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Recent Trends in Spanish Income Distribution: A Robust Picture of Falling Income Inequality [1]

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Abstract: Income distribution in Spain has experienced a substantial improvement towards equalisation during the second half of the seventies and the eighties; a period during which most OECD countries experienced the opposite trend. In spite of the many recent papers on the Spanish income distribution, the period covered by those stops in 1990. The aim of this paper is to extent the analysis to 1996 employing the same methodology and the same data set (ECPF). Our results not only corroborate the (decreasing inequality) trend found by others during the second half of the eighties, but also suggest that this trend extends over the first half of the nineties. We also show that our main conclusions are robust to changes in the equivalence scale, to changes in the definition of income and to potential data contamination. Finally, we analyse some of the causes which may be driving the overall picture of income inequality using two decomposition techniques. From this analyses three variables emerge as the major responsible factors for the observed improvement in the income distribution: education, household composition and socioeconomic situation of the household head.

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1. Introduction

Income distribution in Spain has experienced a substantial improvement towards equalisation during the second half of the Seventies and the Eighties;[2] a period during which most OECD countries experienced the opposite trend.[3]

In spite of the many recent papers on the Spanish income distribution, the period covered by those stops in 1990.[4] The aim of this paper is to extent the analysis to 1996 employing the same methodology and the same data set for the whole period. That is, we analyse in detail the changes in the Spanish income distribution from 1985 to 1996 using the ECPF. Our results not only corroborate the (decreasing inequality) trend found by others during the second half of the Eighties, but also suggest that this trend extends over the first half of the Nineties.

Several factors seem to be driving this trend towards equalisation: (i) a more unequal earnings distribution, which is the main income component;[5] (ii) the redistributive rôle of the public sector;[6] (iii) the substantial changes in (female) labour participation rates and unemployment rates, whose impact on the income distribution has been relatively small;[7] and (iv) demographic changes leading to an ageing population which seems to have had a positive impact on the distribution of income.[8] Even though, accounting for the observed level and change of income inequality is not the main purpose of this paper, we complement our descriptive analysis with a study of the distribution of income by population subgrups. From this analysis three variables emerge as the major responsible factors for the observed improvement in the income distribution: education, household composition and socioeconomic classification of the household head.

The paper is organised as follows. Section 2 addresses some limitations of our analysis and the methodological choices we have taken to address them. Section 3 analyses the distribution of real net equivalent income —which is our reference definition of income— for the period 1985-1996 and its evolution. Section 4 presents the main results of the decomposition analyses of the income distribution by population subgroups. Section 5 checks the robustness of our main conclusions

[2] This is the evidence obtained from the EPF (Encuesta de Presupuestos Familiares, Spanish Family Expenditure Survey) or from the ECPF (Encuesta Continua de Presupuestos Familiares, Spanish Family Expenditure Survey —interviews are held every three months) data. However, studies based on fiscal administrative records (*i.e*. el panel de declarantes del IRPF) find the opposite trend — see, Castañer, 1991; Lasheras *et al*., 1993; Melis and Díaz, 1933; Lambert and Ramos, 1997. See Garde *et al*. (1996) for likely explanations of such difference in trends.

[3] See Atkinson *et al*. (1995), Smeeding and Gottschalk (1995), Gottschalk and Smeeding (1998), Zaidi and de Vos (1998).

[4] See, however, Imedio *et al*. (1997) and Oliver and Raymond (1999) for a notable exception.

[5] See, *inter alia*, Revenga (1991), Díaz and Melis (1993), and Ayala *et al*. (1996).

[6] See Medel *et al*. (1988), Bandrés (1990, 1993) and Gimeno (1993).

[7] See Revenga (1991) and Ayala *et al*. (1996) for the effect of unemployment changes on income inequality; and Alba and Collado (1999), and Gradín and Otero (1999) for the impact of increasing female labour force participation.

[8] The population share and the relative income of households headed by individulas older than 65 years of age have increased over the period.

from section 3. In particular, we analyse the sensitivity of our results to changes in the equivalence scale, to changes in the definition of income and to potential data contamination, mostly at both ends of the distribution. Finally, Section 6 provides a summary and some concluding remarks.

2. Data shortcomings and methodological choices

The data (ECPF) we use presents three major problems for distributional analyses. First, since income and related questions refer to previous term's, information on extra pay (*e.g*. Christmas bonus) which accrue in the last quarter of the year, get reported in the first quarter interviews. Thus, in order to obtain annual earnings we estimate it from income information provided in the second quarter interviews.

Second, like most surveys, income and expenditure (though to a lesser extent) data are clearly underreported when compared to National accounts figures. Differences amount to one third of the figures given by the Spanish National accounts, and decrease over the period of study.

And third, the aggregate distribution by income source steaming from the ECPF differs substantially from that of the National accounts. Here, the main problem arises from the systematic misreporting of capital and self-employment incomes.[9] Here two main problems arise. The first is the underreported total income in relation to National Accounts. On average 1985-1996, the underreported of disposable income is about one third and values for capital income and labour income are 89% and 22%. In addition, the second is the different share of each source of income in the total household income also in relation to the structure of National Accounts. In other words, once imputed rents are taken out, labour income and pensions are overreported in the ECPF —on average and over the period 1985-1996, labour income represents 57.4% of total income in the ECPF as opposed to 47.1% in the National Accounts, whereas pensions represent 21% in the ECPF and only 16% in the National Accounts; thus an overreporting of 10 and 5 percentage points, respectively— and capital and self-employment incomes are underreported by the same amount —capital incomes represent 1.4% of total income in the ECPF and 7.6% in the National Accounts, whereas self-employment income represents 14.4% in the ECPF and as much as 23.9% in the National Accounts; that is, an underreporting of 5.5 and 9.5 percentage points, respectively.[10] Given this bias towards labour income and pensions, the main results reported in section 3 should be read with caution.

Notwithstanding all these data problems, in section 5 we carry out several robustness analyses to check how sensitive our results are to changes in the income definition, to changes in the

[9] Notwithstanding that, Cowell, Litchfield and Mercader-Prats (1999) suggest that misreporting by the self-employed does not change the overall distributional picture substantially. Besides the afore mentioned problems with capital and self-employment incomes, imputed rents are also overreported in the ECPF as compared to national accounts.

[10] Notwithstanding this, one has to bear in mind that, by definition, the sum of ECPF monetary and non monetary incomes does not correspond to the disposable gross income as defined in the National accounts; the two most important factors for such a difference being the fact that ECPF incomes are net of only tax withheld and that ECPF counts transfers amongst families as part of their income —whereas in the National accounts they get cancelled out.

equivalence scale and to problems of data contamination. These robustness analyses clearly suggest that the conclusions obtained in section 3 using real net equivalent income are robust to all these problems. In particular, regarding the problems pointed out above, we use a National accounts adjusted income definition and find that results are indeed robust to these data problems.[11]

Finally, real income is obtained by using a Retail Price Index for each decile and year, which we have estimated from the expenditure structure of each decile. Income is expressed in 1985 prices.

3. Trends in the Spanish income distribution: 1985-1996

In this section we analyse the changes in the income distribution for the period 1985-1996. We use real net equivalent income[12] —the equivalence scale being that of the OECD for Spain— and a wide range of graphical as well as analytical tools.[13]

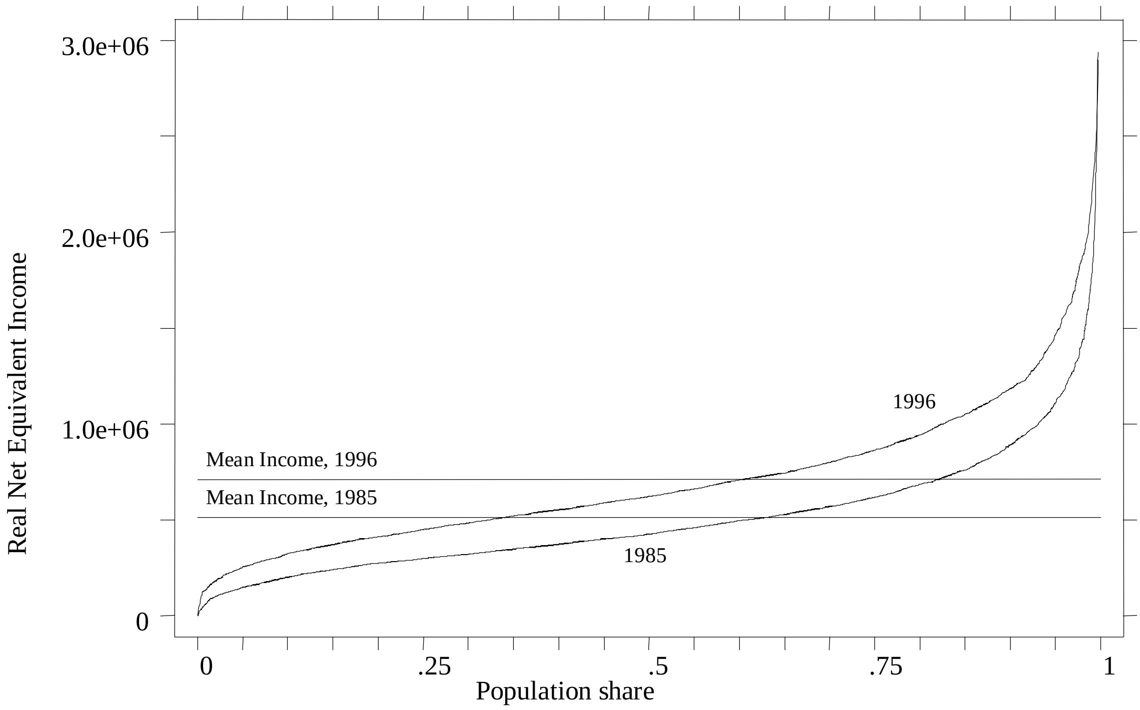
To visualise the income distribution, we first use Pen's parade (1971). To construct the parade let the height of individuals (households) correspond to their income, order the individuals according to their income level (height) and let them march in front of you for one hour exactly.[14] Then, the income distribution for 1996 in Figure 1, consists of a parade of dwarfs and few giants marching in the last couple of minutes. After the first five minutes, individuals marching in front of you are only 73 cm. tall. To see the first individual who is twice as tall one has to wait another 22 minutes, and after half an hour (median income) the height of the marcher is about a meter and a half (153 cm.). Seven minutes later we see the individual of average height, who is 175 cm. tall. Then, one has to wait another 20 minutes, that is, 3 to the end, to see the first individual whose height is twice the average. Finally, the two tallest people in the 1996 ECPF data set are 13.85 and 21.52 meters tall, respectively.

