

## INEQUALITY IN SPAIN 1973–91: CONTRIBUTION TO A REGIONAL DATABASE

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This paper provides the methodology and results of a database of inequality indices for the fifty provinces and seventeen regions of Spain on the basis of the Household Budget Surveys for the years 1973/74, 1980/81 and 1990/91. The inequality indicators considered are the indices of Gini, Theil (0), Theil (1) and Atkinson (1), as well as the distribution by deciles of the population. These indicators are drawn up for three variables: total income, total expenditure, and exclusively monetary expenditure. The variables are also expressed in terms of households, per capita and per capita equivalent. All are available on the Internet (<http://www.ivie.es>).

### INTRODUCTION

The international databases on inequality indices, on which rest the comparisons of welfare among countries and most recently the relationship between personal distribution of income and growth, are in general unreliable. This is admitted by most authors and inevitably casts doubts as to the robustness of the results. The origin of this unreliability lies in the dependence on fragmentary estimates elaborated by other authors, without a minimum guarantee of homogeneity. Thus, the microeconomic information may come either from censuses or from surveys; the variables may be expressed in nominal or real terms; refer to households or individuals; consider income or expenditure variables; incorporate different weighting procedures; or use aggregate indices of inequality (Gini, Theil and Atkinson are the most frequent) in conjunction with income shares of the variable available. Besides, the Spanish information is either absent or presents problems of homogeneity. The new estimations presented in this paper are intended to overcome this situation.

Furthermore, we consider that it could be of great interest to construct a regional database for, at least, the following reasons. Firstly, because the economic policy of the European Union has an important regional component, the objective of the Structural Funds being to reduce inequality among its regions. Secondly, studies of convergence from the point of view of the literature on growth have highlighted the importance of concentrating the sample on smaller geographical units within the same country (Barro and Sala-i-Martin, 1995). This is probably an important factor in explaining the current interest of many authors in regional matters. Thirdly, the methodologies used in the household surveys of

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each country present much greater homogeneity than the comparisons among different countries in international databases. Having available homogeneous databases with a level of disaggregation smaller than national makes empirical testing easier, allowing the use of econometric techniques for cross section data. Fourthly, the provincial dimension<sup>1</sup> of the inequality indices will help to expand the regional database in Spain, where regional series for Gross Value Added (Fundación BBV) endowments of private and public capital (Fundación BBV/IVIE) and human capital (Mas, Pérez Uriel, and Serrano, 1998) are already available.<sup>2</sup>

Spain has available three Household Budget Surveys (Encuestas de Presupuestos Familiares, EPFs) carried out by the National Statistical Institute (Instituto Nacional de Estadística, INE), drawn up with homogeneous methodologies and with a similar level of coverage, around 20,000 households. The surveys were carried out for the years 1973/74, 1980/81 and 1990/91 and are representative at the level of the fifty provinces and seventeen Spanish regions. In this study we elaborate the information and present the results of the inequality indices on the basis of the information contained in the three surveys. Section I briefly reviews the situation of the Spanish information in the international databases. Section II describes the methodology used in the elaboration of the indices. Section III presents some results and Section IV concludes.

## I. INCOME INEQUALITY IN SPAIN IN THE INTERNATIONAL DATABASES

Until recently the databases relating to inequality indicators came from the following sources: Jain (1975); Lecaillon, Pakuert, Morriison, and Germidis (1984), who in turn based it on Paukert (1973); Fields (1989); and Flora (1983). These were the statistical bases used in many of the recent studies that establish the connection between inequality and growth. Among them we could quote the studies by Clarke (1995), Alesina and Rodrik (1994), Persson and Tabellini (1994) and Perrotti (1994, 1996).

The data for Spain came originally from the collection by Jain (1975) and refer to the Household Budget Survey (EPF) done by the INE in the year 1963/64. This survey, the second to be undertaken in Spain,<sup>3</sup> was not mechanized, as at that time the INE did not have sufficient resources. The difficulties of computation and differences in methodology from later surveys explain why it has remained practically unused by Spanish researchers, who have concentrated their efforts on the three later surveys.

