each regional authority.

The literature on the decomposition of poverty indices by population groups is abundant. However, there are no equivalent procedures for the case of multidimensional deprivation. A possible alternative is an adaptation of the decomposition technique of wage differentials initially proposed by Blinder (1973) and Oaxaca (1973). In its original formulation, these differences could be expressed as:

$$\bar{Y}_B - \bar{Y}_A = (\bar{X}_B - \bar{X}_A)\hat{\beta}_A + \bar{X}_B(\hat{\beta}_B - \hat{\beta}_A) + (\hat{\alpha}_B - \hat{\alpha}_A) \qquad [8]$$

This would allow us to decompose the wage gap between two population subgroups into a component that measures the differences between the two groups with regard to a vector of characteristics related to human capital (*X)*, a second component that

[9] The SIM dissimilarity index proposed by Dagum and Costa (2004) coincides with these results. The SIM index is the proportion of individuals identified as poor according to the two criteria used in this study.

represents the part due to differences in the returns to these characteristics ($\beta$) and a third unexplained component that would reflect the differences in the characteristics not taken into consideration by the model.

Transferring this to the case of the two phenomena under study, it would be possible to measure if the divergences found among the regions are, for instance, due to differences in human capital allocations in each region or, on the contrary, to differences that exist in the regional labour markets. It can be observed in the equation above that the differences between the two groups' averages (in our case regions) can be expressed as a function of the differences in the allocation of factors, among the coefficients relative to each factor and any determinants not considered in the model reflected, which are reflected by constant terms. Different studies, such as the ones authored by Biewen and Jenkings (2004), Gang *et al.* (2006), Bhaumik *et al.* (2006) and Gradín (2007), have confirmed that the difference between the poverty rates ($p$) of two groups, $A$ and $B$, can be decomposed as follows:

$$\begin{aligned} \overline{p}_A - \overline{p}_B &= \overline{F(X'_{iA}\beta_{iA})} - \overline{F(X'_{iB}\beta_{iB})} = \\ &= \underbrace{\overline{F(X'_{iA}\beta_{iA})} - \overline{F(X'_{iB}\beta_{iA})}}_{characteristics} + \underbrace{\overline{F(X'_{iB}\beta_{iA})} - \overline{F(X'_{iB}\beta_{iB})}}_{coefficients} \end{aligned} \qquad [9]$$

An important constraint to the application of this decomposition technique to the study of income poverty and multidimensional deprivation, however, is the fact that these kinds of methods were designed for linear regression models. In this study, the models that have to be compared predict the proportion or probability of being poor or suffering deprivation in a specific region. This requires values calculated by non-linear models (logistical regression) and the original decomposition cannot be applied directly. The procedure proposed by Yun (2004) that generalizes Even and Macpherson's (1993) decomposition has been followed in this case. This detailed decomposition can be applied to any model, be it linear or not, and consists of determining the relative weight of each variable and the coefficients relative contribution in the aggregate terms shown in the formula above.

$$\overline{p}_A - \overline{p}_B = \sum_{k=1}^{K} W_{\Delta x_k} \left\{ \overline{F(X'_{iA}\beta_{iA})} - \overline{F(X'_{iB}\beta_{iA})} \right\} + \sum_{k=1}^{K} W_{\Delta \beta_k} \left\{ \overline{F(X'_{iB}\beta_{iA})} - \overline{F(X'_{iB}\beta_{iB})} \right\}, \qquad [10]$$

where the weights $W_{\Delta x_k}$ and $W_{\Delta \beta_k}$ are respectively calculated from:

$$W_{\Delta X_k} = \frac{\left(\bar{X}_{A_k} - \bar{X}_{B_k}\right)\beta_{A_k}}{\sum_{k=1}^{K}\left(\bar{X}_{A_k} - \bar{X}_{B_k}\right)\beta_{A_k}}, W_{\Delta \beta_k} = \frac{\bar{X}_{A_k}\left(\beta_{A_k} - \beta_{B_k}\right)}{\sum_{k=1}^{K}\bar{X}_{A_k}\left(\beta_{A_k} - \beta_{B_k}\right)}, \sum_{k=1}^{K} W_{\Delta X_k} = \sum_{k=1}^{K} W_{\Delta \beta_k} = 1.$$

Additionally, this method overcomes the path dependency problem which takes place as the characteristics or coefficients of a group are sequentially replaced by the corresponding values of the other group to calculate the individual contribution of a variable or a coefficient to the overall difference[10].

Due to the use of dichotomous variables, the problem related to the model's identification gain in importance, as the coefficients may vary depending on the category chosen as a reference. In order to overcome this problem, the normalized regressions proposed by Yun are used (2005b), which do not vary with changes in the category used as a reference. According to this method, the model that describes the likelihood of poverty could be expressed as follows:

$$P = F\left(\alpha + \sum_{l=1}^{L} X_l \hat{\delta}_l + \sum_{m=1}^{M}\sum_{k_m=2}^{K_m} D_{mk_m}\hat{\beta}_{mk_m}\right), \qquad [11]$$

where there are $L$ continuous variables and $M$ sets of categorical variables, the $m^{th}$ set has $K_m$ categories and $K_m$-1 variables in the equation.

Making some calculations, the formula above could be rewritten as:

$$P^* = F\left(\alpha^* + \sum_{l=1}^{L} X_l \hat{\delta}_l^* + \sum_{m=1}^{M}\sum_{k_m=2}^{K_m} D_{mk_m}\hat{\beta}_{mk_m}^*\right), \qquad [12]$$

where the parameters are:

[10] An example of this detailed decomposition through a sequential procedure can be seen in Fairlie (2005).

$$\alpha^{*} = \alpha + \sum_{m=1}^{M} \overline{\hat{\beta}}_{m}$$
$$\hat{\delta}_{l}^{*} = \hat{\delta}_{i}, i = 1,\text{K}\ , L \qquad .$$
$$\hat{\beta}_{mk_m}^{*} = \hat{\beta}_{mk_m} - \overline{\hat{\beta}}_{m}, k_m = 1,\text{K}\ , K_m, m = 1,\text{K}\ , M$$

Lastly, in order to test the statistical significance of the estimated contributions, we followed Yun (2005a), who used the delta method to calculate asymptotic variances. $C = \overline{F(X'_{iA}\beta_{iA})} - \overline{F(X'_{iB}\beta_{iA})}$ represents the effect of the characteristics and $D = \overline{F(X'_{iB}\beta_{iA})} - \overline{F(X'_{iB}\beta_{iB})}$ represents the effect of the coefficients. Based on a covariance matrix of the model's coefficients, the asymptotic variances can be calculated as follows:

$$\sigma_C^2 = G_C \Sigma_{\beta_A} G'_C \text{ y } \sigma_D^2 = G_D \begin{bmatrix} \Sigma_{\beta_A} & 0 \\ 0 & \Sigma_{\beta_B} \end{bmatrix} G'_D = \frac{\partial D}{\partial \beta'_A} \Sigma_{\beta_A} \frac{\partial D'}{\partial \beta_A} + \frac{\partial D}{\partial \beta'_B} \Sigma_{\beta_B} \frac{\partial D'}{\partial \beta_B},$$

where $G_C = \left[ \frac{\partial D}{\partial \beta'_A} \right]$ and $G_D = \left[ \frac{\partial D}{\partial \beta_A}; \quad \frac{\partial D}{\partial \beta_B} \right]$.

