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A study in Spanish regions' poverty: a new methodological perspective

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Abstract

The present article reviews poverty studies in Spanish Autonomous Communities using a new methodological approach. One of the main concerns in those studies is poverty concentration in specific Spanish Autonomous Communities. This can be the result of a bias due to use a unique national poverty line, since the circumstances of every family unit, specifically if it is poor or not, could be different depending on the Region it inhabited. In order to test this assertion we estimate a CHAID algorithm and CATPCA. The main conclusion of this analysis is that Spanish poverty is strongly influenced by regional differences. To correct this effect we define as Spanish poor households those that are, at the same time, under the national and regional poverty line. We call this group Real poverty. Finally, we calculate ten poverty indexes for this real poor population. The results show that it is no possible to categorize Spanish Autonomous Communities

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depending on poverty indexes, since they do not configure a specific distribution of those regions. On the contrary, every index establishes its own regional ordering. Therefore, we should introduce regional adjustments in data and focus in household characteristics –size, type, age, level of education…- to explain Spanish poverty. The information comes from the Spanish Survey on Income and Living Conditions (SILC) in 2008.

JEL classification numbers: I32, I31, C43
Keywords: Economic Poverty, Real poverty, indexes

1 Introduction

Poverty has been an important subject in Spanish economics studies. Some of those researches have focused on regional differences (EECB Málaga University [9]; [1-8, 10-15, 17]), showing a very heterogeneous behavior of Spanish Autonomous Communities[4], with some of them between the richest European regions with low poverty rates and, at the same time, others in an extreme situation with high poor population. This should confirm the existence of *place poverty* in Spain [16, 18].

Numerous indexes have been employed to study the condition of poor people. The most popular are *Head count ratio* (H); *Income gap ratio* (I); *Poverty gap ratio* (HI); *Percentage Contribution to Poverty (CPI)*; the *Relative Contribution to Poverty (CRI); Sen index* (S); *Gini Index* (G); the family of *Foster, Green & Thorbecke* (FGT); and *Hagenaars* index (HAG).

In a previous study, Calvo, Sánchez and Martínez [6] applied those indexes to Spanish Autonomous Communities to obtain a multidimensional poverty index

[4] From now on CC.AA.

to classify them. Using a national poverty line and a methodological combination of factorial and cluster analysis we categorized Regions in three groups: the first one composed by those in the best situation, with low poverty rates –Madrid, Catalonia, the Basque Country and Navarra-; group two integrated by those around national mean –Andalucía, Aragón, Asturias, Cantabria, Castilla & León, Valencia, Galicia, Balearic Islands, La Rioja and Murcia-; and a third cluster with Regions in difficulties, suffering from high poverty rates and intensity –Extremadura, Castilla-La Mancha, Canary Islands and Ceuta and Melilla-.

Our main concern with the method used in the preceding article was the use of a unique poverty line. We suspected that poverty concentration in specific Spanish regions could be the result of a bias due to the use of this national measure, since the circumstances of every family unit, specifically if it is poor or not, could be different depending on the Region it inhabited. If this is true, a new methodological approach should be implemented to correct this bias.

The first step in this direction is to analyze the influence of location factors in Spanish poverty. We estimate CHAID (Chi-squared Automatic Interaction Detector) to obtain the main characteristics, other than rent, that can explain household poverty. We find the best predictor is Region variable.

To extend the study of the relationships between poverty and different variables we conduct a principal components categorical analysis (CATPCA). This is a two steps categories' reduction procedure: in the first one it generates a weight of the analyzed variables; in the second it estimates a classic principal components model. The main result is that poverty, region and household size belong to the same factor. So, if we employ national poverty line we are assimilating poverty to region due to regional income differences.

Since Spanish poverty studies are strongly conditioned by regional differences, we propose a method to correct the heterogeneity they introduce. We define as Spanish poor households those that are, *at the same time*, under the

national and regional poverty line. We call this group *Real poverty*. Finally, we calculate poverty indexes for this *real* poor population.