The international database that meets the greatest number of requirements for homogeneity and consistency, is that elaborated by the Luxembourg Income Study (LIS) project, the results of which can be seen in Atkinson, Rainwater, and Smeeding (1995) and on the Internet.<sup>4</sup> In the framework of this project the

<sup>1</sup>Spain is divided into fifty provinces (NUTS 3 regions) and seventeen autonomous communities (NUTS 2 regions).

<sup>2</sup>The human capital series are available on the Internet (<http://www.ivie.es>) and the other regional variables in <http://bancoreg.fbbv.es>. In Mas, Pérez, and Uriel (2000) can be found the methodology for the capital series (private and public).

<sup>3</sup>The first was undertaken in 1958.

<sup>4</sup><http://www.lis.ceps.lu>.

information relating to several countries of the OECD was processed in great detail, but Spain was not among them until recently. The information has been elaborated by the INE and provided to the LIS, from the surveys of 1980/81 and 1990/91.

The database that is currently receiving most attention is the one elaborated by Deininger and Squire (1996). The information contained in it covers 108 countries, and has been used among others by Forbes (1998), Barro (1999) and Li, Squire, and Zou (1998). For Spain, fourteen estimations are offered but only eight are included in what the authors call the high quality data set.<sup>5</sup> The reference source quoted by the authors is the Statistical Yearbook but we do not know which institution published it.<sup>6</sup> Moreover, it combines information coming from the three EPFs and the Continuous Household Budget Survey (ECPF) also carried out by the INE since 1985.

The size of the ECPF sample was 3,200 households, much smaller than that of the three EPFs, which does not allow geographical disaggregation.<sup>7</sup> The purpose of the ECPFs is for short run policy analysis, their fundamental objective being the measurement of the growth of household consumption, whereas that of the EPFs is structural. This means that the coverage of the sample, the breadth of the concepts considered and the treatment and filtering of the data are very unequal from one source to the other, so they cannot be considered as being of the same quality. For these reasons, in this study we have concentrated on the three homogeneous EPFs corresponding to the years 1973/74, 1980/81 and 1990/91.

## II. INEQUALITY IN SPAIN THROUGH THE EPF FOR 1973/74, 1980/81 AND 1990/91; METHODOLOGICAL ASPECTS

As has been said, the Household Budget Surveys (EPF) provide the most suitable information for analyzing the evolution of inequality in Spain in the long term. Several authors have used them,<sup>8</sup> although only Martín-Guzmán *et al.* (1996) and del Río, Ruíz-Castillo, and Sastre (1999) have compared the last three surveys, which cover a period of nearly twenty years. Geographically, the level of disaggregation considered by all authors is that of the seventeen regions of Spain, with the exception of Pérez, Goerlich, and Mas (1996), Goerlich, and Mas (1998, 1999), García and Martín (1994) and Ortega *et al.* (1991). The EPF are designed with the aim of estimating the weights corresponding to each type of goods in the consumer price indices, and of contributing to the formation of some macroeconomic variables in the National Accounts, in particular Private Consumption.

<sup>5</sup>The six excluded correspond to estimations by Jain (1975) that cover only the urban population, Ginneken and Park (1984) and Milanovic (1994) due to availability of the primary sources.

<sup>6</sup>Not from the Statistical Yearbook of the INE, which does not provide the Gini indices, though it does provide the distribution of the average expenditure of the households by deciles.

<sup>7</sup>In the third quarter of the year 1997 the INE started a new Continuous Survey (ECPF 1997) to replace the earlier one (ECPF 1985) and the EPFs. The sample was expanded to 8,000 households and was designed to be representative at the level of the seventeen regions of Spain (NUTS 2).

<sup>8</sup>See, for example, Ruíz-Castillo (1987, 1993, 1997), del Río and Ruíz-Castillo (1996, 1997), Ayala, Martínez, Ruíz-Huerta (1993), Martín-Guzmán, *et al.* (1996), Bosch, Escribano, and Sánchez (1989), Pérez, Goerlich, and Mas (1996) and Goerlich and Mas (1998).