The idea of the tests is to verify whether the contributions of the characteristics and the coefficients are statistically significant. Under the null hypothesis, the tests are $t_C = C \big/ \sigma_C$ and $t_D = C \big/ \sigma_D$, which asymptotically follow a normal distribution.

4.2. *Results*

In order to test the differences in the components of income poverty and multidimensional deprivation in each region, the first step of applying the methodology reviewed in the preceding section lies in estimating the different *logit* models for each region and for the nation as a whole. The relationships can be studied by controlling the effects caused by unobserved variables when considering each of the regions on an individual basis. Tables 5 and 6 show the results of the regressions for the two kinds of indicators considered in this study. In addition to being necessary as a starting point for the decomposition set out, these *logit* models allow one to sketch out a preliminary

description of the determinants of the incidence of poverty and multidimensional deprivation.

Any determinants that appear in most of the studies as relevant influencing factors in the relative risk of belonging to the group of poor or deprived people have been chosen as explanatory variables. More specifically, they reflect aspects like household characteristics, educational attainment and labour market status. In addition to the household head's gender and age, household size, the number of children and the type of household (single person, couples with or without children, single-parent households and other households) are included among the first of these. This latter variable is represented through a set of dummies in which “single person” is the reference category.

Issues related to the socio-economic situation and the labour market are highly relevant to explain household living conditions as, on the one hand, they reflect the effect of investments in human capital represented by the household head’s educational attainment and, on the other, the influence exerted by the current employment situation. Three dummies variables reflecting the highest level of educational attainment reached by the household head are included: without studies, primary education and higher education, whilst secondary education is taken as the category of reference. In addition, three variables are considered to reflect the labour market situation (part-time employment, unemployed and inactive), and the household head being in full-time employment is taken as the group of reference. Lastly, the proportion of employed active adults in the household is considered to take into account all the sources of the household's resources, and not only those of the household head.

With the necessary caution derived from any possible problems concerning the sample representativeness of some regions, the results obtained take on the signs that were to be expected *a priori.* Starting off with the results corresponding to the income poverty indicator, the coefficients corresponding to extreme categories in the case of the household head's educational attainment stand out. Higher education constitutes an important negative factor for the likelihood of being poor when compared to the category of reference (secondary education). At the other extreme, the fact of having an educational attainment equivalent to primary education or having no studies at all

notably increases the risk of finding oneself in a situation of poverty. These results are evident for both the national total and for most of the regions.

As regards issues related to the labour market, all the coefficients for the nation as a whole are significant and most have the expected signs. The effect exerted by the household head being in part-time employment stands out. This situation increases the risk of suffering poverty more than situations of unemployment or inactivity; situations which, as a general rule, cause a greater incidence of poverty than full-time employment. Being in part-time employment can therefore lead to a situation that is worse than that of households dependent on social transfers when it becomes the main source of income for households, although it can also serve to complement other sources of income. These results are repeated for most of the regions, though there are some variations. Unemployment is a more important risk factor for poverty than inactivity in some regions, such as Asturias, the Balearic Islands, Castilla y León or Extremadura.

Therefore, it does not turn out to be a surprise that poverty is negatively related to the proportion of employed adults in the household. A greater level of available resources in the household means that the greatest possible number of household members being in employment constitutes the best guarantee of success against poverty for both the nation as a whole, as well as for most regions. The proportion of active adults in the household has also been considered in the calculations in order to be able to compare and differentiate the relevance of employment, unemployment and inactivity from the standpoint of the collective labour supply within the household. The variable corresponding to the proportion of active household members has a positive effect in the nation as a whole and in most of the regions. The difference with the result for the proportion of employed adults indicates that, given a specific employment rate within the household, the incorporation of other active household members without employment entails an increase in the risk of suffering a lack of income.

Household composition and other demographic characteristics, such as the household head's gender and age, do not follow such a clear pattern as that of the above-mentioned variables. Although they turn out to be generally significant and they take on the signs expected of them for the nation as a whole, the same cannot be said for

the regional models. While the number of children turns out to have a positive significant effect in eleven of the seventeen regions, the effect of being a single-parent household is only significant in five regions and, what is more, with contradictory signs.

The table of results for multidimensional deprivation shows some divergences when it is compared to this pattern, especially in the case of the regional models. In general terms, the national model is very similar to the one obtained for income poverty concerning the effects' significance –in this case, all are significant–, as well as concerning their signs and magnitudes. This similarity in the national aggregate as regards the results obtained for income poverty, however, conceals considerable differences in some regional coefficients, such as Andalucía, Castilla-La Mancha, Castilla y León, Extremadura and Galicia, where the number of significant effects falls, or in Navarre, where the changes are just the opposite. For instance, the importance of the greatest possible number of household members being active increases –also taking on a positive sign–, while the capacity of all active household members being in employment to reduce the risk of suffering multidimensional deprivation is confirmed. In several cases, equivalent characteristics would therefore be associated, in general terms, to different levels of poverty and multidimensional deprivation in each regional authority. Consequently, it is possible to think that these differing results could at least partially be the cause behind the weak relationship between poverty and deprivation.

In order to explore and explain the heterogeneity of the regional poverty and deprivation rates in greater detail, the decomposition proposed in the previous section was used. Given that an attempt was made in this case to analyze the discrepancies between the respective regional rates and the corresponding national rate, (9) could be expressed as follows:

$$\overline{p}_{REG} - \overline{p}_{NAC} = \overline{F(X'_{iREG}\beta_{iREG})} - \overline{F(X'_{iNAC}\beta_{iNAC})} \qquad (13)$$

In other words, groups *A* and *B* of the prior expressions respectively correspond to each of the regions and to the national aggregate. This methodology allows the discrepancies observed to be decomposed according to both the influence of the regional distribution of factors and characteristics, as well as according to the specific

features of the regions. An example of the former case would be the increase in the risk of poverty in a region having lower educational attainment or a higher unemployment rate. The latter could come about when the reducing effects of educational attainment on the risk of poverty differ among the regions. To sum up, the problem broached resides in the dilemma of attributing the responsibility of both phenomena either to personal characteristics or to the environment's characteristics. This is not a minor question due to the fact that an improvement in the design of policies to combat poverty and exclusion would depend on its response.