Which are the main differences between this parade and that for 1985? At first sight, one clearly notices that the individuals marching in the 1996 parade are nearly all of them taller than those in the 1985 one.[15] That is, from 1985 to 1996, income has increased in real terms for each and every individual. Average household income increased by 39.1% between 1985 and 1996 (from 512,512 to 712,934 pesetas), at an average annual rate of 3.1%. These results imply an unambiguous increase in overall social welfare, according to all individualistic, symmetric, additively separable

[11] See Oliver (1997) for the methodology used in order to build such an income variable.
[12] The exact definition of the real net equivalent income is provided in Appendix 1.
[13] The structure of this section draws on Jenkins (1994, 1996).
[14] Note that the income parade is the cumulative distribution function turned on its side.
[15] Only the last 12 individuals are taller in the 1985 parade than in the 1996 one. In other words, the two lines cross at percentile 99.65. However, such a crossing may not be significant for it may be due to data contamination (Cowell y Victoria-Feser, 1998).

and increasing social welfare functions —rank dominance condition, Saposnik, 1981.[16] We can also say that the proportion of households in poverty has fallen over time, regardless of which common real income level is used to define the poverty line for the two distributions (Atkinson, 1987).

Figure 1. Changing income parades, 1985 and 1996



Density functions provide another interesting picture of the income distribution, and as compared to the income parades, they allow for a closer look at both ends of the distribution. Which is the shape of the income distribution in 1985? As Figure 1 shows, the frequency at both ends of the estimated distribution is low: there are relatively few households with very low and very high incomes.[17] Most households have incomes between 250,000 and one million pesetas. Notice that often relative poverty lines are defined as half the contemporary mean or median (256,256 and 213,380 pesetas, respectively). Hence, small changes in the low income cut-off might imply big changes in the estimated proportion of poor. The highest frequency (mode) is at about 300,000 pesetas. The distribution, however, does not have one peak only: at about 500,000 pesetas there is another

[16] That is, for all social welfare functions $W_1 = \frac{1}{n}\sum U(y)$, U'>0 $\forall y \geq 0$; where *n* is the number of households, *y* denotes income, and *U*(*y*) is a individualistic utility function of income. Note that Saposnik's rank dominance condition or first order stochastic dominance does not require any assumption on the inequality aversion of the social welfare function. In other words, it does not impose any restriction on *U*''.

[17] All density functions in the paper are estimated using a Gaussian kernel and a window width of 10,000 pesetas, unless otherwise specified. Adaptative kernels would, no doubt, improve estimation at low frequency income levels.

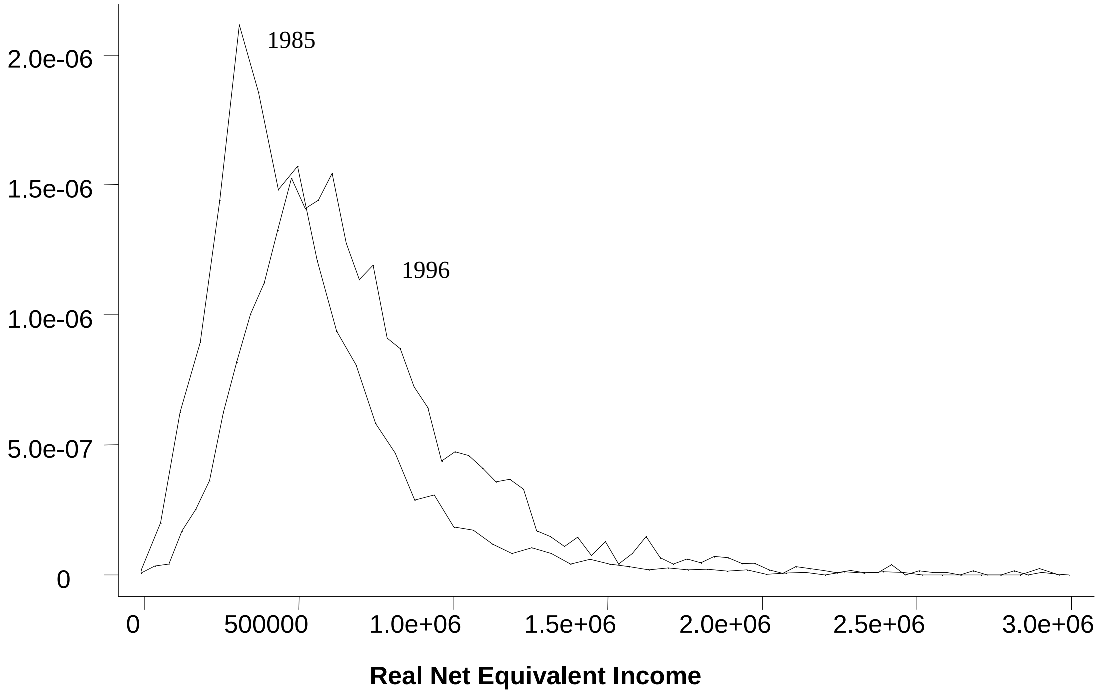
great concentration of households, though with less frequency. According to this picture, then, the density does not look like being unimodal but rather bimodal.[18] Notwithstanding this, such a bimodal frequency distribution might be due to sampling problems: a kernel density with a wider (optimal) window width shows a unimodal distribution function —see Figure 2, panel (b). Finally, the mountain side is steeper and smoother to the left than to the right, and indeed, there is a distinct plateau at around 900,000 pesetas.

How has the shape of the income distribution changed after more than a decade?[19] When comparing the densities in Figure 2 panel (a), two clear changes stand out: (i) the whole density has shift rightwards, and (ii) the peaks are not as high as in 1985, and now they have the same height. The shift of the distribution to the right corroborates the universal income increase for all households (percentiles). However, the shape has clearly changed. We still have a bimodal distribution —with modes at 475,000 and 600,000 pesetas— but the modes are lower. This fall in income concentration has a negative effect on inequality, which is counterbalanced by the frequency gain in the middle part of the distribution (between 500,000 and 1 million pesetas). As a result, income inequality falls between 1985 and 1996.

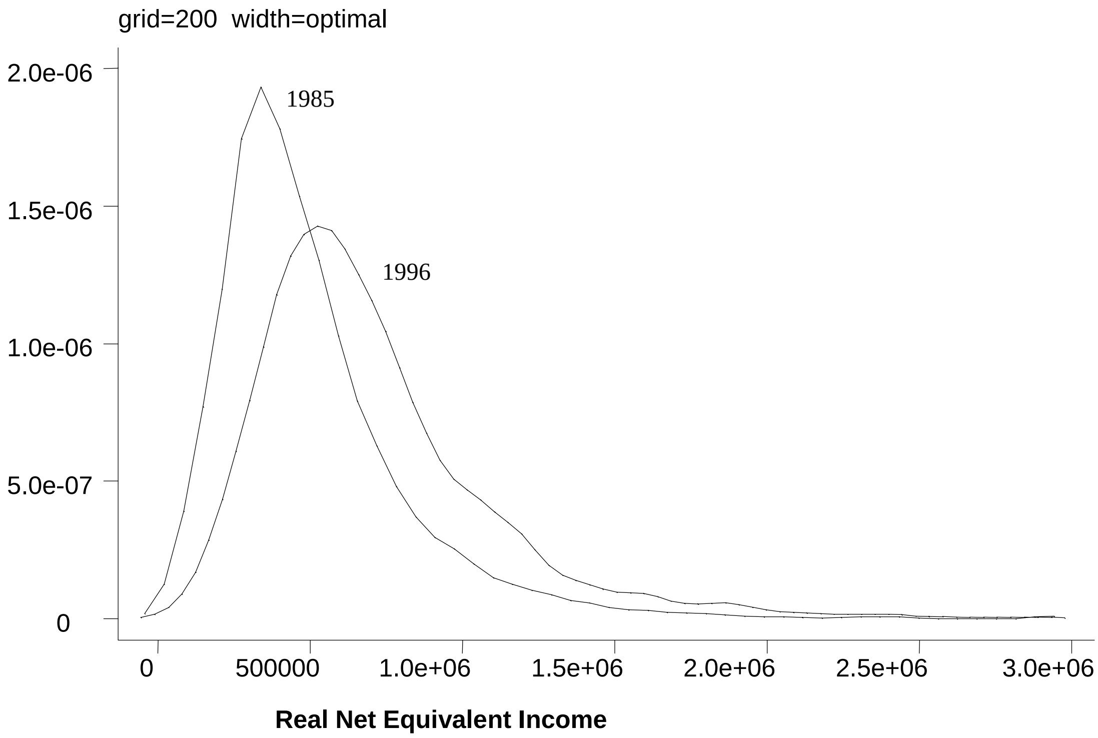
[18] Such great concentration of incomes at various points of the distribution may suggest a certain degree of polarization. See Esteban and Ray (1994) or Esteban, Gradín and Ray (1997) for a theoretical study on polarization; and Gradín (1997) for an empirical analysis of polarization in Spain.