All variables are net of income tax. The unit of analysis is the household, excluding occasional visitors and domestic servants. The selection of the sample was done by means of a two-stage stratified sampling,<sup>9</sup> representative at the level of the fifty provinces of Spain.<sup>10</sup>

Inequality in the personal distribution of income can be approached from the income side or from the expenditure side, and within the latter, among totals or among subsets obtained by eliminating certain expenditure items. Some authors, for example Slesnick (1991, 1993) recommend as a suitable measure of the standard of living the consumption of goods, i.e. the expenditure of households or of their individual members, as it constitutes a better approximation to the concept of permanent income. Furthermore, the nature of the information contained in the Spanish EPFs has inclined most authors to consider expenditure as the variable of reference, though there is no general agreement on this point. Briefly, the main arguments in favor of using expenditure are as follows<sup>11</sup>: (a) the purpose of the survey is to provide the weightings in the consumer price indices, therefore the expenditure side receives more attention than the income side; (b) some individuals may conceal income for tax reasons, whereas there is less incentive to conceal expenditure; and (c) the estimates by the INE of total expenditure are higher than income in 60 percent of households, an observation that reinforces the previous one.

Nor is there agreement on the relevance of excluding certain expenditure items associated with housing and the acquisition of consumer durables.<sup>12</sup> For this reason, in this study we consider simultaneously the behavior of three variables: total income, total expenditure and exclusively monetary expenditure.<sup>13</sup> The latter is the result of deducting from total expenditure all that arising from self-consumption, self-supply and free meals, as well as the assigned rent of the dwelling. This last item is deducted from total expenditure because the rents of owner-occupied homes are not amounts effectively paid by the owner. Furthermore, these magnitudes are estimates, with all the problems involved in an exercise of assignation. Some authors, e.g. del Río and Ruíz-Castillo (1996), also advocate excluding the real rents paid by the occupiers of rented dwellings in order not to introduce distortion, as tenants would have a higher standard of living as a consequence of not owning a dwelling. However, although the argument of symmetry of treatment would make advisable the exclusion of both, it is no less true that if it is desired to measure the exclusively monetary expenditure, rents effectively paid should be included, in the same way as we do not consider the exclusion of the payments made in the market, fundamentally for food, in order to offset those caused by self-supply or self-consumption. For these reasons,

<sup>9</sup>This implies that we can maintain the assumption that the observations are independent but not identically distributed.

<sup>10</sup>The former African enclaves of Ceuta and Melilla, now *autonomous cities*, were not considered in the EPF of 1973/74 and have therefore been excluded from our sample.

<sup>11</sup>A detailed analysis can be found in Ruíz-Castillo (1997), del Río and Ruíz-Castillo (1996) and Ayala *et al.* (1993). In general, however, the same qualitative pattern on inequality emerges either using expenditure or income.

<sup>12</sup>Bosch *et al.* (1989) take this option, while Martín-Guzmán *et al.* (1996) choose to consider only totals.

<sup>13</sup>Imposing the condition that the three variables should present positive values, we have 24,095 observations in the EPF for 1973/74, 23,636 for 1980/81, and 20,931 for 1990/91.

and further ones detailed in Martín-Guzmán *et al.* (1996), total expenditure is the magnitude taken as reference in the majority of studies. However, in order to maintain comparability with other studies made on the basis of the Spanish EPFs, we have considered the three variables: total income, total expenditure and monetary expenditure, from which the rents effectively paid by tenants have been excluded.

The indices of inequality can be elaborated from real or nominal data. On this point the authors who have worked with the EPFs have used different options. The most elaborate is that adopted by Ruíz-Castillo (1993, 1997) who uses specific deflators for each household on the basis of 58 categories of consumer goods. He also takes into account the three-month period in which the information on each family was gathered, enabling the real expenditure to be dated in a particular three-month period. Ruíz-Castillo's highly elaborated procedure does not introduce important modifications from our perspective,<sup>14</sup> and nor does the use of average CPI values.