The results of the decomposition exercises of the differences between the regional rates and the national rate of poverty and multidimensional deprivation are shown in Table 7. The most outstanding result is the greater importance of the component of "coefficients" as regards the component of "characteristics" in both cases. Regional differences in the effects of the characteristics seem to contribute more than the divergences in their regional distribution.

Although the size of the respective values change, the regions having greater differences when compared to the national poverty and multidimensional deprivation rates, like Andalucía, the Canary Islands and Extremadura, show a greater contribution of the "characteristics component". We could therefore affirm that the greater levels of poverty and deprivation in such regions are, to a large extent, due to different starting point situations (this component explains almost 60% of the difference in the poverty rate and around 50% of the deprivation rate in Andalucía, and 26% of the poverty rate and 24% of the deprivation rate in Extremadura).

In any case, the most relevant result corresponds to the detailed analysis of the contribution of household socio-demographic characteristics, educational attainment and the labour market status to poverty and multidimensional deprivation (Tables 8 and 9). The results suggest that these are distinct phenomena that follow a different pattern. The contributions of the effects in some regions change in magnitude, depending on whether poverty or multidimensional deprivation are being analyzed, while in others they take on the opposite sign. For instance, while demographic characteristics predominate for income poverty in Andalucía, the allocation of human capital and the unemployment rate predominate in Extremadura. If deprivation is analyzed, the same

factor still carries weight in Andalucía while in Extremadura demographic factors take on greater importance.

Lastly, reference should be made to the contribution made by other unobserved variables that are considered through the model's constant term, which are more relevant in general terms to study differences in poverty rates than differences in deprivation rates. There can be no doubt that the decomposition carried out confirms the dependence of both processes on different determinants in each region. Differences in each territory's economic and social structure –as the weight of the component of "coefficients" in several regions demonstrates– contribute to the unequal relationship observed between the two phenomena that have been the subject of this study.

## 5. CONCLUSIONS

Traditional studies on poverty based on a strictly income-based approach have been placed into question in recent years by a series of different proposals that incorporate a multidimensional approach. The interest in considering household living conditions in a combined way has also reached the policy decision-making sphere. The European Commission and several national governments have started to systematize a set of social well-being indicators that reflect this multidimensional notion of poverty.

The level of development reached by these new approaches, however, has not been enough to accurately identify the kind of relationship that exists between households' income levels and situations of multidimensional deprivation. The literature dedicated to analyzing whether a low level of income also entails insufficient living conditions has increased considerably in recent years, placing into question the consistency of poverty estimates based on strictly income-based criteria. Although differences among countries exist, most of the empirical evidence points toward a certain level of statistical association between both measures, though the relationship is generally weak. This study has made an attempt to extend this line of research by incorporating two alternative elements to the main stream of analyses: constructing synthetic deprivation indices through a latent class model and analyzing the relationship between multidimensional deprivation and income poverty, whilst incorporating the heterogeneity that arises from differences among regions.

As a result of the estimates carried out, the confirmation of a weak relationship between both phenomena stands out. An analysis of regional rates shows that this result is not an exclusive characteristic of the national aggregate and that this phenomenon is reproduced in most of the regions. There are, however, differences among the regions and a definite underlying pattern of statistical association between both phenomena does not seem to appear in the different territories.

The common way of considering the analysis of the relationship between deprivation and poverty from an aggregated standpoint could therefore conceal the existence of much more significant relationships in specific regions. In these cases, identifying a consistent core of poverty should contribute to more suitable policy designs targeted at the most disadvantaged individuals, especially in contexts like the Spanish one in which public intervention has been affected by a process of growing territorial decentralization. Along the same lines, the results show that factors related to educational attainment and the labour market exercise a marked influence on the risk of poverty and multidimensional deprivation. Attaining higher levels of employment in the household should lead to a reduction in the risk of suffering low income and deficient living conditions, as long as it does not rest on part-time employment.

The last relevant result arises from the decomposition of the regional divergences involving the two situations under study. In spite of the fact that the characteristics of individuals and of the households in which they live are determinants, differences exist among the regions as a result of their different social policies, the specificities of the regional labour markets or the peculiarities of their productive structures. On the one hand, these differences could explain the lack of a relationship between the income poverty and multidimensional deprivation indices. On the other, the persistence of such differences should lead to enhanced co-ordination in some regional policies in order to ensure a certain level of equality.

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**Table 1. Regional distribution of income poverty and multidimensional deprivation**

| Reg. Authorities | *FGT(0)* | *Ranking* | *FGT(1)* | *Ranking* | *Deprivation* | *Ranking* | *Equivalent Income* | *Ranking* | *Per Capita Income* | *Ranking* |
|---|---|---|---|---|---|---|---|---|---|---|
| Andalucía | 27.02% | 4 | 0.0770 | 6 | 27.77% | 3 | 10205 | 16 | 6509 | 16 |
| Aragón | 16.57% | 11 | 0.0567 | 10 | 12.35% | 13 | 13062 | 7 | 8592 | 7 |
| Asturias | 15.18% | 12 | 0.0490 | 13 | 12.99% | 12 | 13118 | 6 | 8837 | 6 |
| Balearic Islands | 16.69% | 10 | 0.0556 | 12 | 20.60% | 7 | 13499 | 5 | 8883 | 5 |
| Canary Islands | 28.06% | 3 | 0.0928 | 3 | 37.81% | 1 | 10469 | 14 | 6713 | 13 |
| Cantabria | 14.90% | 13 | 0.0382 | 14 | 11.31% | 14 | 12976 | 8 | 8488 | 8 |
| Castilla-La Mancha | 29.04% | 2 | 0.0969 | 2 | 16.61% | 9 | 10422 | 15 | 6697 | 15 |
| Castilla y León | 24.74% | 6 | 0.0784 | 5 | 14.26% | 11 | 11274 | 12 | 7434 | 10 |
| Catalonia | 12.47% | 14 | 0.0360 | 15 | 17.29% | 8 | 13873 | 4 | 9134 | 4 |
| Valencia Region | 19.79% | 7 | 0.0599 | 8 | 20.98% | 6 | 11346 | 11 | 7393 | 12 |
| Extremadura | 34.63% | 1 | 0.1080 | 1 | 31.14% | 2 | 9501 | 17 | 6229 | 17 |
| Galicia | 19.26% | 8 | 0.0557 | 11 | 25.59% | 4 | 11459 | 9 | 7501 | 9 |
| La Rioja | 19.13% | 9 | 0.0672 | 7 | 8.65% | 16 | 11352 | 10 | 7433 | 11 |
| Madrid | 11.89% | 14 | 0.0323 | 16 | 15.21% | 10 | 14574 | 2 | 9524 | 2 |
| Murcia | 25.02% | 5 | 0.0808 | 4 | 24.68% | 5 | 10587 | 13 | 6710 | 14 |
| Navarre | 9.72% | 16 | 0.0303 | 17 | 5.85% | 17 | 15825 | 1 | 10299 | 1 |
| Basque Country | 9.67% | 17 | 0.0289 | 18 | 10.52% | 15 | 14268 | 3 | 9497 | 3 |
| Spain | 19.42% | | 0.0585 | | 20.31% | | 12201 | | 7959 | |