[19] A graphical description of year to year changes are available from the authors on request.

Figure 2. Density function of real net equivalent income in Spain, 1985 and 1996



Panel a: Gaussian kernel, window width of 10.000



Panel b: Gaussian kernel, optimal window width

Tables 1, 2 and 3 provide additional elements of analysis that corroborate the falling inequality conclusion. Firstly, income as percentage of the median increases for the poorer half of the distribution and decreases for the richer half of the distribution —see Table 1. As the last column shows, the first nine vingtiles (those below the median income) experienced a positive, though monotonically decreasing, change in their relative position, whereas the relative distance of the richest nine vingtiles became smaller over these twelve years.

Table 1. Income distribution evolution in Spain. 1985-1996 (I)
Median income = 100 and change 1985-1996 in percentage

Percentile	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Change 85/96
5	34	37	41	41	45	45	43	45	43	43	41	41	18,4
10	47	50	52	51	54	53	54	55	54	54	52	52	10,3
15	57	58	60	59	62	60	61	62	62	62	60	60	5,4
20	64	64	66	64	68	67	67	67	67	68	66	66	3,1
25	70	70	71	72	73	72	73	73	73	73	73	72	3,6
30	75	76	77	78	78	78	77	78	78	79	79	78	3,6
35	81	82	83	84	83	83	84	83	84	84	84	84	2,6
40	88	88	89	89	89	90	89	89	89	89	89	89	1,4
45	94	93	94	94	94	94	94	94	94	95	95	95	0,8
50	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**0,0**
55	108	106	107	106	106	106	107	105	105	106	106	106	-1,2
60	116	113	113	113	113	112	113	111	113	113	113	114	-1,9
65	124	120	121	120	121	119	121	118	120	121	120	120	-3,2
70	134	129	131	127	129	127	129	126	129	129	129	129	-3,6
75	145	142	140	138	138	137	140	136	140	139	139	139	-4,4
80	161	155	152	151	150	150	153	149	154	152	151	152	-5,6
85	178	174	169	166	166	166	171	165	169	169	167	169	-5,3
90	208	203	194	189	190	189	197	190	195	193	194	190	-8,7
95	261	253	236	228	236	237	241	231	248	239	239	235	-9,9
Average	120	116	116	114	116	116	116	114	116	116	116	115	-4,6

Secondly, annualised income growth rates decrease monotonically with respect to the income vingtile, so that for the period 1985-1996 the income of the poorest vingtile grows twice as much as that of the penultimate vingtile, and only the last four vingtiles experience growth rates below the average income's —see Table 2.

Finally, Table 3 shows income shares and cumulative income shares for vingtiles of the population. The comparison between 1985 and 1996 figures clearly reveals the income distribution improvement over this period. The income share of the poorest fifth of the population grew nearly two percentage points, whereas the income share held by the richest fourth fell three percentage points. This improvement is best seen by means of the Lorenz curves in Figure 3. The 1985 distribution Lorenz dominates the 1996 distribution. This result corroborates the rank dominance shown by the income parades in Figure 1 and provides us with a powerful conclusion: according to all standard inequality indices,[20] income inequality unambiguously decreased between 1985 and 1996.

[20] That is, for all symmetric and scale invariant indices satisfying the Pigou-Dalton principle of transfers. See Lambert (1993), section 5.3 for a definition of those properties.

Table 2. Income distribution evolution in Spain, 1985-1996 (II)

Cumulative annualised income growth rates and total growth, in percentage.

	Annual											Annualised	Total
percentile	86	87	88	89	90	91	92	93	94	95	96	85/96	85/96
5	10,5	15,1	9,0	14,6	5,8	-1,6	12,5	-4,8	-1,1	-1,5	0,0	5,1	72,7
10	8,4	10,2	5,8	10,3	4,4	4,3	9,4	-1,8	-1,9	-0,4	1,1	4,4	60,9
15	4,5	9,7	5,1	9,5	4,1	4,5	7,1	0,3	-0,3	-1,0	1,0	4,0	53,7
20	2,5	7,1	6,2	9,5	4,9	4,0	6,0	0,8	-0,3	-0,2	1,7	3,8	50,5
25	3,3	6,4	8,3	6,1	5,7	4,2	5,5	1,0	-1,2	2,7	0,5	3,8	51,1
30	3,6	7,1	8,4	5,2	5,1	4,3	6,0	1,5	-1,5	2,5	0,2	3,8	51,1
35	2,9	6,5	9,0	3,8	6,7	3,8	5,0	1,5	-1,2	2,3	1,2	3,7	49,6
40	3,1	5,7	7,8	4,7	7,5	1,9	6,2	0,5	-0,5	1,7	1,4	3,6	47,9
45	2,1	5,8	7,7	4,7	6,4	3,2	5,2	0,8	0,1	1,9	1,6	3,6	47,0
50	2,7	4,8	8,1	4,2	6,6	3,1	6,1	0,4	-0,8	2,1	1,6	3,5	45,9
55	1,1	5,5	8,0	4,1	6,5	3,9	4,3	0,2	-0,4	2,4	1,9	3,4	44,1
60	-0,2	5,0	7,8	4,6	5,8	3,9	3,8	2,1	-0,7	2,2	2,4	3,3	43,1
65	-0,5	5,6	7,7	4,7	4,7	5,3	3,1	1,9	0,1	1,8	1,0	3,2	41,1
70	-0,5	6,0	5,2	5,3	5,0	4,7	4,0	2,7	-0,6	1,8	1,4	3,1	40,6
75	0,3	3,8	6,0	4,5	5,8	5,3	3,3	2,9	-1,1	2,2	1,0	3,1	39,5
80	-0,8	2,9	6,8	4,1	6,1	5,3	3,1	4,1	-2,1	1,2	2,1	3,0	37,7
85	0,3	1,7	5,9	4,2	6,7	6,1	2,1	3,0	-0,6	1,0	2,6	3,0	38,1
90	-0,3	0,6	5,2	4,5	6,0	7,6	2,6	3,1	-2,3	2,7	-0,1	2,6	33,2
95	-0,4	-2,0	4,0	8,3	7,0	4,8	1,5	8,0	-4,6	2,3	-0,4	2,5	31,5
Media	-0,8	4,6	6,3	6,5	5,9	3,8	4,1	2,1	-0,7	1,7	0,4	3,0	39,1

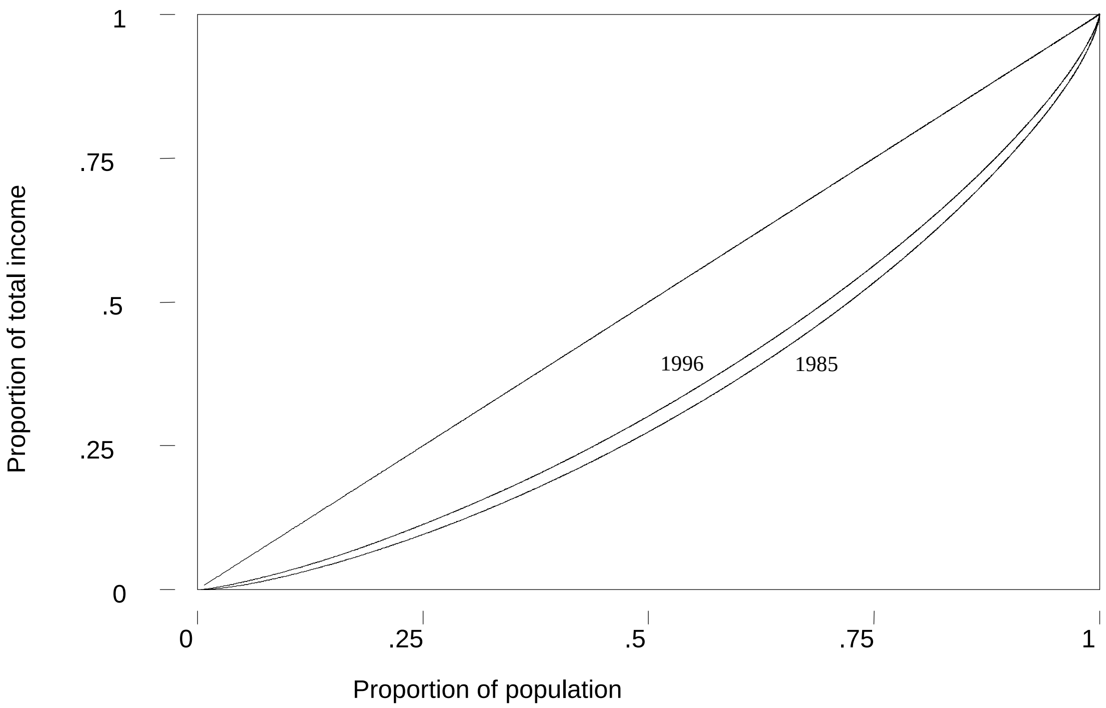
Note: The annualise income growth rate is $[(Y_1/Y_0)(1/n)]$-1.