The idea behind this option is to remove the national/regional bias: if we apply as the general criterion the national poverty line we would include some households that are poor at national level but not at regional status. This is important for the poorest regions; on the contrary, if we exclusively utilize the regional poverty line we would consider as poor some family units that are not under the national poverty line (not poor at national level). This is related to the richest regions; but if we use the intersection of both criteria, national and regional poverty lines, we attain the *real poor*, those households considered poor compared to the rest of the nation and also measured up to their region.

The article presents the following structure: in its first epigraph we discuss the general methodology and the data; the second one is devoted to describe the heterogeneity of Spanish poverty by Autonomous Communities; section three establishes the procedure we apply to "homogenize" those regions and how we achieve the *real poor* using a double poverty line; the fourth section calculates poverty indexes under this new criterion; finally epigraph five presents the main conclusions of the study.

2 General methodology and data

Data come from the Survey on Income and Living Conditions (SILC) in 2008 (observations from 2007) conducted by the Spanish Statistics National Institute (INE). The unit of analysis is the household. It works with a sample of 13,014 observations representing 16,580,451 Spanish families. It is significant at regional level.

The variable we employ to attain *poverty line* is the income per unit of equivalent consumption. In order to calculate it we select the total family's

income[5] and divide it by the number of members of the household using modified OECD equivalence scales. Its formula is:

$$e_h = 1 + 0,7(a_h - 1) + 0,5m_h$$

with e_h the equivalent scale; a_h the number of adults in *h* household; and m_h the number of children under 16 years.

We define *poverty line* following EUROSTAT criterion as 60 per cent of the median of income per unit of equivalent consumption. Therefore, those families whose income per unit of equivalent consumption is under the 60 per cent of the distributional median have been classified as poor households.

3 Regional poverty in Spain

The *Spanish poverty line* was 9,535.36€ per year in 2008. Nevertheless, if we disaggregate by CC.AA the poverty threshold differs depending on the region considered. Table 1 shows the results.

Spanish Regions are very heterogeneous. Extremadura has the lowest income per unit of equivalent consumption mean: 12,502.39€ per year, 70% of Spanish mean. Under that mean are also Andalucía, Canary Islands, Region of Murcia, Castilla-La Mancha, Castilla & León, Galicia or La Rioja. On the contrary, Aragon, Balearic Islands, Catalonia, the Basque Country and especially Madrid and Navarra have an income per unit of equivalent consumption mean higher than the national one.

If we compute a specific poverty line for each region, column 3, heterogeneity persists. So, poverty threshold ranks from 6,512€ per year in Extremadura to 11,785€ in Navarra.

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[5] In Calvo, Martinez and Sánchez (2008, pp 107-116) we describe the methodology to calculate total household income as well as income per unit of equivalent consumption.

Table 1: Poverty line by Spanish Autonomous Community (income per unit of equivalent consumption)[6]

	Mean	***Median***	***Poverty line***
Andalucía	14987.51	13262.27	7957.36
Aragón	18295.66	16742.83	10045.70
Asturias	17673.38	16204.68	9722.81
Canary Islands	15511.67	13788.73	8273.24
Cantabria	17693.97	16411.37	9846.82
Castilla-La Mancha	14840.14	12806.85	7684.11
Castilla & León	16492.06	14717.55	8830.53
Catalonia	19846.67	17896.33	10737.80
Madrid	21342.94	19132.54	11479.53
Valencia	17553.82	15860.99	9516.59
Extremadura	12502.39	10853.38	6512.03
Galicia	15840.82	14465.10	8679.06
Balearic Islands	18677.25	16770.43	10062.26
La Rioja	17221.52	16545.95	9927.57
Navarra	21348.81	19643.11	11785.87
Basque Country	20856.34	19557.42	11734.45
Region of Murcia	15523.21	14605.51	8763.31
SPAIN	17731.48	15892.27	9535.36

Source: Drawn up by authors from SILC 2008.

Using poverty line we can estimate the number of poor people in Spanish Regions. We have computed them with both measures: the national and the regional poverty line. The results are shown in Table 2.

[6] We exclude references to Ceuta and Melilla Autonomous Cities because of lack of significance at that level. Nevertheless we include them to compute national values.