In this study we have decided to use the provincial CPIs, base 1991, which take into account variations over time but ignore the relative differences of prices among provinces. Each EPF was deflated, taking into account the period in which it was gathered,<sup>15</sup> so that for the EPF of 1973/74 the simple average of the CPIs for the years 1973 and 1974 was used, and for the EPFs of 1980/81 and 1990/91 the corresponding weighted mean (i.e. three quarters of the CPI for the first year and one quarter of the CPI for the second year).<sup>16</sup> On this point it is important to point out that the deflation used does not in any way affect the inequality indices calculated at provincial level, as all the indices used are scale invariant. However it does affect the aggregate inequality index at regional and national level, if only marginally.

### *Elevation Factors*

In order to make the sample representative of the total population, each observation (household) must be weighted with the elevation factors provided by the surveys. The use of elevation factors in the transposing of sample data to population data is uneven in the literature, and their use in econometric and/or statistical calculations that involve inference is not completely clear.<sup>17</sup> In this study we have decided to replicate all the characteristics of each household by the corresponding elevation factor.

<sup>14</sup>Though it does enable him to verify that between 1973/74 and 1980/81 the changes in relative prices were favorable to the lower strata of the distribution, whereas between 1980/81 and 1990/91 the evolution of relative prices was distributionally neutral (del Río and Ruíz-Castillo, 1996).

<sup>15</sup>The EPF for 1973/74 was gathered from July 1973 to June 1974, those for 1980/81 and 1990/91 from April to March.

<sup>16</sup>In deflating the EPF only the yearly CPI have been considered and not the monthly ones, as no homogeneous series of monthly CPIs by provinces is available that covers the period of the three surveys.

<sup>17</sup>In this sense it should be pointed out that some authors have indeed taken into account the problems posed by the use of elevation factors in deriving statistical inferences based on Lorenz curves and inequality measures (see, for example, the results of Beach and Kaliski (1986) or Bishop, Chakraborti, and Thistle (1994) for weighted independent samples as against those of Gail and Gastwirth (1978), Beach and Davidson (1983) and Gastwirth and Gail (1985) for simple random samples.

Let  $F_i$  be the elevation factor supplied by the surveys,  $Y_i$  the variable being studied in real terms (income, total expenditure or monetary expenditure) of each household surveyed, which for simplicity we will call generically income. We define the *average income per household*,  $\mu^H$ , as

$$(1) \quad \mu^H = \sum_{i=1}^n \frac{F_i}{F} \cdot Y_i$$

where  $F = \sum_{j=1}^n F_j$ . While the *average per capita* income will be:

$$(2) \quad \mu^P = \frac{\sum_{i=1}^n F_i Y_i}{\sum_{j=1}^n F_j N_j} = \sum_{i=1}^n \frac{F_i N_i}{\sum_{j=1}^n F_j N_j} \cdot \frac{Y_i}{N_i}$$

where  $N_i$  is the number of members of the corresponding household.

In this way the calculations applied to households are weighted by the elevation factors, while the calculations referring to individuals are weighted by the product of the elevation factor and the number of members of the household.<sup>18</sup>

### *Equivalence Scales and Heterogeneous Households*

Comparison among households of different characteristics, especially regarding number of members and their ages, makes recommendable the use of equivalence scales. The aim of these is to adjust households' income to their potential needs.<sup>19</sup> There is currently no general agreement on the most suitable scale, so the choice of one or other is to a large extent arbitrary. Some equivalence scales weight according to the number of adults and/or according to the age of the members of the household, assigning them different weights,<sup>20</sup> the most popular being the so-called Oxford scale.<sup>21</sup>

In the elaboration of the database we have opted for the solution proposed by Coulter, Cowell, and Jenkins (1992a, 1992b) and more frequently used by the recent literature (see the LIS database), to consider that families differ only in the number of their members, which allows the equivalence scale to be summarized in a single parameter. This option presents the advantage of making it easier to interpret equivalence scales in terms of families' economies of scale as a function of their size, enabling the following cases to be considered: (a) non-existence of economies of scale, i.e. needs are doubled when the number of household members doubles, equivalent to calculations in per capita terms (assuming that *person weighting* is used)<sup>22</sup>; (b) infinite economies of scale, i.e. needs do not change when

<sup>18</sup>The use of elevation factors is known as *population weighting* in the terminology of Atkinson *et al.* (1995).