Table 3. Income distribution evolution in Spain, 1985-1996 (III): income shares and cumulative income shares for vingtiles, 1985-1996

Percentage of real net equivalent income

Perc.	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Income share												
5	0,8	1,3	1,1	1,3	1,0	1,0	1,2	1,3	1,4	1,1	1,1	1,3
10	1,7	1,9	1,9	1,9	1,8	1,9	1,9	1,9	1,8	1,9	1,9	2,0
15	2,0	2,2	2,3	2,4	2,3	2,3	2,3	2,4	2,3	2,3	2,3	2,3
20	2,4	2,4	2,6	2,7	2,7	2,6	2,6	2,7	2,6	2,6	2,6	2,7
25	2,7	2,8	2,9	3,0	3,0	3,0	2,9	3,0	2,9	2,9	2,9	3,0
30	3,0	3,0	3,2	3,3	3,3	3,3	3,2	3,2	3,2	3,2	3,2	3,2
35	3,3	3,4	3,5	3,5	3,6	3,5	3,5	3,6	3,5	3,5	3,5	3,5
40	3,6	3,7	3,8	3,8	3,8	3,8	3,8	3,8	3,8	3,8	3,8	3,8
45	3,8	3,9	4,0	4,0	4,1	4,1	4,0	4,1	4,0	4,0	4,1	4,1
50	4,2	4,2	4,3	4,3	4,4	4,4	4,4	4,4	4,3	4,4	4,3	4,3
55	4,5	4,5	4,5	4,6	4,7	4,7	4,6	4,7	4,7	4,6	4,7	4,6
60	4,8	4,9	4,9	4,8	4,9	5,0	4,9	5,0	5,0	4,9	4,9	4,9
65	5,1	5,2	5,2	5,2	5,3	5,3	5,3	5,3	5,3	5,3	5,3	5,2
70	5,6	5,5	5,6	5,5	5,6	5,6	5,6	5,6	5,7	5,7	5,6	5,5
75	6,0	6,0	6,0	5,9	6,1	6,0	6,0	6,0	6,0	6,0	6,0	6,0
80	6,5	6,5	6,5	6,4	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,4
85	7,2	7,1	7,0	6,9	7,1	7,1	7,0	7,0	7,1	7,1	7,0	7,0
90	8,1	7,9	7,9	7,8	7,9	7,9	7,8	7,8	7,8	7,8	7,7	7,8
95	9,4	9,2	9,1	9,1	9,1	9,1	9,0	9,0	9,0	8,9	9,1	9,0
100	15,3	14,4	13,7	13,6	12,9	13,0	13,4	12,6	13,1	13,3	13,4	13,5
Cumulative income share												
5	0,8	1,3	1,1	1,3	1,0	1,0	1,2	1,3	1,4	1,1	1,1	1,3
10	2,5	3,1	3,0	3,2	2,8	2,8	3,1	3,2	3,2	3,0	3,0	3,3
15	4,5	5,4	5,3	5,5	5,1	5,1	5,4	5,6	5,5	5,3	5,3	5,6
20	6,9	7,8	8,0	8,2	7,8	7,7	8,0	8,3	8,1	8,0	7,9	8,4
25	9,6	10,6	10,9	11,2	10,8	10,7	10,9	11,3	11,0	10,9	10,9	11,3
30	12,6	13,6	14,1	14,5	14,1	14,0	14,1	14,5	14,2	14,1	14,1	14,6
35	15,9	17,0	17,6	18,0	17,6	17,5	17,6	18,1	17,7	17,6	17,6	18,1
40	19,4	20,7	21,3	21,8	21,4	21,4	21,4	21,9	21,5	21,4	21,4	21,8
45	23,3	24,6	25,3	25,8	25,6	25,5	25,4	26,1	25,5	25,5	25,5	25,9
50	27,4	28,8	29,6	30,1	29,9	29,9	29,7	30,5	29,8	29,8	29,8	30,2
55	31,9	33,3	34,1	34,8	34,6	34,6	34,4	35,2	34,5	34,5	34,5	34,8
60	36,7	38,2	39,1	39,6	39,5	39,6	39,3	40,2	39,5	39,4	39,4	39,7
65	41,8	43,4	44,3	44,8	44,8	44,8	44,6	45,5	44,8	44,7	44,7	44,9
70	47,4	49,0	49,8	50,3	50,5	50,5	50,2	51,1	50,5	50,4	50,3	50,4
75	53,4	54,9	55,8	56,3	56,5	56,5	56,2	57,2	56,5	56,4	56,3	56,4
80	59,9	61,4	62,3	62,6	63,0	62,9	62,8	63,7	63,1	62,9	62,8	62,8
85	67,2	68,5	69,3	69,5	70,2	70,0	69,8	70,7	70,1	70,0	69,8	69,7
90	75,3	76,4	77,2	77,3	78,1	77,9	77,6	78,5	77,9	77,8	77,5	77,5
95	84,7	85,6	86,3	86,4	87,1	87,0	86,6	87,4	86,9	86,7	86,6	86,5
100	100	100	100	100	100	100	100	100	100	100	100	100

Figure 3. Lorenz Curves of Income in Spain, 1985 and 1996



As it is well known, all the information analysed so far can be summarised into an inequality index. In particular, we use three members of the generalised entropy Family of indices (I_0, I_1 and I_2), two members of the Atkinson family of indices ($A_{0.5}$ and A_1), and the Gini coefficient.[21]

The generalised entropy class of inequality indices is given by:

[1*a*] $$I_c = \frac{1}{n}\frac{1}{c(c-1)}\sum_i\left[\left(\frac{y_i}{\mu}\right)^c - 1\right],\ c \neq 0,1,$$

[1*b*] $$I_0 = \frac{1}{n}\sum_i \log\frac{\mu}{y_i},\ c = 0,$$

[1*c*] $$I_1 = \frac{1}{n}\sum_i \frac{y_i}{\mu}\log\frac{y_i}{\mu},\ c = 1,$$

where parameter *c* denotes the sensitivity of the index to income differences in different parts of the distribution, $i = 1, \ldots, n$ is the unit of analysis (household), *y* is income, and μ is mean income.

I_0 corresponds to the mean log deviation (MLD); I_1 corresponds to one of the indices proposed by Theil (1967); and I_c with sensitivity parameter c=2 corresponds to half the coefficient of variation squared. The bigger the sensitivity parameter *c*, the more sensitive I_c is to income differences at the top of the distribution.

[21] For a detailed analysis of these and other inequality indices see, *inter alia*, Atkinson (1970), Cowell (1980, 1995, 1998),

The Atkinson class of inequality indices (I_e) contains a family of indices which are also identified by a sensitivity parameter, e; and it is given by:

[2] $$I_e = 1 - \frac{y_d}{\mu}$$

where y_d is the equally distributed equivalent income:

[3a] $$y_d = \left[\sum_i \frac{1}{n} y_i^{1-e} \right]^{\left(\frac{1}{1-e}\right)} \quad , \; e > 0 \; , \quad e \neq 1$$

[3b] $$y_d = \frac{1}{n} \sum_i \log y_i \quad , \; e = 1$$

Note that, in this case, the bigger the sensitivity parameter e, the more sensitive I_e is to differences at the bottom end of the distribution. Moreover, notice that the generalised entropy class of inequality indices in [1] includes monotonic transformations of the entire Atkinson class of inequality indices (Shorrocks, 1980: 622). Finally, the Gini coefficient can be written as:

[4] $$Gini = \sum_i \sum_j \frac{\left| y_i - y_j \right|}{2n^2 \mu}$$

where subscripts i y j denote two sample units.

What do all these inequality indices show for the period 1985-1996? Broadly speaking, the evolution of income inequality is independent of the inequality index used —see Table 4 and Figure 4. Between 1985 and 1996, all indices decreased over 25%, except the Gini coefficient, which fell 12.7%.

Our results are in line with the empirical literature for Spain that uses the family expenditure surveys (encuestas de presupuestos).[22] However, our estimates show a higher inequality level and a greater decrease than most studies. Such differences could be due to differences in the definition of income and in the equivalence scale.

From a comparative perspective, it is worth noticing that, although Spanish income inequality was one of the highest among OECD countries at the beginning of the sample period, during the sample period it has experienced one of the most substantial reductions of all OECD countries.[23]

Jenkins (1991), Lambert (1996) or Shorrocks (1980).

[22] See, *inter alia*, Alcaide (1989, 1991); Escribano (1990); Revenga (1991); Gimeno (1993); Ayala, Martínez and Ruiz-Huerta (1996); Imedio, Parrado and Sarrión (1997); Cowell, Litchfield and Mercader-Prats (1999); Goërlich and Mas (1999).

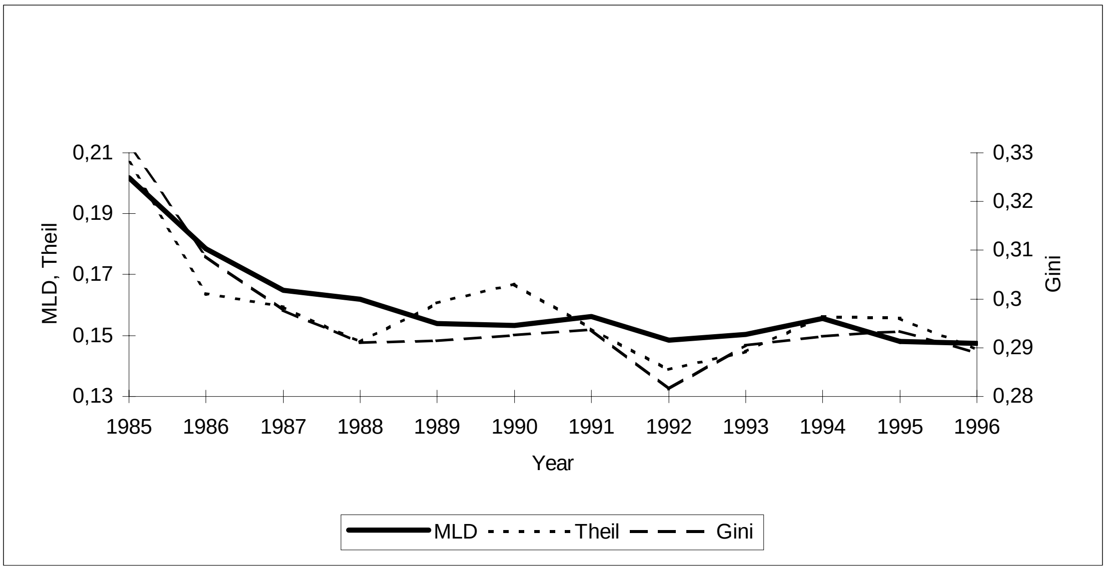
[23] See Gottschalk and Smeeding (1997) for a comparison of nineteen OECD countries in the Eighties using LIS data.