**Source:** Own making based on the Survey on Living Conditions 2005.

**Table 2. Distribution of the population according to poverty and multidimensional deprivation (% of total)**

| | Income Poverty | |
|---|---|---|
| *Deprivation* | Poor | Not Poor |
| Deprived | 7.19% | 13.12% |
| Not Deprived | 12.04% | 67.65% |

**Source:** Own making based on the Survey on Living Conditions 2005.

**Table 3. Relationship between poverty and multidimensional deprivation**

| | Statistics |
|---|---|
| $\chi^2$ | 1796432.67 |
| Cramer's "V" | 0.207 |
| Contingency coefficient | 0.203 |

*All coefficients are significant at 5 and 1 per cent.

**Source:** Own making based on the Survey on Living Conditions 2005.

**Table 4. Relationship between poverty and multidimensional deprivation by regions**

| | $\chi^2$ | *Cramer's "V"* | *Contingency Coeff.* |
|---|---|---|---|
| Andalucía | 270406.8 | 0.189 | 0.186 |
| Aragón | 35681.6 | 0.171 | 0.169 |
| Asturias | 37258.0 | 0.188 | 0.185 |
| Balearic Islands | 44078.3 | 0.218 | 0.213 |
| Canary Islands | 207512.1 | 0.333 | 0.316 |
| Cantabria | 8731.6 | 0.127 | 0.126 |
| Castilla-La Mancha | 93303.8 | 0.226 | 0.22 |
| Castilla y León | 64233.7 | 0.164 | 0.162 |
| Catalonia | 212271.5 | 0.178 | 0.176 |
| Valencia Region | 42127.1 | 0.097 | 0.097 |
| Extremadura | 27322.0 | 0.161 | 0.159 |
| Galicia | 232369.2 | 0.295 | 0.283 |
| La Rioja | 19622.1 | 0.260 | 0.252 |
| Madrid | 212795.0 | 0.195 | 0.192 |
| Murcia | 25842.1 | 0.144 | 0.143 |
| Navarre | 48673.3 | 0.293 | 0.281 |
| Basque Country | 35162.7 | 0.132 | 0.131 |

*All coefficients are significant at 5 and 1 per cent.

**Source:** Own making based on the Survey on Living Conditions 2005.

## Table 5. Logit model results for income poverty

| | AND | ARA | AST | BAL | CAN | CANT | CLM | CYL | CAT |
|---|---|---|---|---|---|---|---|---|---|
| Age of HH | 0.0017 | 0.0349* | -0.0130 | -0.0007 | -0.0026 | 0.0262* | -0.0195* | 0.0319* | 0.0100 |
| HH female | 0.1616 | 0.7469* | 1.0886* | 0.5678* | -0.3467* | 0.5055 | 0.2196 | -0.1646 | 0.5283* |
| HH w/out studies | 0.6172* | 1.5994* | 0.2173 | 1.1368* | 0.0705 | -0.3787 | 1.8336* | 1.7093* | 1.2464* |
| HH with primary edu. | 0.2198* | 0.2827 | 0.1537 | 0.3149 | 0.2885 | 0.4052 | 0.6972* | 0.8788* | 0.6965* |
| HH with higher edu. | -1.3032* | -1.2148* | -0.4031 | -0.8264* | -1.1267* | -1.2854* | -1.1491* | -0.4388* | -1.3518* |
| Household size | -0.1453* | 0.4358* | -0.5601* | 0.3073 | -0.2317 | 0.1530 | 0.2673* | 0.2842* | 0.2428* |
| Number of children | 0.5730* | 0.3533 | 0.4970* | 0.2034 | 0.6244* | 0.5979* | 0.1769 | 0.1157 | 0.6369* |
| Proportion of active adults | 0.6726* | -2.0342 | 0.9425 | -0.5244 | 0.6594 | -0.0754 | -1.4118* | 0.4105 | 0.8183 |
| Proportion of employed adults | -2.4419* | 1.6500 | -2.0902 | -1.8899* | -2.7085* | -0.7378 | -0.9793 | -0.9831* | -1.4919* |
| HH in full-time employment | 1.4311* | 2.2035* | 2.0435* | 1.6127* | 1.6554* | 0.2131 | 0.9755* | 1.7315* | 1.3491* |
| HH unemployed | 0.3743* | 1.0343 | 2.5138* | 1.3863* | 0.2346 | 0.9365* | 0.7050* | 0.7941* | 0.3634 |
| HH inactive | 0.5984* | 0.2266 | 0.9907* | -0.3741 | 0.6218* | -1.9157* | 1.4778* | 0.0906 | 0.5732* |
| Couples w/out children | -0.1735 | -0.5407 | 0.7576* | -0.9804* | -0.0995 | -2.6513* | 0.8382* | -0.9669* | -0.8594* |
| Couples with children | 0.4489* | -0.7781 | 2.0999* | -0.8054 | -0.0607 | -3.7533* | 1.4659* | -0.5327 | -1.1238* |
| Single-parent households | 0.4723 | -0.9848 | 1.1461 | -0.3858 | 0.6122 | -3.0207* | 2.3460* | -1.7523* | -0.0627 |
| Other households without children | 0.0626 | -1.4794 | 1.0351 | -1.3038* | -0.2548 | -3.0960* | -0.3380 | -1.2493* | -1.3559* |
| Other households with children | 0.1866 | -2.9460* | 2.3536* | -1.2775 | 0.5333 | -3.0230* | 0.2966 | -1.2024* | -2.0451* |
| Constant | -0.8216* | -4.1884* | -1.4004* | -0.6497 | 0.2436 | -0.4063 | -1.3761* | -3.2438* | -2.8059* |
| Number of observations | 4829 | 1563 | 1596 | 1364 | 1859 | 950 | 2013 | 2437 | 3724 |
| Wald test | 621.11 | 197.81 | 150.27 | 162.56 | 242.62 | 116.73 | 367.47 | 222.75 | 377.96 |