<sup>19</sup>A good description of the problem can be found in Atkinson *et al.* (1995). On the theoretical foundations of the adjustment to needs see Deaton and Muellbauer (1980) and del Río and Ruiz-Castillo (1996). A historical review of the analysis of equivalence scales can be found in Nelson (1993). On the use of equivalence scales in the context of the elaboration of human capital series, see Basu and Foster (1998).

<sup>20</sup>See McClements (1977), Goodman, Johnson, and Webb (1989) and the references quoted there, or Bosch *et al.* (1989) among others.

<sup>21</sup>The Oxford scale assigns the coefficient 1 to the first member of the household, 0.5 to each additional adult member, and 0.3 to each member under 14 years of age, though these weights have undergone changes over time.

<sup>22</sup>On the consideration of different weights, see the next subsection.

the number of household members doubles, equivalent to calculations in terms of households (assuming we are using *household weighting*); and (c) variable economies of scale, in between the two above extremes, i.e. needs grow with the number of household members, but less than proportionately. In the aggregate results presented below all three options are considered, option (c) being restricted, following Atkinson *et al.* (1995), to the case in which needs grow according to  $\sqrt{N_i}$ .

From a more formal standpoint we could define the *per capita equivalent real income*  $x_i^{[\theta]}$ , as

$$(3) \quad x_i^{[\theta]} = \frac{Y_i}{N_i^\theta}, \quad \theta \in [0, 1]$$

$\theta = 1$  implies non-existence of economies of scale, calculations in *per capita* terms,  $x_i^{[1]} = x_i = Y_i/N_i$ .

$\theta = 0$  implies infinite economies of scale, calculations in terms of households, no adjustment according to the size of household,  $x_i^{[0]} = Y_i$ .

$0 < \theta < 1$ , implies certain economies of scale which grow smaller as  $\theta$  increases.

$x_i^{[\theta]}$  therefore represents the *per capita* equivalent real income of household  $i$ , that is to say the real income equivalent to that of a household of a single individual. The (fictitious) equivalent real income of household  $i$ , which has  $N_i$  members, would be given by

$$(4) \quad Y_i^{[\theta]} = x_i^{[\theta]} N_i = \frac{Y_i}{N_i^\theta} N_i$$

### *Weights According to Household Size*

The elevation factors mentioned above are population weightings used in order to make the sample representative in terms of the underlying population. All the calculations presented below take into account these elevation factors, i.e. they all consider population weightings. Furthermore, it is necessary to state clearly whether the statistics calculated should be weighted by the number of members of the household, *person weighting*, or not, *household weighting*, following the terminology of Atkinson *et al.* (1995). In general, we are more interested in individuals than in households, so the usual practice is to weight *per capita* equivalent income by the size of the household, i.e. assign to each individual the *per capita* equivalent income of the household to which he/she belongs. This is done by, for example, Atkinson *et al.* (1995), del Río and Ruiz-Castillo (1996, 1997) or Ruiz-Castillo (1997). By using this procedure they are implicitly assuming that there are no inequalities within the household, which has been criticized by several authors (Haddad and Kambur, 1990).

The combined use of population weights (elevation factors) and person weights (weighting by the number of members of the household) produces an estimate of the distribution of income among all the individuals of the population. Likewise, the combined use of population weights and household weights (considering each household as a unit) generates estimates of the distribution of

income among the households of the population. Not considering the population weights generates estimates of the distribution of income among individuals or households of the sample available, which since it is not random, may differ considerably from the underlying population. All the calculations of this study incorporate weighting by the number of members of the household, so that in terms of *per capita* income a family of  $N_i$  members counts as  $N_i$  times a family of a single member. As an exception, when  $\theta = 0$  the possibility of household weights is also considered, since when no adjustment is made for household size it seems more sensible to treat each family as a unit than to assign to each member of the household an equivalent income equal to the family income.