Table 4. Inequality indices and Abbreviated Social Welfare measures, 1985-1996

Index	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Inequality												
I_0	0,202	0,178	0,165	0,162	0,154	0,153	0,156	0,148	0,150	0,156	0,148	0,148
	(0,010)	(0,009)	(0,009)	(0,009)	(0,010)	(0,011)	(0,007)	(0,009)	(0,007)	(0,009)	(0,006)	(0,007)
I_1	0,207	0,164	0,160	0,148	0,161	0,167	0,152	0,139	0,145	0,156	0,156	0,145
	(0,018)	(0,006)	(0,010)	(0,006)	(0,017)	(0,023)	(0,007)	(0,007)	(0,005)	(0,012)	(0,011)	(0,008)
I_2	0,350	0,198	0,219	0,182	0,267	0,324	0,195	0,175	0,173	0,229	0,221	0,185
	(0,088)	(0,012)	(0,033)	(0,013)	(0,081)	(0,135)	(0,016)	(0,016)	(0,008)	(0,045)	(0,038)	(0,022)
Gini	0,331	0,309	0,298	0,291	0,291	0,293	0,294	0,282	0,291	0,292	0,293	0,289
	(0,007)	(0,005)	(0,005)	(0,005)	(0,007)	(0,008)	(0,005)	(0,005)	(0,004)	(0,006)	(0,006)	(0,005)
$A_{0.5}$	0,094	0,080	0,075	0,071	0,073	0,074	0,072	0,066	0,069	0,073	0,072	0,069
A_1	0,183	0,163	0,152	0,150	0,143	0,142	0,145	0,138	0,140	0,144	0,138	0,137
p90/p10	4,422	4,069	3,714	3,694	3,500	3,552	3,666	3,439	3,608	3,594	3,705	3,660
Abbreviated Social Welfare												
$W_{0.5}$	1,363	1,368	1,402	1,449	1,494	1,536	1,567	1,604	1,618	1,609	1,623	1,629
W_1	12.945	12.960	13.019	13.083	13.154	13.212	13.246	13.294	13.313	13.300	13.325	13.330
Sen	342,750	351,325	373,381	400,799	426,630	450,933	467,232	494,649	498,937	493,928	501,809	506,929

Note: inequality measures are defined in the main text. Abbreviated Social Welfare measures are defined in footnote 24. Standard Errors in parentheses.

Figure 4. Income inequality measures, 1985-1996



To what extent our income inequality estimates do faithfully reflect the true population trend in income inequality? As it is common wisdom, sampling variation in the survey being used might lead to important differences between the true population inequality measures and those estimated from the sample. In order to test the statistical significance of our inequality estimates, in Table 4, we include standard errors for most measures. The confidence intervals calculated from these standard errors are small enough to allow us to be confident not only that the fall was statistically significant, but also that we have a reasonable estimate of the scale of inequality growth over the period.

Finally, defining social welfare as an increasing function of per capita income and decreasing in inequality,[24] the bottom panel in Table 5 shows a clear improvement for all years except for 1994, where per capita income fell and inequality increased. In other words, in terms of social welfare, the few yearly increases in income inequality during the period were counterbalanced by the growth in per capita income.

4. Income inequality by population subgroups

In this section we analyse some of the causes which may be driving the overall picture of income inequality trends obtained in the previous section. Given the limitations imposed by the information provided in the ECPF data sets, we use breakdowns by education, sex, age, socioeconomic classification and household composition and size. Personal characteristics refer to the household

[24] We use abbreviated social welfare functions to measure social welfare. In particular, the three functions we use employ $A_{0.5}$, A_1, and the Gini coefficient as inequality measures. Thus, $W_e = y_d^{(1-e)}/(1-e)$, e>0, $e\neq 1$; $W_e = \log(y_d)$, e=1; Sen = $\mu\cdot$ (1-*Gini*). see Lambert (1993) for a detailed analysis on abbreviated social welfare functions.

head.

To account for income inequality and inequality trends we use three different additive decomposition techniques and the inequality measure I_0.[25] The first one is the well known decomposition by population subgroups put forward by Cowell (1980) and Shorrocks (1980). This decomposition will enable us to account for the effect on inequality levels of each characteristic separately —*i.e.* not taking into account the effect that other attributes also have on inequality.

Let us consider a population of n income units y_i (*i.e.* individuals or households) with mean income μ and variance σ^2. Partition the population into k mutually exclusive and exhaustive set of subgroups —*e.g.* by household composition, age of the household head, educational attainment, etc.— comprising n_k members each and mean income μ_k.

Then, I_0 can be decomposed into two contributions. The first one —second term in [5]— corresponds to the between groups component and measures the inequality which would obtain had every individual had the mean income of the subgroup she belongs to. The second contribution —first term in [5]— is the within group component and measures a weighted average of subgroup inequalities.

[5] $$I_0 = \sum_k v_k I_{0k} + \sum_k v_k \log\left(\tfrac{1}{\lambda_k}\right)$$

In [5], $v_k(\equiv n_k/n)$ is the population share of group k and $\lambda_k(\equiv \mu_k/\mu)$ denotes the mean income of group k relative to population (or rather sample) mean income.

In order to account for inequality change we use Jenkins' (1995) methodology. The change in I_0 can be expressed as:

[6] $$\Delta I_0 = I_{0,t+1} - I_{0,t} = \sum_k \bar{v}_k \Delta I_{0k} + \sum_k \bar{I}_{0k} \Delta v_k - \sum_k \left[\overline{\log(\lambda_k)}\right] \Delta v_k - \sum_k \bar{v}_k \Delta \log(\lambda_k) \approx$$

$$\approx \underbrace{\sum_k \bar{v}_k \Delta I_{0k}}_{[T1]} + \underbrace{\sum_k \bar{I}_{0k} \Delta v_k}_{[T2]} + \underbrace{\sum_k \left[\bar{\lambda}_k - \overline{\log(\lambda_k)}\right] \Delta v_k}_{[T3]} + \underbrace{\sum_k \left(\bar{\theta}_k - \bar{v}_k\right) \Delta \log(\mu_k)}_{[T4]}$$

where θ_k ($\equiv v_k\, \lambda_k$) is subgroup k's share of total population income, subscript t denotes the period, Δ is the difference operator and a bar over variables denotes the average of that variable over the two periods. As Jenkins (1995) argues "the approximation is more useful than the exact decomposition because it relates inequality changes to changes in sub-group inequalities, shares and means" (p. 38). For clarity's sake, instead of using the decomposition in [6], we use proportionate changes ($\%\Delta I_0 = \Delta I_0 / I_{0,t}$), and reinterpret terms T1 to T4 accordingly.

[25] Note that we could have used any of the generalized entropy family measures to do the decomposition analyses. We choose I_0 for its good and convenient decomposition properties. In particular, I_0 is the only measure of the generalised entropy class whose decomposition weights are a sole function of population shares. That is, weights do not depend on subgroup incomes—see Shorrocks, 1980.

Therefore, overall inequality changes can be decomposed into changes in sub-group inequalities [T1], changes resulting from changes in subgroup's population weights [T2 and T3], and changes resulting form changes in subgroup's relative incomes [T4].

As we pointed out above, when estimating the impact of a given attribute on inequality level or its change, these two decompositions only consider the effect of every attribute separately. In order to estimate the joint effect of all relevant characteristics available in the ECPF, we use a different decomposition suggested by Fields (1998).

Fields (1998) considers a log-linear income generating function

[7] $$\Psi = \ln(y) = \sum_j \beta_j X_j + \varepsilon$$

where X_j are individual or household characteristics, β_j are the corresponding OLS coefficients, and ε is the regression residual.

If [7] is a good representation of the income generating process, the contribution s_j of each characteristic j can be expressed as:

[8] $$s_j = \frac{\operatorname{cov}\left[\beta_j X_j, \Psi\right]}{\sigma^2_\Psi}$$

where the numerator is the covariance between $\beta_j X_j$ and Ψ, and the denominator is the variance of log-income, σ^2_Ψ.

Note that this is an exact and additive decomposition.

[9] $$\sum_j s_j = R^2$$

[10] $$\sum_{j=1}^{J+1} \frac{\operatorname{cov}\left[\beta_j X_j, \Psi\right]}{\sigma^2_\Psi} = 1.$$

Hence, each factor's contribution to the explanatory capacity of the model can be defined as,

[11] $$\eta_j = \frac{s_j}{R^2}$$

Fields (1998) shows that the decomposition in [10] holds for a wide class of inequality measures, including the Atkinson class, A_e, the generalised entropy class, I_c, and the Gini coefficient. In particular, [10] holds for any continuous and symmetric inequality measure $I(\Psi_1, \ldots, \Psi_N)$, for which $I(\mu, \ldots, \mu)=0$.