| | CV | EXT | GAL | RIO | MAD | MUR | NAV | VAL. | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|
| Age of HH | -0.0180* | 0.0130 | 0.0075 | 0.0079 | -0.0122 | -0.0253* | -0.0542* | -0.0550* | -0.0045* |
| HH female | 0.5054* | 0.0503 | 0.2005 | -0.2983 | -0.0477 | 0.6853* | 0.6993* | 0.0190 | 0.1834* |
| HH w/out studies | 0.0173 | 1.0825* | 1.1034* | 0.9346 | 2.2555* | 1.7046* | 1.6500* | 0.8570 | 1.1880* |
| HH with primary edu. | 0.2911* | 0.8531* | 0.8301* | 0.8787* | 1.0716* | 0.9386* | 1.2315* | 0.6875* | 0.5960* |
| HH with higher edu. | -0.4204* | -1.8866* | -0.9165* | -1.5823* | -0.8724* | -0.3407 | 0.1041 | -1.4675* | -1.0255* |
| Household size | -0.0832 | 0.3481* | 0.0378 | 0.9336* | -0.1774* | -0.4819* | -0.0124 | -0.6068* | 0.0091 |
| Number of children | 0.4909* | 0.6500* | 0.4026* | 0.1353 | 0.5083* | 1.0748* | 0.1501 | 1.1659* | 0.4468* |
| Proportion of active adults | 0.0183 | -1.1444* | 1.2691* | 0.3312 | 1.0044* | 0.3928 | -1.7506 | 2.7006* | 0.7017* |
| Proportion of employed adults | -1.7446* | -1.3978* | -1.6601* | -1.9784* | -5.4016* | -4.3260 | 0.1784 | -4.3832* | -2.3261* |
| HH in full-time employment | 0.5481 | 0.8749 | 0.7686 | 2.2969* | 0.0000* | 3.7451 | -0.0823 | 1.6421* | 1.2239* |
| HH unemployed | 0.5810* | 1.6201* | -0.5124 | 1.8269* | -0.8102 | 0.5658 | -0.6292 | -2.1978* | 0.2517* |
| HH inactive | 1.1139* | 0.0944 | 0.9689* | 1.8024* | -0.8403* | 0.5670* | 1.5079* | 2.6409* | 0.5612* |
| Couples w/out children | -0.3697 | -0.8608* | -0.9756* | -2.3002* | -0.6914 | -0.7959* | -0.1656 | -0.5546 | -0.5247* |
| Couples with children | -0.0183 | -0.5229 | -0.0364 | -1.4749* | 0.5259 | 0.3893 | 0.2086 | 0.4890 | -0.0423 |
| Single-parent households | 0.0808 | 3.8096* | 0.8933 | 0.8385 | 1.9037* | 1.4210 | 1.4150 | 0.8669 | 0.5153* |
| Other households without children | -0.3320 | -1.3562* | -1.3895* | -3.7423* | 0.0789 | 1.2214* | -1.3700 | -0.9423 | -0.6238* |
| Other households with children | -0.0284 | -1.9069* | -0.5149 | -3.7782* | -0.9892 | 1.0762* | -0.4055 | 1.7474 | -0.4716* |
| Constant | -0.1392 | -1.2767* | -2.2906* | -2.9884* | 0.5591 | 1.2401* | 0.3198 | 0.9518 | -0.9544* |
| Number of observations | 2995 | 1625 | 2716 | 1150 | 2243 | 1755 | 1195 | 1795 | 36678 |
| Wald test | 275.61 | 307.91 | 301.33 | 145.26 | 303.33 | 324.44 | 98.33 | 256.47 | 3099.92 |

**Source:** Own making based on the Survey on Living Conditions. *Significant at 5%.

## Table 6. Logit model results for multidimensional deprivation

| | AND | ARA | AST | BAL | CAN | CANT | CLM | CYL | CAT |
|---|---|---|---|---|---|---|---|---|---|
| Age of HH | -0.0250 | -0.0668* | -0.0555* | -0.0324* | -0.0057 | -0.0932* | -0.0359* | -0.0435* | -0.0310* |
| HH female | 0.1156* | 0.2288 | 0.6613* | 0.6870* | -0.3228* | -0.5310 | 0.2293 | 0.2769 | 0.4721* |
| HH w/out studies | 0.6881 | 2.4582* | 1.8857* | 2.7280* | 0.9115* | 0.0000* | 1.3502* | 2.5329* | 0.9278* |
| HH with primary edu. | 0.4068 | 0.2184 | 0.2116 | 0.8476* | 0.0925 | 1.1710* | 0.8268* | 1.6087* | 0.6220* |
| HH with higher edu. | -1.0560 | -2.4084* | -1.4738* | -1.1048* | -1.7802* | -1.8502* | -1.2272* | -0.3646 | -0.6703* |
| Household size | 0.1170 | -0.0216 | -0.1580 | -0.1089 | 0.0320 | 0.5610* | 0.1507 | -0.1598 | 0.3313* |
| Number of children | 0.1191* | 0.6465* | 0.6456* | 0.7965* | 0.3639* | 0.4568* | 0.2439 | 0.1286 | 0.2254* |
| Proportion of active adults | 0.8677 | -1.6904 | 1.5722* | 2.1868* | 2.6462* | 3.3891* | 0.1223 | 1.9671* | 1.0043* |
| Proportion of employed adults | -1.1496 | -0.1039 | -1.5459* | -2.2291* | -3.8072* | -2.7806* | -0.2869 | -2.7818* | -1.9814* |
| HH in full-time employment | 0.5810 | 0.6954 | 0.4157 | 0.0177 | 0.8429* | 1.7426* | 0.7908 | 0.7912 | 0.2841 |
| HH unemployed | 0.5266 | 1.3152* | 0.1902 | 1.2354* | -0.6787* | -2.3804* | 1.8932* | -1.2610* | 0.2575 |
| HH inactive | 0.6284 | 0.4710 | 0.8196* | -0.3406 | -0.5818* | 1.8143* | 1.1039* | 0.5329 | -0.5000* |
| Couples w/out children | -0.2310* | 0.4582 | -1.1067* | -0.1735 | 0.2260 | -1.0215 | -0.3803 | -0.5703 | -0.5458* |
| Couples with children | -0.2756* | -0.4665 | -1.5995* | -1.4182* | -0.6100 | -5.0440* | -0.4778 | -0.4951 | -1.7382* |
| Single-parent households | -0.6114* | 1.1736 | -0.2150 | -0.0401 | 0.7513 | -0.9565 | 1.4375* | 1.4395* | -0.5449 |
| Other households w/out children | -0.2191* | 0.4622 | 0.0092 | 0.1015 | 0.5085 | -2.3355* | 0.0073 | -0.1370 | -1.0701* |
| Other households with children | -0.4115* | -0.3921 | -2.0650* | -0.2580 | -0.2268 | -3.2446* | -0.6316 | 0.2002 | -1.5614* |
| Constant | -0.2777* | 1.7173 | 1.4706* | -0.0742 | 0.1359 | 1.2839 | -0.9086 | 0.1837 | 0.1400 |
| Number of observations | 4829 | 1563 | 1596 | 1364 | 1859 | 950 | 2013 | 2437 | 3724 |
| Wald test | 324.83 | 171.96 | 151.18 | 165.84 | 289.37 | 130.98 | 208.75 | 211.74 | 263.02 |