Table 2: Poor population in Spanish Autonomous Communities. National and regional poverty lines

	National Poverty line		**Regional Poverty lines**		**Difference (1)–(3) Absolute values**	**Difference (3)/(1) Percentage**
	Poor Households		**Poor Households**			
	Number	**(%)**	**Number**	**(%)**		
Andalucía	626,401	25.7	368,358	16.8	258,043	41.19
Aragón	44,936	1.8	58,216	2.7	-13,28	-29.55
Asturias	39,326	1.6	43,628	2.0	-4,302	-10.94
Canary Islands	150,745	6.2	95,859	4.4	54,886	36.41
Cantabria	21,704	0.9	25,879	1.2	-4,175	-19.24
Castilla-La Mancha	177,215	7.3	78,379	3.6	98,836	55.77
Castilla & León	164,246	6.7	132,332	6.0	31,914	19.43
Catalonia	258,766	10.6	382,328	17.5	-123,562	-47.75
Madrid	170,345	7.0	315,122	14.4	-144,777	-84.99
Valencia	240,128	9.9	236,222	10.8	3,906	1.63
Extremadura	149,579	6.1	43,531	2.0	106,048	70.90
Galicia	162,497	6.7	124,552	5.7	37,945	23.35
Balearic Islands	54,114	2.2	62,934	2.9	-8,82	-16.30
La Rioja	18,199	0.7	19,063	0.9	-0,864	-4.75
Navarra	13,102	0.5	24,742	1.1	-11,64	-88.84
Basque Country	46,799	1.9	91,925	4.2	-45,126	-96.43
Region of Murcia	86,347	3.5	75,456	3.4	10,891	12.61
SPAIN	2,434,983	100.0	2,188,988	100.0	245,995	10.10

Source: Drawn up by authors from SILC 2008

There are big differences depending on the poverty line considered. The most relevant, in absolute values, are related to Andalucía, where poor households reduce in more than a quarter of a million when regional threshold is employed

instead of national one, and Catalonia and Madrid, where poor increase by more than 100,000 employing the same method.

In percentage terms the changes are still more important. Extremadura decreases its poor families by 71% if we take into account the regional poverty line instead of the national one; on the contrary, Navarra, the Basque Country and Madrid increase their poor population by more than 80%.

The problem with using a national poverty line is we do not consider the circumstances of every family unit could be different depending on the Region, biasing the results. We do not have a regional *price index*[7] to normalize income, but we suspect the *cost of living* differs between CC.AA. If this is true, the use of a unique poverty boundary translates into considering a "misleading poor distribution": we regard as deprived some households that are not poor if we employ a regional line –those with a positive value in columns 5 and 6 of Table 2- and the contrary –the negative values.

4 Is Region affecting Spanish poor categorization?

In order to test this assertion we apply a CHAID algorithm and CATPCA. Chi-squared Automatic Interaction Detector analyses other variables rather than income to explain poverty. The objective is to find the most influent characteristics on poverty excluded the defining variable (income).

We classify households depending on their main variables: type of household, number of members, household economic activity situation, main family member level of studies, the size of the municipality their live and region. Table 3 shows the first two cataloging levels.

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[7] At least is not public in Spain. We are working on developing some kind.

Table 3: CHAID analysis

Level 1 Variables	Level 1 values	Level 2 variables
Region	Andalucía	Household economic activity situation
Region	Aragón	Main household member level of studies
Region	Asturias	Size of municipality
Region	Canary Islands	Type of household
Region	Cantabria	Type of household
Region	Castilla y león	Type of household
Region	Castilla-La Mancha	Type of household
Region	Catalonia	Type of household
Region	Comunidad de Madrid	Number of members
Region	Comunidad Valenciana	Type of household
Region	Extremadura	Household economic activity situation
Region	Galicia	Main household member level of studies
Region	Balearic Islands	Type of household
Region	La Rioja	Type of household
Region	Navarra	Type of household
Region	Basque Country	Household economic activity situation
Region	Region of Murcia	Type of household

Once we have discovered the main variable to explain poverty (other than income) is Region we want to find why. Then, we conduct a CATPCA analysis in order to determine the relationship between poverty and the rest of variables. This is a two steps categories' reduction method: in the first one it generates weights to the variables; and in the second one it applies a principal components analysis. The results are presented in Table 4 and Figure 1.