In sum, as long as we agree on the income generating process in [7], Fields' methodology allows us to decompose overall income inequality by socioeconomic characteristics of the population without having to agree on a particular inequality measure. In other words, the effect of each characteristic on overall income inequality is independent on the inequality measure used in the empirical analysis.

To estimate the contribution of characteristic *j* to the change in inequality, however, we do have to opt for a particular measure for the decomposition of inequality changes is not index independent. Using I_0, the contribution to the change in income inequality of characteristic *j*, can be expressed as

[12] $$\Pi_j = \frac{\left[s_{j,t+1} I_{0,t+1} - s_{j,t} I_{0,t} \right]}{I_{0,t+1} - I_{0,t}}$$

where $s_{j,t}$ denotes the contribution to level inequality of characteristic *j* in period *t*, $I_{0,t}$ is the inequality in period *t*, and

[13] $$\sum_j \Pi_j = 1 .$$

Therefore, as in [6], the decomposition in [12] allow us to estimate the contribution of characteristic *j* to the change in income inequality. Unlike [6], though, contribution Π_j is net of the effect of the other characteristic included in the model on the change in income inequality.

Obviously, changes in income inequality are due either to changes in the characteristics or to changes in the part of income that the income generating process in [7] cannot explain —the regression residuals. Notwithstanding this, it would be of interest to know whether changes in the characteristics result from changes in the coefficients, from changes in the distribution of the variable, from changes in the covariance or correlation between the characteristics and income, or from mere changes in income inequality.

Now, note that contribution s_j can also be written as

[8'] $$s_j = \frac{\beta_j \cdot \sigma_{X_j} \cdot corr\left[X_j, \Psi\right]}{\sigma_\Psi}$$

where σ_{Xj} is the standard deviation of characteristic *j*, *corr*[*Xj*, Ψ] is the correlation between X_j and Ψ, and σ_Ψ is the standard deviation of Ψ.

For infinitesimal changes, an exact decomposition of the difference in any given s_j can be obtained by logarithmically differentiating [8']

[14] $$\underline{s_j} = \underline{\beta_j} + \underline{\sigma_{X_j}} + \underline{corr\left[X_j, \Psi\right]} - \underline{\sigma_\Psi}$$

where a bar under a variable denotes logarithmic differences.[26]

Why using two different decompositions to analyse the inequality change? Our strategy is to take the best of the two decompositions. On the one hand, Fields' decomposition allows us to estimate the effect of a given factor *net* of the influences of other variables, but the different components of such effects are sometimes difficult to interpret. On the other hand, Jenkins' decomposition does not net out the effect of other factors on the contribution of a given factor, but overall inequality change decomposes into very intuitive components. Thence, we use Fields' decomposition to account for inequality change and Jenkins' decomposition to unravel what is going on within each subgroup, that is, what explains those contributions.

Our empirical results reveal the relative importance of the effects of all socioeconomic characteristics contained in the ECPFs on inequality. Generally speaking, these effects are small.

Our income generating model is

[15] $\Psi = \beta_0 + \beta_1(\text{Age}) + \beta_2(\text{Age})^2 + \beta_3(\text{Education Level}) + \beta_4(\text{Sex}) + \beta_5(\text{Civil Status}) + \beta_6(\text{Partner with income}) + \beta_7(\text{Size of municipality}) + \beta_8(\text{Socioeconomic classification}) + \beta_9(\text{Household size}) + \varepsilon$

where individual characteristics refer to the household head. The explanatory power of all characteristics in [15] is less than 50% of *income inequality* (45,3% in 1985 and 38,5% in 1996, first two columns of Table 8). The individual characteristic which has a greater impact on income inequality is the educational attainment of the household head. Nonetheless, the socioeconomic classification of the household head and household composition also play an important rôle. Each one of the remaining characteristics explains less than 5% of overall inequality. Finally, note that age and sex have a small disequalizing effect.

According to the empirical evidence that derives from decomposition [12], the characteristics included in [15] explain about two thirds (68.6%) of the *change in income inequality* between 1985 and 1996 —see Π_j in the fifth column of Table 8. The variables that explain most of this changes are exactly the same as those which have the greatest contribution to inequality at a point in time:

[26] Note that whenever any of the four contributions in [8'] has different signs for the two periods, the decomposition in [14] will no be applicable for that variable. For instance, if coefficient β_j has different signs in the regressions for *t* and *t*+1, the logarithmic difference [$\log(\beta_{j,t+1}/\beta_{j,t})$] does no exist. Moreover, as Fields himself acknowledges, changes that occur in the real world are non-infinitesimal. The decomposition in [14] could be approximated by using percentage changes. However, in practice the latter can result in a non-exact decomposition, *i.e*. where all components are far from accounting for the entire change in s_j —this has, indeed, been our case, and that is why results are not shown. Another objection to the exact decomposition is that both the coefficients and the correlations are functions of the covariance between the characteristics and income, so that the former cannot change without changes in the latter. A way out is to assume that characteristics are orthogonal, but again, the resulting decomposition may no be exact.

the socioeconomic classification, education level and household composition.

Notwithstanding this, in general, the overall inequality reduction witnessed between 1985 and 1996 is accounted for by reductions in within group inequalities (term T1 in decomposition [6], shown in Table 7). To some extent, this finding challenges the traditional explanations of inequality changes founded on changes in the age or education distribution, in household composition or in the socioeconomic classification of the household head. This is not to say that those factors do not account at all for the overall income inequality reduction experienced in Spain between 1985 and 1996 —as we shall show below, the ageing population, changes in the socioeconomic classification or in the distribution by education level do have a certain impact on inequality trends—, but separately, those contributions never explain more than a third of the overall change —that is, the sum of terms T2, T3 and T4 is always smaller than a third.

Table 5. Income inequality decomposition by population subgroups, 1985 and 1996. Decomposition [5]

			Component		% I_0	
Partition	Year	I_0	Within	Between	Within	Between
Socioeconomic classification of the household head						
	1985	0.202	0.030	0.171	15.1	84.9
	1996	0.148	0.016	0.132	10.5	89.5
Education level of the household head						
	1985	0.202	0.041	0.161	20.4	79.6
	1996	0.148	0.026	0.122	17.4	82.6
Age of the household head						
	1985	0.202	0.003	0.199	1.6	98.4
	1996	0.148	0.001	0.146	1.0	99.0
Cohort of the household head						
	1985	0.202	0.003	0.199	1.6	98.4
	1996	0.146	0.001	0.146	0.5	99.5
Sex of the household head						
	1985	0.202	0.000	0.202	0.1	99.9
	1996	0.148	0.000	0.147	0.2	99.8
Household size						
	1985	0.202	0.017	0.185	8.4	91.6
	1996	0.148	0.008	0.139	5.5	94.5
Household composition						
	1985	0.202	0.021	0.181	10.4	89.6
	1996	0.148	0.010	0.138	6.7	93.3

See [5] for the definition of within and between components. Partitions are defined in Appendix 3

Table 6. Population shares, relative mean income and within group inequality, 1985 and 1996.

	$v_k(\equiv n_k/n)$		$\lambda_k(\equiv \mu_k/\mu)$		I_0		μ_k	
	1985	*1996*	*1985*	*1996*	*1985*	*1996*	*1985*	*1996*
Socioeconomic classification of the household head								
Unemployed	0.07	0.06	0.51	0.64	0.25	0.33	258,950	457,058
Entrepreneurs w/ dep. empl.	0.03	0.02	1.31	1.15	0.18	0.14	673,635	818,203
Agr. Entrepr. wo/ dep. empl.	0.05	0.03	0.68	0.76	0.28	0.16	349,672	542,215
Agricultural workers	0.03	0.02	0.64	0.77	0.15	0.13	326,902	548,846
Entrepreneurs wo/ dep. empl.	0.07	0.08	0.93	0.83	0.16	0.13	474,393	594,947
Other employees	0.33	0.33	1.26	1.21	0.15	0.13	646,009	865,287
Retired	0.30	0.39	0.93	0.95	0.14	0.10	474,551	677,367
Blue collar employees	0.09	0.07	0.97	0.89	0.25	0.13	494,703	633,356
Other non-active	0.03	0.01	0.89	0.77	0.24	0.16	456,247	547,421
Education level of the household head								
Illiterate	0.04	0.03	0.67	0.74	0.16	0.10	342,189	524,448
Without studies	0.25	0.19	0.77	0.83	0.15	0.10	395,888	593,420
Primary education (1st cycle)	0.48	0.41	0.90	0.90	0.17	0.11	461,807	638,242
Primary education (2nd cycle)	0.08	0.15	1.29	0.96	0.17	0.13	660,773	681,806
Secondary education	0.06	0.14	1.41	1.23	0.12	0.17	722,904	876,807
Short BA & BSc.	0.05	0.04	1.62	1.57	0.12	0.12	828,729	1,122,794
BA, BSc. & Doctors	0.04	0.04	2.18	1.91	0.15	0.14	1,118,301	1,358,608
Age of the household head								
<25	0.02	0.02	0.91	0.80	0.26	0.18	466,699	567,408
26-35	0.15	0.13	1.17	1.11	0.21	0.21	601,281	791,376
36-45	0.21	0.20	0.99	0.99	0.26	0.16	508,427	703,496
46-55	0.23	0.20	0.94	1.03	0.20	0.17	479,928	734,905
56-65	0.20	0.20	1.03	0.96	0.21	0.13	525,561	685,342
>65	0.19	0.26	0.93	0.97	0.10	0.10	475,559	693,821
Cohort of the household head								
>=1960	0.02	0.16	0.91	1.08	0.26	0.20	466,699	774,315
1950-59	0.15	0.20	1.17	0.99	0.21	0.17	601,281	711,584
1940-49	0.21	0.20	0.99	1.01	0.26	0.17	508,427	725,763
1930-39	0.23	0.21	0.94	0.98	0.20	0.13	479,928	698,213
1920-29	0.20	0.17	1.03	0.96	0.21	0.09	525,561	687,308
<1920	0.19	0.08	0.93	0.96	0.10	0.09	475,559	684,949
Sex of the household head								
Male	0.86	0.79	0.99	0.99	0.20	0.15	509,354	704,556
Female	0.14	0.21	1.04	1.04	0.20	0.14	531,262	744,568
Household size								
1 Member	0.08	0.11	1.29	1.17	0.24	0.15	662,331	835,604
2 Members	0.21	0.24	1.12	1.08	0.19	0.13	571,937	772,001
3 Members	0.19	0.22	1.07	1.04	0.14	0.14	549,189	744,195
4 Members	0.24	0.26	1.04	0.95	0.20	0.12	534,014	675,673
5 Members	0.15	0.11	0.83	0.85	0.16	0.18	424,902	608,225
6+ Members	0.13	0.06	0.66	0.68	0.22	0.14	340,717	485,347
Household composition								
1 adult	0.04	0.04	1.65	1.40	0.32	0.23	845,988	996,779
2 adults	0.11	0.12	1.26	1.19	0.21	0.15	647,801	847,366
3+ adults	0.22	0.27	1.01	1.01	0.17	0.14	516,515	717,649
1 adult + child	0.01	0.01	0.96	0.95	0.63	0.29	492,961	674,687
2 adults + 1 child	0.07	0.07	1.19	1.05	0.15	0.18	607,458	750,600
2 adults + 2 children	0.11	0.08	1.08	0.93	0.19	0.15	553,134	666,513
2 adults + 3+ children	0.06	0.02	0.83	0.63	0.26	0.13	426,568	446,544
3+ adults + children	0.20	0.13	0.73	0.80	0.19	0.14	372,327	569,642
1 adult, HH>65 years	0.04	0.07	0.94	1.02	0.08	0.07	483,746	727,639
2+ adults, HH>65 years	0.15	0.19	0.92	0.96	0.11	0.11	473,334	682,001