| | CV | EXT | GAL | RIO | MAD | MUR | NAV | VAL. | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|
| Age of HH | -0.0192* | -0.0258* | -0.0297 | -0.0417* | -0.0431 | -0.0334* | -0.1001* | -0.0303* | -0.0300* |
| HH female | 0.2206 | -0.0012 | 0.4703 | -0.3679 | -0.3944 | -0.0937 | 0.4989 | -0.0839 | 0.1262* |
| HH w/out studies | 1.0687* | 0.0899 | 0.8773 | 2.8779* | 1.8110 | 1.6034* | 2.8194* | 1.3793* | 1.2411* |
| HH with primary edu. | 0.2552* | 0.1358 | 0.6920 | 1.7370* | 1.2295 | 0.5120* | 0.5898 | 0.1070 | 0.5683* |
| HH with higher edu. | -1.1213* | -0.5912* | -0.6739 | 0.1263* | -0.7091 | -0.5440* | -0.8856* | -0.8467* | -0.9175* |
| Household size | 0.2390* | 0.1868 | -0.1190* | 0.0204 | 0.0443* | -0.2528* | -0.8739* | 0.1909 | 0.0774* |
| Number of children | 0.1907* | 0.4813* | 0.4592 | 1.3680* | 0.2032* | 0.6781* | 1.7721* | -0.0047 | 0.2617* |
| Proportion of active adults | 0.7521* | 0.6483 | 1.5482 | 2.4326* | 0.7498* | 1.4649* | 2.9411* | 0.7320 | 1.2662* |
| Proportion of employed adults | -1.3074* | -0.7967 | -3.1708 | -1.9103* | -0.2243* | -0.7706 | -4.0853* | -2.0211* | -1.7403* |
| HH in full-time employment | 0.6257* | 1.6117* | 1.6869 | 1.1918* | -0.7654* | -0.2294 | -3.4005* | 0.4327 | 0.4269* |
| HH unemployed | 0.4095 | 0.3706 | 0.2856* | 1.3488* | 0.8335 | 0.8482 | 1.2146* | -0.1648 | 0.3118* |
| HH inactive | -0.0057 | 0.6103 | 0.1225* | -0.0964 | 0.9187 | 1.0975* | -0.6586 | 0.1651 | 0.2853* |
| Couples w/out children | -1.1478* | 0.1798 | -0.4348 | -0.4833 | -0.6289* | 0.1948 | -1.9856 | -1.4268* | -0.4691* |
| Couples with children | -1.3806* | -1.3264* | -0.8284* | -3.4053* | -0.7433* | -0.9710* | 0.1528 | -1.3985* | -0.8779* |
| Single-parent households | 0.2678 | -0.0452 | 0.7207 | -0.8255 | 2.0339 | -0.3448 | -0.0348 | -0.7664 | 0.3382* |
| Other households w/out children | -0.8562* | -0.3649 | -0.1579 | -0.4983 | -0.8493* | 0.4376 | 0.2842 | -1.4446* | -0.4108* |
| Other households with children | -1.0514* | -1.0670 | -0.1142 | -2.3159* | 0.0321* | 0.8619 | 4.1344 | -1.8772* | -0.5212* |
| Constant | -0.0372 | -0.0813 | 1.0378* | -1.0653 | -0.0510* | -0.2268 | 0.3198* | 0.7171 | 0.1043 |
| Number of observations | 2995 | 1625 | 2716 | 1150 | 2243 | 1755 | 1195 | 1795 | 36678 |
| Wald test | 218.55 | 121.05 | 305.70 | 144.71 | 174.50 | 155.73 | 184.66 | 101.34 | 1889.77 |

**Source:** Own making based on the Survey on Living Conditions. *Significant at 5%.

## Table 7. Decomposition of income poverty and multidimensional deprivation differences

| | Poverty | | | Deprivation | | |
|---|---|---|---|---|---|---|
| | Difference | Characteristics | Coefficients | Difference | Characteristics | Coefficients |
| Andalucía | 0.0744 | 0.0428* | 0.0316* | 0.0714 | 0.0356* | 0.0358* |
| Aragón | -0.0307 | -0.0016* | -0.0291* | -0.0861 | -0.0231* | -0.0629* |
| Asturias | -0.0435 | -0.0119* | -0.0316* | -0.0769 | -0.0216* | -0.0553* |
| Balearic Is. | -0.0272 | -0.0359* | 0.0086 | 0.0009 | -0.0020* | 0.0028 |
| Canary Is. | 0.0874 | 0.0234* | 0.0640* | 0.1659 | 0.0400* | 0.1258* |
| Cantabria | -0.0467 | 0.0069* | -0.0536* | -0.1180 | -0.0095* | -0.1085* |
| C-La Mancha | 0.0949 | 0.0280* | 0.0670* | -0.0335 | 0.0062* | -0.0396* |
| Castilla y León | 0.0538 | 0.0201* | 0.0337* | -0.0715 | -0.0026* | -0.0689* |
| Catalonia | -0.0699 | -0.0170* | -0.0529* | -0.0371 | -0.0189* | -0.0182* |
| Valencia Reg. | 0.0042 | -0.0051* | 0.0093* | 0.0074 | -0.0150* | 0.0223* |
| Extremadura | 0.1540 | 0.0565* | 0.0975* | 0.1049 | 0.0248* | 0.0801* |
| Galicia | -0.0033 | 0.0077* | -0.0109* | 0.0466 | 0.0098* | 0.0368* |
| La Rioja | -0.0042 | -0.0241* | 0.0199* | -0.1156 | -0.0210* | -0.0946* |
| Madrid | -0.0772 | -0.0241* | -0.0530* | -0.0539 | -0.0481* | -0.0058 |
| Murcia | 0.0555 | 0.0155* | 0.0400* | 0.0406 | 0.0361* | 0.0045 |
| Navarre | -0.0983 | -0.0202* | -0.0780* | -0.1376 | -0.0188* | -0.1187* |
| Basq. Count. | -0.0989 | -0.0213* | -0.0775* | -0.1016 | -0.0130* | -0.0885* |