With this method we uncover two dimensions: the first one incorporates number of members, the type of household, the situations of its members related to economic activity and the level of studies; the second one aggregates the size of the municipality, region and poverty (measured as a dummy variable: 1 if the

household is poor and 0 otherwise).

Table 4: CATPCA analysis

	Dimension 1	Dimension 2
household economic activity situation	.821	-.028
main family member level of studies	.488	-.399
Region (CC.AA.)	-.061	.768
Number of members	.840	.269
Poverty dummy	-.071	.500
Size of municipality	-.118	.788
Type of household	.938	.177

Source: Drawn up by authors

Table 5: Households' distribution depending on regional and national poverty lines.

		Regional Level *Poverty line: less than 60 per cent of CC.AA median of income per unit of equivalent consumption*	
Nacional Level		Households whose income is under the poverty line	Households whose income surpass the poverty line
Poverty line: less than 60 per cent of national median of income per unit of equivalent consumption	Households whose income is under the poverty line	REAL POVERTY 1,831,017	Households considered poor at national level but not at regional status 603,967
	Households whose income surpass the poverty line	Households not considered poor at national level but poor at regional status 357,972	NOT POOR

Source: Drawn up by authors from SILC 2008

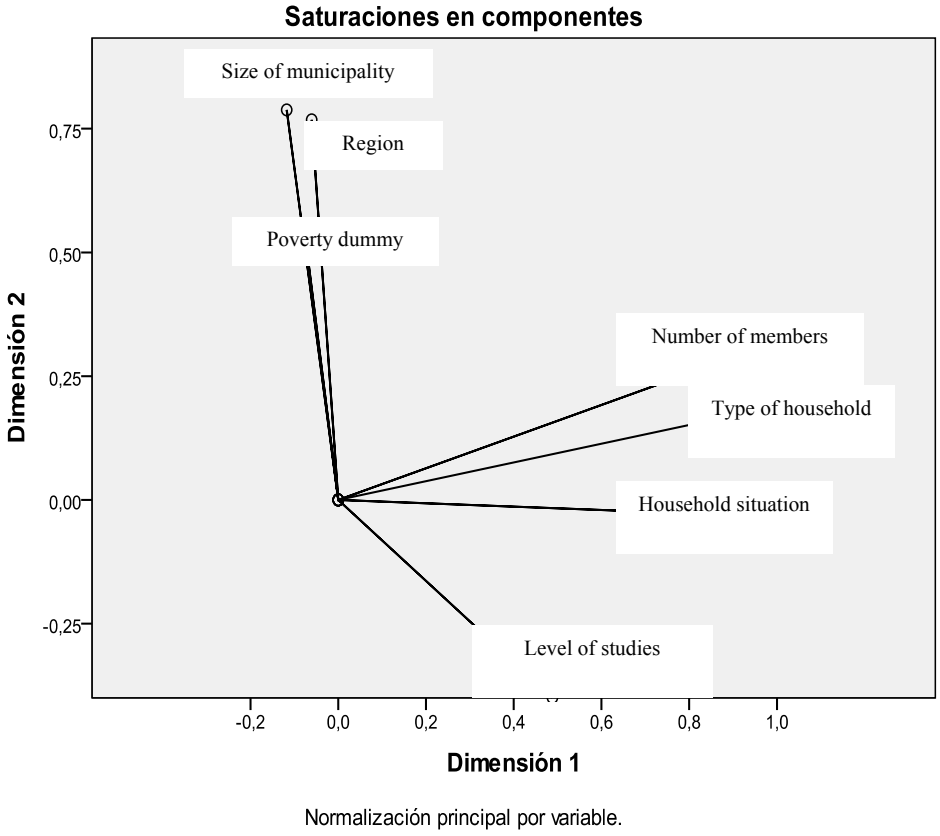

Figure 1: CATPCA analysis

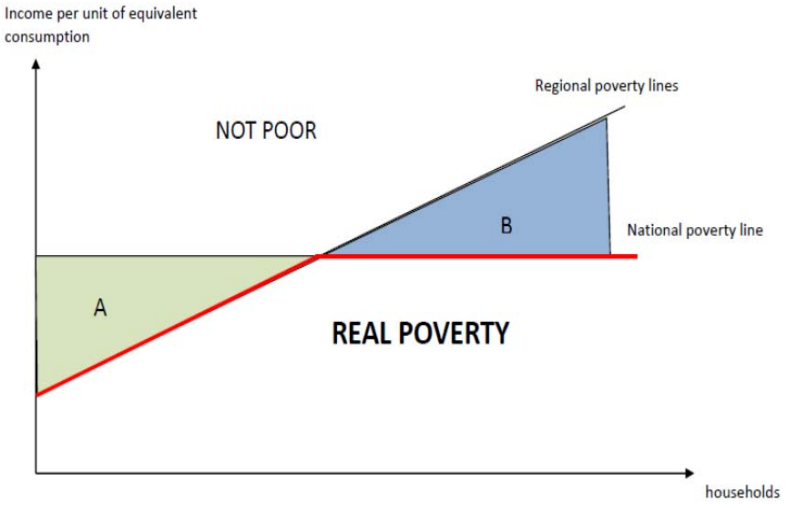

Figure 2: Real poverty

Table 6: Real Poverty by Autonomous Communities

	Real Poverty	
	Poor Households (number)	**Poor Households (number)**
Andalucía	368,358	20.1
Aragón	44,936	2.5
Asturias	39,326	2.1
Canary Islands	95,859	5.2
Cantabria	21,704	1.2
Castilla-La Mancha	78,379	4.3
Castilla & León	132,332	7.2
Catalonia	258,766	14.1
Madrid	170,345	9.3
Valencia	236,222	12.9
Extremadura	43,531	2.4
Galicia	124,552	6.8
Balearic Islands	54,114	3.0