Table 7. Subgroup decomposition [6] of the changes in overall income inequality, 1985 and 1996. Percentages

Partition	T1	T2	T3	T4
Socioeconomic classification	58.9	13.7	7.2	20.8
Education	75.3	-3.8	-5.6	30.8
Age	84.6	12.3	0.4	2.9
Cohort	127.2	-31.6	-1.0	3.2
Sex	100.1	0.2	-0.1	-0.2
Household size	81.2	2.4	8.3	7.8
Household composition	70.4	9.3	6.5	15.3

Terms T1, T2, T3 and T4 are defined in [6] and in the main text. T1 is the contribution resulting from changes in inequality within subgroups. T2 and T3 correspond to the contribution resulting from changes in subgroup population shares. T4 is the contribution resulting from changes in subgroup mean incomes. Partitions are defined in Appendix 3.

Next we use the three decompositions defined above to analyse the contribution of every characteristic to inequality level at a point in time and its change between 1985 and 1996.

a) SOCIOECONOMIC CLASIFICATION OF THE HOUSEHOLD HEAD

As we have pointed out above, the social classification of the household head is the factor that most contributes to the change in income inequality —term T1 in table 7 is about 60% and Π_j, in Table 8, is 25%. In the decomposition [6] the remaining 40% (T2+T3+T4) is accounted for by changes in subgroup's population shares (T2+T3) and changes in subgroup's mean incomes (T4), in the same proportion. These changes imply a change in the correlation between the socioeconomic classification and income that explains the change in the contribution of this variable to the change in income inequality —see Table 8. The most notorious change in the subgroup's population shares is closely related to the ageing of the population: the retired increase their relative share by 9 points —see Table 6. This change in the retired's share reinforces the equalising impact that the substantial fall in this subgroup's income inequality has on overall inequality change.

As the between component in Table 5 shows inequality among relative income means also fell. Notwithstanding this, not all groups having mean income below the sample mean, increase their relative mean. The relative mean incomes of the only two subgroups having mean incomes above the sample mean ('entrepreneurs with dependent employees' and 'other employees') fall. Indeed, several groups experience a substantial fall in their relative mean incomes. The 'entrepreneurs without dependent employees' see their mean income reduced 10 points, whereas that of the 'blue collar workers' and of the 'other workers' gets reduced 8 points. It is also worth noting the 13 points increase in the relative mean income of the 'unemployed'. The 'retired', however, benefit from a slight increase in their relative income mean. Such a small increase is, nonetheless, insufficient to push their mean income above the sample mean.

Table 8. Contribution of the socioeconomic characteristics to overall income inequality and its change, 1985 and 1996. (Decompositions [8], [11], [12], [14]).

	s_j		% R^2		Π_j	Decomposition of the change in s_j (%)			
Variable	1985	1996	1985	1996		A	B	C	D
Age	-0.5	-0.2	-1.1	-0.4	-1.5	2.6	-3.7	108.5	7.4
Education	15.7	13.2	34.6	34.3	24.1	116.5	30.3	9.2	56.0
Sex	-0.4	-0.4	-0.9	-1.0	-0.4	1365.1	-412.3	-539.6	313.2
Civil status	2.2	1.4	4.9	3.7	5.0	83.6	-22.5	65.2	26.4
Spouse with income	4.4	4.4	9.8	11.4	4.5	2382.0	-2730.9	2308.2	1859.2
Size of Municipality	2.5	2.9	5.6	7.4	1.3	256.4	4.6	-434.0	-273.0
Socioeconomic classification	12.9	9.4	28.5	24.4	25.0	-3.1	4.8	106.3	7.9
Household composition	8.4	7.7	18.5	20.1	10.5	15.9	81.4	13.3	10.5
R^2	45.3	38.5	100.0	100.0	68.6				
No. Observations	3034	3067							

s_j is the contribution of variable *j* to income inequality at a point in time (see [8]).
% R^2 is the contribution of variable *j* to the change in income inequality as a percentage of the explanatory power of the model: 100[s_j /R^2].
Π_j is the contribution of variable *j* to the change in income inequality (see [12]).
Decomposition of the change in s_j (expressed as % s_j):
A: Relative change of the coefficient.
B: Relative change of the standard deviation of the variable.
C: Relative change of the correlation between the variable and the logarithm of income.
D: Relative change of the standard deviation of the logarithm of income.
Variables are defined in Appendix 3.

Inequality fell for all socioeconomic groups, with the notable exception of the unemployed. The reduction, though, is not the same for all groups. In general, groups with lower mean income experience a greater reduction in within inequality —note the substantial fall of the 'agricultural entrepreneurs with dependent employees', the 'blue collar workers' and the 'other non active'. The most notable exception is the 'unemployed' group, for which inequality increases drastically. What is driving such and increase? Although the answer to this question is clearly beyond the scope of this paper, some tentative explanations could include a change in the benefits policy, a change in the composition of the unemployed subgroup, or a change in the income distribution of the unemployed in the employment spell previous to the interview.

b) EDUCATION LEVEL OF THE HOUSEHOLD HEAD

The change in population shares by education level has a disequalizing effect of about 10% of the overall inequality change —see T2+T3 in Table 7. Such an equalizing effect is mainly due to the decreasing proportion of households whose head has primary education (1st cycle) or less. Changes in subgroup's relative mean income, however are equalizing —term T4 in Table 7. Overall, relative mean incomes increased for households whose head attained lower education levels (having also smaller relative mean incomes) and fell for those headed by individuals with higher educational attainments. In terms of the decomposition in [14] this implied a reduction in the education coefficient.[27]

[27] It is worth noting that those coefficients are not returns to education estimates. Actually, according to Barceinas *et al*. (2000), returns to education increased for more educated individuals. Thence, changes in the distribution of income sources other than

The fall in within group inequality, which accounts for three fourths of overall inequality reduction, is mainly experienced by households headed by individuals with low educational attainments (less than secondary education). In fact, within group inequality only rises for households headed by individuals with secondary education —this is also the group with the highest subgroup population share increase. Changes in within group inequality follow a clear pattern. In 1985 within group inequality was lower the more educated groups than for less educated ones. Twelve years later, the situation is the opposite. In sum, during these twelve years, more educated group's income fell in relative terms, but its dispersion rose, whereas the less educated group's relative income and dispersion behaved the opposite way.

c) HOUSEHOLD COMPOSITION

Changes in household composition account for 10.5% of overall income inequality change, and this percentage rises to 70.4 if the effect of the other variables are not taken into account. On the one hand, these changes in household composition are due to a greater equality of subgroup's mean incomes: relative mean income falls (increases) for those groups having mean incomes above (below) the sample mean. On the other hand, those changes point at certain changes in the population shares of the more numerous households and those with and individual aged 65 or more, which reduces the dispersion of this variable. Within group inequality falls for all groups, except for those with two adults and a child. Finally, we would like to comment on the lone parent households group. Even though its population share is still very small, and has hardly changed over the period, and its mean income is only 5 points below the sample mean, its inequality fell drastically. Notwithstanding all this, in 1996, lone parent households still showed the highest income inequality.

d) AGE OF THE HOUSEHOLD HEAD

The sign of the effect of age on the overall inequality change differs according to the decomposition used. When the joint effect of all variables is taken into account —decomposition [14]— age has a small disequalizing impact. However, when considering the sole effect of age —decomposition in [6]—, the impact is equalizing. The small disequalizing effect is accounted for by the falling (negative) correlation between age and income. Note also that the increasing dispersion of the age variable has prevented the negative effect from being greater. Indeed, the main change in population shares is an increase of the 'older than 65' group's share. It is also worth noting the substantial fall in relative mean income of the youngest group, which has a small effect on overall inequality change because its population share is very small (2%) and it does not change over the period.