**Source:** Own making based on the Survey on Living Conditions 2005. * Significant at 5%.

## Table 8. Decomposition of income poverty differences

| | Demographic | | Employment situation | | Educational Attainment | |
|---|---|---|---|---|---|---|
| | Charac. | Coeff. | Charac. | Coeff. | Charac. | Coeff. |
| Andalucía | 0.0414* | -0.0008 | 0.0002* | -0.0249 | 0.0012* | 0.0102 |
| Aragón | -0.0016* | 0.4837* | 0.0000 | 0.0218 | 0.0000 | -0.0139 |
| Asturias | -0.0420* | -0.1900* | 0.0296* | -0.0364 | 0.0005* | 0.0161* |
| Balearic Is. | 0.0032* | 0.0963* | -0.0376* | -0.0906 | -0.0015* | 0.0019 |
| Canary Is. | 0.0082* | -0.0798* | 0.0086* | -0.0500 | 0.0066* | 0.0339* |
| Cantabria | 0.0030* | 0.2890* | 0.0003* | 0.0634 | 0.0036* | 0.0550* |
| C-La Mancha | 0.0018* | 0.0046* | 0.0091* | -0.0927 | 0.0170* | -0.0194* |
| Cast. y León | 0.0054* | 0.2893* | 0.0021* | 0.0218* | 0.0126* | -0.0075* |
| Catalonia | -0.0013* | 0.1514* | -0.0092* | 0.0556 | -0.0064* | -0.0028* |
| Valencia R. | 0.0008* | -0.0462* | -0.0078* | -0.0011 | 0.0019* | 0.0123* |
| Extremadura | 0.0079* | 0.2922* | 0.0217* | -0.1411 | 0.0268* | 0.0156* |
| Galicia | -0.0078* | 0.0521* | 0.0094* | 0.0864 | 0.0061* | 0.0041* |
| La Rioja | -0.0269* | -0.1490* | -0.0130* | 0.0300 | 0.0157* | -0.0049* |
| Madrid | 0.0034* | -0.0564* | -0.0097* | -0.0549 | -0.0178* | -0.0129* |
| Murcia | 0.0120* | 1.8515* | -0.0206* | 1.5066 | 0.0241* | 0.0424 |
| Navarre | 0.0008* | -0.3783* | -0.0037* | 0.0503 | -0.0173* | 0.0014 |
| Basq. Count. | -0.0279* | -0.2220* | 0.0261* | 0.0323* | -0.0196* | 0.0016* |

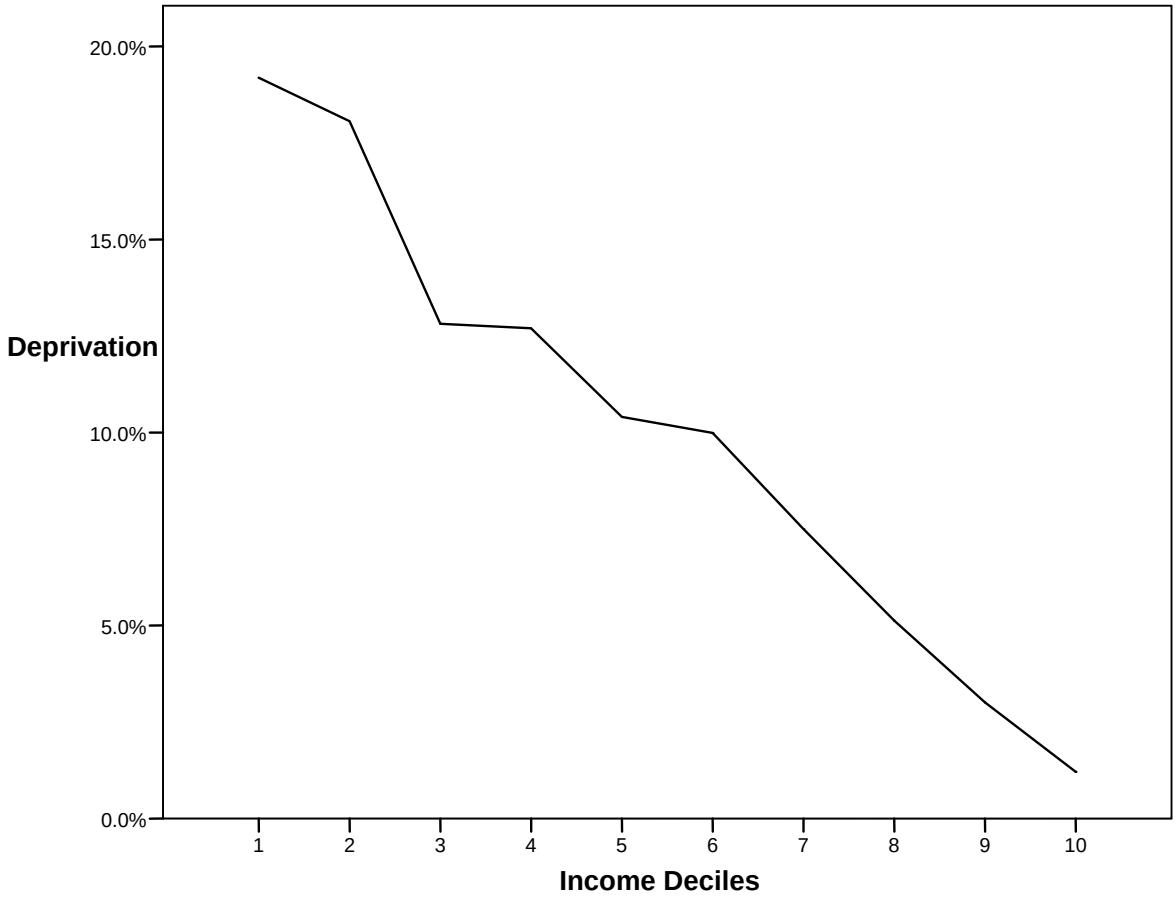
**Source:** Own making based on the Survey on Living Conditions 2005. * Significant at 5%.