Taking into account these clarifications, the Gini, Theil (0), Theil (1) and Atkinson indices, and the Lorenz curves have been calculated in terms of four definitions for the three variables being studied: total income, total expenditure, and exclusively monetary expenditure. Table 1 offers a summary of the four definitions considered in this study in the calculation of the indices of inequality.

TABLE 1  
ELEVATION FACTORS, ECONOMIES OF SCALE AND WEIGHTS

Variable	$\theta$	$p_i$	$x_i^{[\theta]}$	$\mu$
Per household	$\theta = 0$	$p_i = \frac{F_i}{\sum_{j=1}^n F_j}$	$Y_i$	$\sum_{i=1}^n \frac{F_i}{\sum_{j=1}^n F_j} Y_i$
Household weighting				
Person weighting		$p_i = \frac{F_i N_i}{\sum_{j=1}^n F_j N_j}$	$Y_i$	$\sum_{i=1}^n \frac{F_i N_i}{\sum_{j=1}^n F_j N_j} Y_i$
Per capita	$\theta = 1$	$p_i = \frac{F_i N_i}{\sum_{j=1}^n F_j N_j}$	$\frac{Y_i}{N_i}$	$\sum_{i=1}^n \frac{F_i N_i}{\sum_{j=1}^n F_j N_j} \frac{Y_i}{N_i}$
Per capita equivalent	$\theta = 0.5$	$p_i = \frac{F_i N_i}{\sum_{j=1}^n F_j N_j}$	$\frac{Y_i}{N_i^{0.5}}$	$\sum_{i=1}^n \frac{F_i N_i}{\sum_{j=1}^n F_j N_j} \frac{Y_i}{N_i^{0.5}}$

### III. INEQUALITY IN SPAIN THROUGH THE EPF FOR 1973/74, 1980/81 AND 1990/91; SOME RESULTS

Although all the indicators are available for interested readers,<sup>23</sup> in the presentation of the results we have opted for the Gini index due to its popularity, having previously verified that all of them offer similar conclusions. Also, among the twelve variables available we have selected total expenditure *per capita* as we consider it to be the most representative.<sup>24</sup>

At the start of the period, in 1973, the highest levels of inequality were situated in the west and south of Spain (Figure 1), while the provinces with highest *per capita* income were those of the north-east, the closest to the rest of the

<sup>23</sup><http://www.ivie.es>. The Spanish inequality database has recently been expanded to include the 1998 indices but only at national and regional level since the new Encuesta Continua de Presupuestos Familiares (ECPF) does not allow the provincial desagregation. This information will be updated yearly.

<sup>24</sup>Even if we recognized that some results can be slightly different if other equivalence of scale is used.



European countries (Figure 2).<sup>25</sup> Nearly twenty years later the geography of *per capita* income was practically the same, while the map of provincial inequality had moved, though maintaining the south and centre-west of Spain as the areas with the most unequal personal distribution (Figure 3).

The indicators that trace the evolution of these two variables appear in Table 2. Inter-personal inequality in Spain was reduced between the years 1973 and 1991 (column 1), and also the dispersion among the provincial indicators as measured by the standard deviation (column 2) and by the ratio between the maximum and minimum values (column 5). Alongside this there was an increase in the national *per capita* income (column 6) accompanied by a reduction of the indices of dispersion (columns 7 and 10) which are, however, higher in this variable than in the Gini indices.<sup>26</sup> Also, whereas columns 8 and 9 confirm the persistence of the Balearics and Badajoz as the provinces with respectively the highest and the lowest *per capita* income, columns 3 and 4 point toward the higher geographical mobility of inequality in Spain that was mentioned earlier.

Figures 1 and 2 indicated that the location of inequality and of *per capita* income were geographically opposite. Column 11—which reflects the coefficients of simple correlation—confirms that there is a close negative and significant relationship between the two variables, indicating that the poorest provinces also present the highest levels of inequality among their inhabitants.