La Rioja	18,199	1.0
Navarra	13,102	0.7
Basque Country	46,799	2.6
Region of Murcia	75,456	4.1
SPAIN	1,831,017	100.0

Source: Drawn up by authors from SILC 2008

Therefore, we can conclude that Spanish poverty classification is strongly affected by differences between Autonomous Communities. Consequently, a

measure of Spanish relative poverty should take into account regional diversity.

If we combine national and regional poverty lines we can examine all households' possibilities. Table 3 and Figure 2 describe them showing the distribution of Spanish families from SILC 2008.

- **A** : Poor people at national level but not poor at regional level ⇒ Related to Regions with poverty line under National poverty line
- **B** : Poor people at regional level but not poor at regional level ⇒ Related to Regions with poverty line over National poverty line

2,434,983 Spanish households were under the national poverty line in 2008. From this group 603,967 are considered not poor if we employ the regional poverty threshold. They come from the most disadvantaged Spanish regions: Extremadura, Canary Islands… For example, Andalucía's families with income per unit of equivalent consumption between 7,957.36€ and 9,535.36€ per year belong to that faction.

On the other side, 2,188,988 Spanish families were poor if we only take into account regional poverty lines. From them 357,972 can be excluded if we add national threshold. They reside in the most developed Spanish Communities: Madrid, Catalonia, the Basque Country or Navarra. A Navarra's household with an income smaller than 11,785€ and bigger than 9,535.36€ per year fits in this group.

If we take into account both criterions then only 1,831,017 can be categorized as *Real Poor*: those that are under national and regional poverty lines. They are poor in a double sense: compared to the rest of national households and also related to their regional counterpart. Table 6 presents this population distributed by CC.AA.