**Table 9. Decomposition of multidimensional deprivation differences**

| | Demographic | | Employment situation | | Educational Attainment | |
|---|---|---|---|---|---|---|
| | Charac. | Coeff. | Charac. | Coeff. | Charac. | Coeff. |
| Andalucía | 0.0344* | 0.0032* | -0.0002* | 0.0042* | 0.0014* | -0.0066* |
| Aragón | -0.0233* | -0.1375* | 0.0004 | -0.0737 | -0.0002 | -0.0184* |
| Asturias | -0.0249* | -0.1741* | 0.0048* | 0.0310 | -0.0014* | -0.0180* |
| Balearic Is. | -0.0057* | -0.1363* | 0.0018* | 0.0846 | 0.0020* | -0.1047 |
| Canary Is. | 0.0033* | 0.2430* | 0.0207* | -0.0158 | 0.0161* | 0.0195* |
| Cantabria | -0.0094* | -0.0970* | -0.0013* | 0.1808* | 0.0012* | 0.0676* |
| C-La Mancha | 0.0009* | -0.0012* | -0.0023* | -0.0495 | 0.0076* | 0.0017 |
| Cast. y León | -0.1489 | -0.1997* | 0.0319 | 0.0169* | 0.1144* | -0.0141 |
| Catalonia | -0.0034* | -0.2481* | -0.0109* | 0.0717 | -0.0046* | -0.0250 |
| Valencia R. | -0.0167* | 0.0625* | 0.0082* | -0.0072 | -0.0065* | 0.0015* |
| Extremadura | 0.0042* | 0.1252* | 0.0117* | -0.0252 | 0.0089* | 0.0231* |
| Galicia | 0.0407* | -0.0952* | -0.0205* | -0.1236* | -0.0104* | 0.0139* |
| La Rioja | -0.0149* | 0.0864* | -0.0060* | 0.0346 | -0.0001* | -0.0443* |
| Madrid | 0.0106* | 0.0119* | -0.0070* | -0.0149 | -0.0517* | 0.0025 |
| Murcia | 0.0194* | 0.0150* | -0.0074* | -0.0084 | 0.0241* | 0.0012 |
| Navarre | -0.0023* | -0.1303* | -0.0059* | 0.0069* | -0.0106* | -0.0074* |
| Basq. Count. | 0.0344* | 0.0601* | -0.0002* | -0.0519* | 0.0014* | -0.0048* |

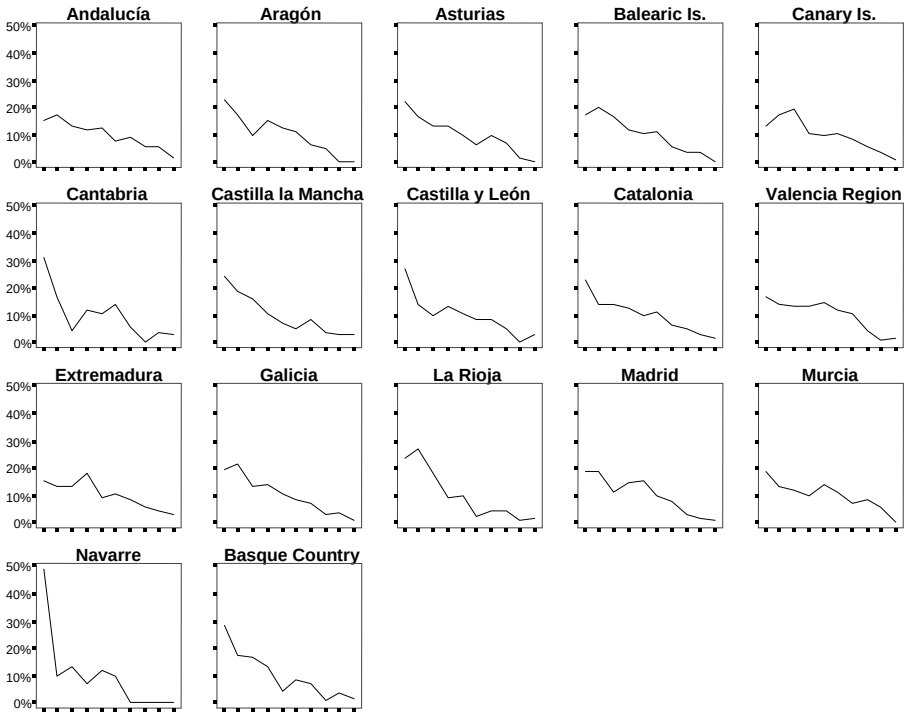
**Source:** Own making based on the Survey on Living Conditions 2005. * Significant at 5%.

**Graph 1**
**Distribution of multidimensional deprivation by income deciles**



**Graph 2**
**Distribution of the population by deciles and regional authorities**

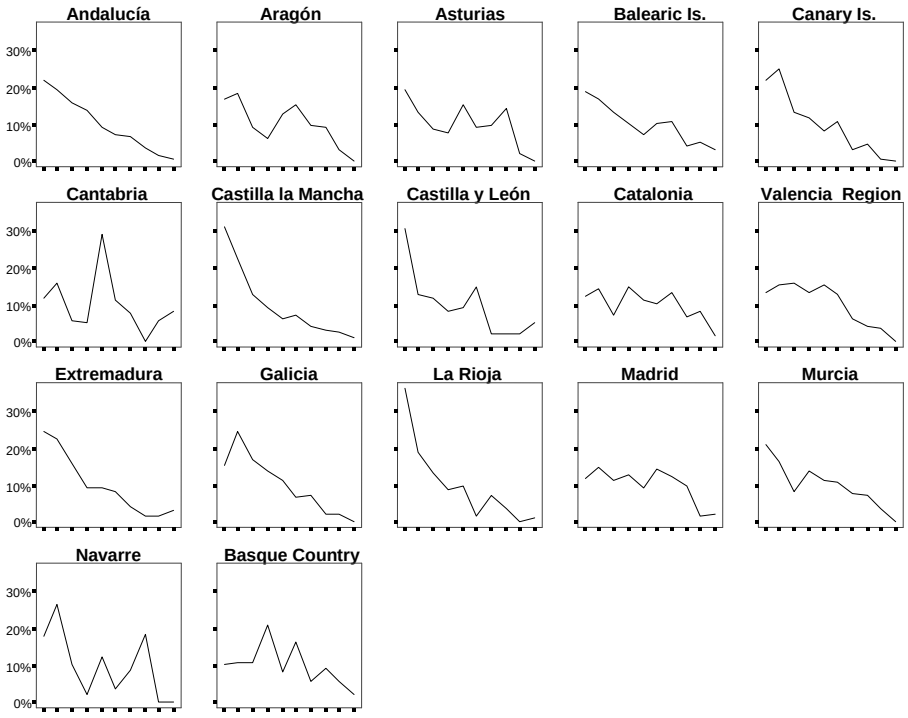
a) Regional deciles




* Income deciles appear on the vertical axis and the deprivation percentages corresponding to each decile appear on the horizontal axis.

**Source:** Own making based on the Survey on Living Conditions 2005.

b) National deciles




* Income deciles appear on the horizontal axis and the deprivation percentages corresponding to each decile appear on the vertical axis.
**Source:** Own making based on the Survey on Living Conditions 2005.