The combination of growth in *per capita* income and reduction in inequality that has taken place in the country as a whole guarantees the improvement in the welfare of its citizens. Sen's (1974)<sup>27</sup> welfare index which appears in Table 3, confirms that there has been an improvement of welfare (column 1) for the country as a whole, as well as a reduction in the inequality of the indices of the provinces (columns 2 and 5). Although the welfare map replicates to a large extent that of *per capita* income, it is no longer the Balearic islands and Badajoz that show the extreme values of the ranking in the three periods. It can also be observed that the inter-province differences are greater in terms of welfare than of *per capita* income, a result that was expected since the poorest provinces are also the most unequal.

Although the reduction of inequality in personal distribution has been a widespread phenomenon in Spain, as has the growth in *per capita* income and welfare, Table 4 indicates that this result cannot be extended to all the provinces. Thus, some of them have experienced increases in inequality among their citizens, though the overall result has been an improvement in welfare in all of them from 1973 to 1991, coinciding with the period of regional decentralization that was set in motion after the installation of democracy in Spain in 1978.

Finally, Table 5 shows the estimation of a convergence equation with panel structure, fixed province and time effects and allowing for a different speed of

<sup>25</sup>Information about provincial *per capita* income is taken from regional statistics (drawn up by the Fundación BBV). The average provincial expenditure taken from the micro-economic EPF's data could have been used as an alternative. We took the first option because it is more familiar to Spanish researchers, and also because macro-economic variables are those regularly used in estimating convergence equations.

<sup>26</sup>All the indices have been standardized (Spain = 1) to enable comparison.

<sup>27</sup>Sen's welfare index (1974) is defined as  $W = \mu(1 - G)$ ,  $\mu$  being the average *per capita* income and  $G$  the Gini index.





Figure 2. Per Capita Income, 1973



TABLE 2  
INEQUALITY AND PER CAPITA INCOME INDICATORS, LEVELS

Period	Gini, Per Capita Total Expenditure					Per Capita Income					
	Spain (1)	Provincial Indices				Spain (thousands of 86 pts) (6)	Provincial Indices				Income Per Capita and Inequality Correlation** (11)
		Standard Deviation (normalized)* (2)	Max (normalized)* (3)	Min (normalized)* (4)	Max/Min (5)		Standard Deviation (normalized)* (7)	Max (normalized)* (8)	Min (normalized)* (9)	Max/Min (10)	
1973/74	0.3421	0.0784	1.16 (Cáceres)	0.8 (Vizcaya)	1.45	658.1	0.235	1.43 (Balearics)	0.55 (Badajoz)	2.6	-0.46 (-0.07%)
1980/81	0.3338	0.077	1.11 (Lugo)	0.82 (La Rioja)	1.35	702.1	0.214	1.42 (Balearics)	0.59 (Badajoz)	2.41	-0.44 (-0.14%)
1990/91	0.3197	0.0688	1.10 (Ourense)	0.82 (Teruel)	1.34	950.3	0.203	1.40 (Balearics)	0.62 (Badajoz)	2.25	-0.45 (-0.10%)

Notes: \*Spain = 1. \*\*Significance level in brackets.

TABLE 3  
WELFARE INDEX (SEN, 1974)

Period	Spain (thousands of 86 pts) (1)	Provincial Indices			
		Standard Deviation (normalized)* (2)	Max (normalized)* (3)	Min (normalized)* (4)	Max/Min (5)
1973/74	432.9	0.2638	1.53 (Balearics)	0.54 (Cáceres)	2.81
1980/81	467.7	0.2372	1.41 (Álava)	0.58 (Granada)	2.41
1990/91	646.5	0.2242	1.49 (Balearics)	0.6 (Badajoz)	2.47

Note: \*Spain = 1.

convergence across periods. Column 1 presents the unconditional convergence equation, while column 2 is conditioned by the Gini index of inequality. The results of this table point toward a negative effect of inequality of personal income distribution on the growth of economies, in line with some recent studies,<sup>28</sup> though a warning has to be made that this result is sensitive to which inequality variable is used, to the estimation procedure,<sup>29</sup> and could be expected to be sensitive also to the inclusion of additional variables that condition the steady state. In this sense, the availability of a database such as that presented here becomes a very useful instrument for investigating the relationship between inequality and convergence in a regional context.