5 Poverty indexes

In this section we present the results for different indexes calculated for real poor population in Spanish Regions. Since *Real Poverty* includes both national and regional poverty threshold, we should use one or another depending on the circumstances[8]. The indexes are the following:

- *Head Count Ratio (H)*
- *Income Gap Ratio* (I):
- *Poverty Gap Ratio* (HI):
- *Percentage Contribution to Poverty (CPI)*
- *Relative Contribution to Poverty (CRI)*
- *Gini's coefficient*
- *Sen's index (S)*
- *Foster, Green & Thorbecke's Indexes* (FGT)
- *Hagenaars'* index (HAG)

The results for real poverty households are included in Tables 7 and 8.

The first index (H) specifies the share of poor people in total population. We can classify CC.AA in three groups depending on this indicator: the first one is integrated by those Communities with poverty rates bigger than the mean: Region of Murcia, La Rioja, Castilla & León, Balearic and Canary Islands, Andalucía, Valencia and Galicia; in the second group we can aggregate those around the Spanish mean: Castilla-La Mancha, Extremadura and Cantabria; finally the third one is composed by the most developed Spanish regions: the Basque Country, Navarra, Madrid, Aragón, Catalonia and Asturias, where the rate of poor population is smaller than Spanish average. Figure 2 sorts Spanish Communities based on this index.

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[8] We do not include the way indexes are computed because of lack of space. They are disposable upon request.

The Income Gap Ration (I) completely changes the order of Communities since it modifies the approach, emphasizing poverty intensity. With values over 0.34 (the mean is 0.336) are Asturias, La Rioja, the Basque Country and Castilla & León. On the contrary, Madrid, Balearic and Canary Islands, Cantabria and Valencia reach values smaller than 0.23.

Table 7: Real Poor Households: Poverty Indexes I

	H	**I**	**H*I**	**CPI**	**CRI**
Andalucía	0.131	0.394	0.052	0.216	1.275
Aragón	0.089	0.236	0.021	0.023	0.763
Asturias	0.096	0.210	0.020	0.017	0.680
Canary Islands	0.133	0.252	0.034	0.035	0.816
Cantabria	0.106	0.240	0.026	0.010	0.778
Castilla-La Mancha	0.114	0.342	0.039	0.046	1.107
Castilla & León	0.138	0.220	0.030	0.041	0.713
Catalonia	0.095	0.336	0.032	0.179	1.088
Madrid	0.077	0.336	0.026	0.146	1.087
Valencia	0.127	0.260	0.033	0.094	0.840
Extremadura	0.112	0.253	0.028	0.019	0.818
Galicia	0.126	0.223	0.028	0.043	0.722
Balearic Islands	0.133	0.269	0.036	0.021	0.871
La Rioja	0.153	0.220	0.034	0.005	0.713
Navarra	0.059	0.217	0.013	0.009	0.702
Basque Country	0.056	0.416	0.023	0.068	1.347
Region of Murcia	0.157	0.375	0.059	0.035	1.215
SPAIN	0.110	0.309	0.034	1.000	1.000

Source: Drawn up by the authors from ECV 2008

The Poverty Gap Ratio (HI) is the first one to be sensitive to both the share of poor households in Spanish population and the degree of poverty. The regions

with the highest index –in the worst situation in terms of poverty- are the Region of Murcia, Andalucía and Castilla-La Mancha; the best positioned Navarra, Asturias, Aragón and the Basque Country.

The Percentage Contribution to Poverty (CPI) indicates the share of each Community in total poor households. In this case we can observe that Andalucía contributes with more than 20 per cent; Catalonia with almost 18 and Madrid with more than 14. On the other side La Rioja and Navarra add less than 1 per cent.

Finally, the Relative Contribution to Poverty (CRI) shows if a Community is over or underrepresented. If CRI is bigger than 1 then the affected Community is in a worsen situation than Spain as a whole; on the contrary, if the value is smaller than 1 the Community is better off. Once more the index changes the classification. The Basque Country, Andalucía, Murcia, Castilla-La Mancha, Catalonia and Madrid are overrepresented. The rest of the Communities are underrepresented, especially Asturias and Navarra.

Gini's coefficient is a measure of inequality. If G=0 the equality between the poor is maximum. In this case S = HI. On the contrary, if G=1 then poor people are unequally distributed and S =H.