#### IV. CONCLUSIONS

The availability of a regional database on indices of inequality is especially interesting for the countries of the European Union that enjoy a very active regional policy. But also for all researchers interested in the analysis of welfare, for the wealth of information that it contains and the guarantees of homogeneity with which it has been elaborated. The regional series here presented complete those already available for the Spanish economy relating to the basic macro-magnitudes, physical capital (public and private) and human capital, broadening their interest for the economists interested in the regional analysis of the processes of growth.

The paper offers some results that illustrate regional inequality in Spain. According to the data, the provinces that present highest indices of inequality are those situated in the south and west of the country. On the other hand, the most egalitarian are those located geographically in the north-east of Spain, which are also those presenting highest levels of *per capita* income. Consequently, as also indicated by the simple correlation coefficients, there exists a significant negative

<sup>28</sup>See, for example, Galor and Zeira (1993), Benabou (1996a, 1996b), Chiu (1998), Alesina and Rodrik (1994), and Alesina and Perotti (1996).

<sup>29</sup>See Goerlich and Mas (1999).

TABLE 4

INEQUALITY, PER CAPITA INCOME AND WELFARE INDICATORS, ANNUAL RATES OF VARIATION (%)

Period	Gini, Per Capita Total Expenditure			Per Capita Income			Welfare Index (Sen, 1974)		
	Spain (1)	Provincial Indices		Spain (4)	Provincial Indices		Spain (7)	Provincial Indices	
		Max reduction (2)	Max increase (3)		Max (5)	Min (6)		Max (8)	Min (9)
1973/81	-0.35	-2.78 (Cáceres)	+3.02 (Balearics)	+0.81	+3.87 (Teruel)	-1.51 (Gyuipúzcoa)	+0.97	+4.86 (Teruel)	-1.15 (Guipúzcoa)
1981/91	-0.43	-2.84 (Balearics)	+1.80 (Lleida)	+3.07	+5.35 (Ourense)	+1.49 (Asturias)	+3.29	+5.54 (Jaén)	+2.06 (Asturias)
1973/91	-0.40	-1.50 (Cáceres)	+0.72 (Lleida)	+1.21	+2.95 (Soria)	-0.37 (Sevilla)	+2.25	+4.51 (Cáceres)	+1.23 (Guipúzcoa)

TABLE 5  
ESTIMATION OF THE CONVERGENCE EQUATION 1973–91  
(PANEL WITH PROVINCIAL AND TIME EFFECTS)

	Unconditional (1)	Conditional (2)
Y73	– 12.94 (–16.28)**	– 12.91 (–16.52)**
Y81	– 14.47 (–15.10)**	– 14.44 (–15.27)**
Inequality*	–	– 4.61 (–2.39)
R2	0.935	0.937
X2(1)***	30.55	30.52

*Notes:* \*Gini. Per capita total expenditure. \*\**t*-ratio in brackets. \*\*\*Test of the equality of the speed of convergence across periods. White (1980) heteroskedasticity consistent inference.

relationship between *per capita* income and Gini indices, indicating that the richest provinces are also the most egalitarian. The estimation of a convergence equation conditioned by the initial levels of inequality indicates that inequality has had a negative impact on the growth of the *per capita* income of the Spanish provinces.

Finally, it is worth mentioning that Spain has experienced a reduction of the dispersion of the Gini indices, and also that of the interprovincial levels of *per capita* income, between the years 1973 and 1991, so we can speak of convergence in both variables during these years. When, following Sen (1974), the growth in *per capita* incomes are combined with the evolution of the inequality indices, we conclude that there has been a gain in welfare for the country as a whole, although some provinces experienced losses in the course of the period.

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