The categorization of Spanish Communities is again modified. Those where the poor are more unequally distributed are Balearic Islands, Extremadura and the Basque Country, all of them over the national mean (0.165); on the contrary, the equality between poor households is the highest in Madrid (0.109).

Sen Index combines information about the poor (number and distribution), the degree of poverty and inequality (Gini's coefficient). Then, it is a good approach to measure the real problems related to poverty and the situation of poor families. The position worsens with higher values of the index. The Region of Murcia, Andalucía, La Rioja, Castilla-La Mancha and Balearic Islands reach the worst values, with indexes well above or close to 0.15. On the other side of the distribution, with the smallest rates, are the Basque Country, Navarra, Aragón and Madrid.

The family of Foster, Green & Thorbecke indexes takes into account the relative distance to poverty line. Then, when poverty aversion parameter increases (α) the relevance attributed to poorest households augments.

Table 8: Real Poor Households: Poverty Indexes II

	G	S	FGT3	FGT4	HAG
Andalucía	0.162	0.064	0.089	0.453	0.006
Aragón	0.150	0.031	0.011	0.009	0.004
Asturias	0.165	0.033	0.009	0.005	0.003
Canary Islands	0.133	0.047	0.018	0.015	0.005
Cantabria	0.145	0.037	0.012	0.008	0.003
Castilla-La Mancha	0.147	0.050	0.035	0.058	0.002
Castilla & León	0.156	0.047	0.014	0.008	0.007
Catalonia	0.163	0.042	0.025	0.037	0.004
Madrid	0.109	0.031	0.036	0.128	0.002
Valencia	0.143	0.046	0.020	0.026	0.004
Extremadura	0.199	0.045	0.014	0.010	0.005
Galicia	0.128	0.041	0.012	0.007	0.004
Balearic Islands	0.207	0.056	0.025	0.036	0.005
La Rioja	0.156	0.052	0.017	0.016	0.005
Navarra	0.139	0.019	0.005	0.002	0.002
Basque Country	0.170	0.029	0.026	0.046	0.002
Region of Murcia	0.162	0.075	0.034	0.025	0.008
SPAIN	0.165	0.047	0.034	0.112	0.004

Source: Drawn up by the authors from ECV 2008

FGT3 and FGT4 present very similar results. In both cases the biggest poverty problems are concentrated in Andalucía, where the ratio more than doubles the national mean. It looks like in this Spanish region poverty is a really important problem, since the amount of poor population and poverty deepness are the highest. Madrid and Castilla-La Mancha are close to the mean and the rest

have smaller indexes, especially Navarra and Asturias.

Finally Hagenaars index considers the share of the poor in total population as well as an aggregate measure of poverty intensity. Communities' distribution again changes with Region of Murcia, Castilla & León and Andalucía well over the national mean; La Rioja, Balearic and Canary Islands and Extremadura also bigger than the national value and Castilla-La Mancha, Madrid, Navarra and the Basque Country with the lowest ratios.

6 Conclusion

In previous studies we analyzed the characteristics of Spanish poverty and discover that regional variables were very important. In fact, we could categorize Spanish regions in different clusters depending on the number of poor people and poverty intensity.

Nevertheless, we suspected that those results were biased because of the use a unique national poverty line, since the circumstances of every family should be different contingent to the region it resides.

In this article we have tested this assertion. To do that we, first, have introduced a CHAID algorithm and CATPCA analysis; afterwards, and based on the results showing that region is very correlated to poverty –measured by income-, we have selected the *Real Poor* in order to correct this bias: those households that are, at the same time, under the national and regional poverty line.

1,831,017 Spanish families can be classified as *real poor* following that double criterion. We have calculated ten poverty indexes for that population.

Spanish regions cannot anymore be categorized on clusters depending on poverty indexes computed to poor. There is no a concrete regional distribution to apply factorial and cluster analysis.

Therefore, we should correct data by regional factors and look for the

reasons to explain Spanish poverty in household's characteristics –sex, age, level of education, type of family, size, economic situation…- rather than in locational aspects. And Spanish and EU social policy should concentrate in those factors.

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