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labour income should explain the decreasing education coefficients observed in decomposition [14].

e) BIRTH COHORT OF THE HOUSEHOLD HEAD

The breakdown by cohorts allow us to analyse the life-cycle effects on the overall inequality change.[28] If nothing else would have changed, falling within group inequality would imply a reduction in overall inequality 30% bigger than the finally observed. Even though inequality falls for all cohorts, those reductions are specially significant for the last three cohorts still in working age in 1985 —1940-49, 1930-39 and 1920-29. The inequality reduction in the last cohort is likely to be due to the transition from labour income to pensions for its members were 56 to 65 years old in 1985 and retired 12 years later. Changes in subgroup population shares have a clear-cut disequalizing effect. This change is mainly due to the relative increase for the youngest cohort (having the greatest within group inequality in both years) and to the relative fall for the oldest one (having the smallest within inequality, also in both years).

f) SEX OF THE HOUSEHOLD HEAD

Surprisingly enough, sex does not account neither for inequality level at a point in time nor for the change in inequality. In other words, income inequality is the same among households headed by males than among those headed by females.[29]

5. Robustness analyses to changes in the equivalence scale, in the income definition and to trimming

This section shows the robustness of our main results to changes in the equivalence scale (section 5.1), in the income definition (section 5.2), and with respect to the quality of the micro-data set we use (section 5.3).

5.1. Equivalence scales and changes in inequality trends

As explained above, the analysis so far employed the OECD equivalence scale to equivalise money income. This assumes certain needs of and relationships within households which may be driving our results. The main aim of this section is to show to what extent the income inequality trends obtained (in section 3) employing income adjusted using the OECD equivalence scale hold when using different equivalence scales.

[28] Strictly speaking, the analysis of cohort effects requires panel data for this is the only way to follow the same individuals over time. Notwithstanding this, since ECPF samples are representative for each sample year, within cohort income changes can be assumed to be due to life-cycle effects. However, note that, the cross-section nature of our data does not permit to distinguish life-cycle effects from time effects.

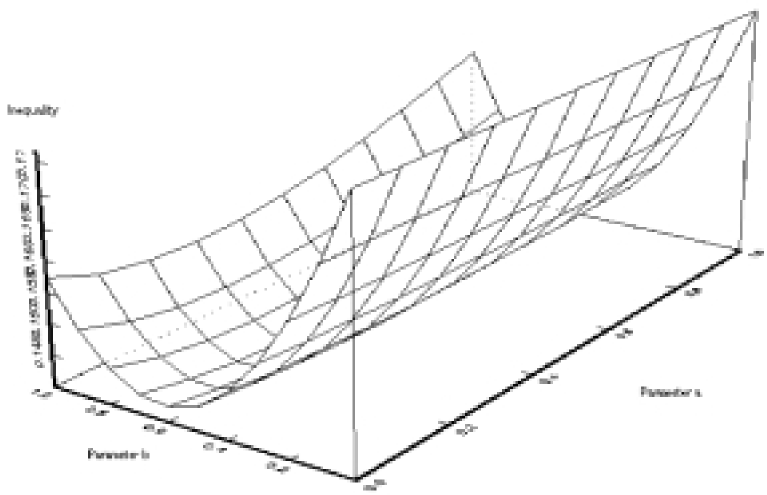
[29] These results call for further investigation on the identification of the female headed household since it does not seem reasonable to assume that relative mean income is higher for female than for men headed households.

In order to do so, we use the parametric equivalence scale put forth by Cutler and Katz (1992), *CK*, and the inequality measure I_0. *CK* can be written as

$$CK = (A + aM)^b \quad 0 \le a \le 1, \qquad 0 \le b \le 1$$

where *A* is the number of adults, *M* the number of children aged less than 14, *a* determines the importance of children and *b* is the equivalizing parameter. *b* = 0 would correspond to not equivalizing (i.e. equivalent income equals household income); for *b* > 0, economies of scale are assumed, which reduce as *b* is increased; and therefore, for *b* = 1 equivalent income is per capita income (that is, assuming *a* = 1). The OECD equivalence scale corresponds to values of *a* = 0.69 and *b* = 0.82, for the study period. These values are very similar to those obtained in Duclos and Mercader-Prats (1999) using the EPF 1980/81 (*a* = 0.72 y *b* = 0.82).[30] As Figure 6 shows, inequality (I_0) and the two parameters *a* and *b* have a *U*-shape relationship, and this is more pronounced for parameter *b*.

Figure 6. Inequality (I_0) of real net equivalent income for different values of *a* and *b*, 1996.

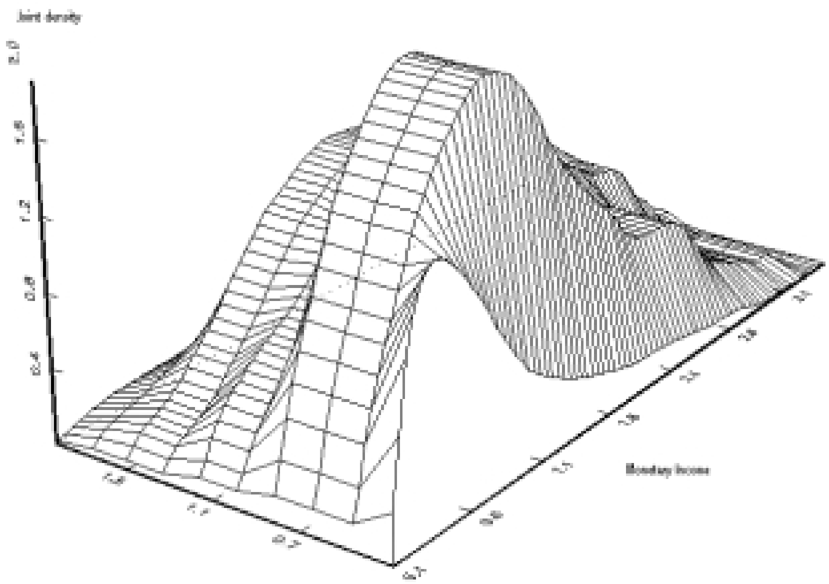


The impact of the equivalizing parameter (*b*) on income inequality depends on two factors, which may go in opposite directions. On the one hand, given the positive correlation between monetary income (not equivalized) and household size, increasing *b* means that equivalent income for households above average size is likely to fall by more than equivalent income for households below average size, as long as *b* is sufficiently small. Hence, this is an equalizing effect. On the other hand, the same process may change rankings in the equivalent income distribution, and this may work in the opposite direction. The joint density of monetary income (*b* = 0) and household

[30] Parameters *a* and *b* were estimated adjusting CK to the OECD equivalence scale, in a non-linear manner. Duclos and Mercader-Prats (1999) use the same procedure to estimate the two parameters using the *Encuesta de Presupuestos Familiares 1980/1981*.

size corroborates the positive relation between these two variables —see Figure 7.[31]

Figure 7. Joint density of monetary income and household size, 1996.



However the joint density of per capita income (b = 1) and household size clearly shows a negative relationship between these two variables. This is explained by the reranking in the income distribution pointed out above.

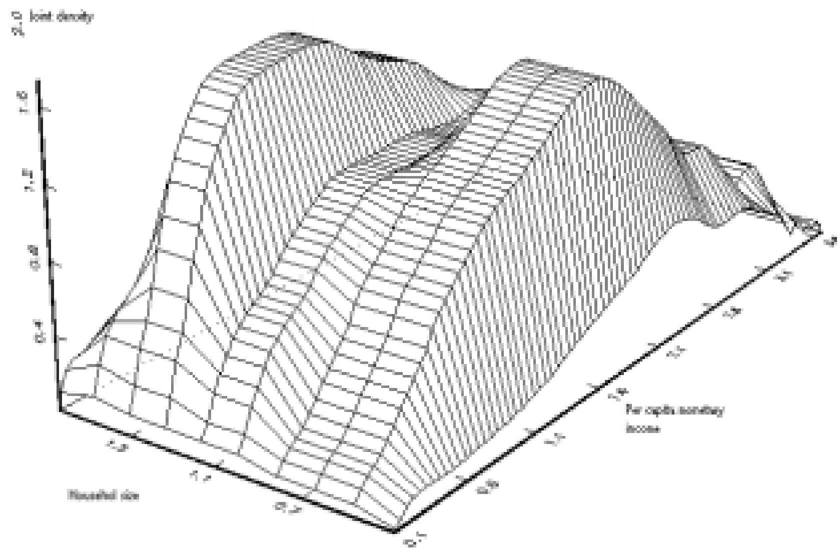
For I_0, the effect of small changes in b on inequality depends on the covariance between equivalent income (y) and household size, n_h:

$$\frac{\partial I_0}{\partial b} = -\frac{\operatorname{cov}(y, \log(n_h))}{\bar{y}} \approx \frac{\operatorname{cov}(x, \log(n_h))}{\bar{x}} - b \operatorname{var}(\log(n_h))$$

where $\bar{y}$ is average equivalent income, x is household monetary income and $\bar{x}$ is average monetary income.

[31] Joint densities for other sample years are very similar to the one for 1996 and are not shown.

Figure 8. Joint density of per capita income and household size, 1996.



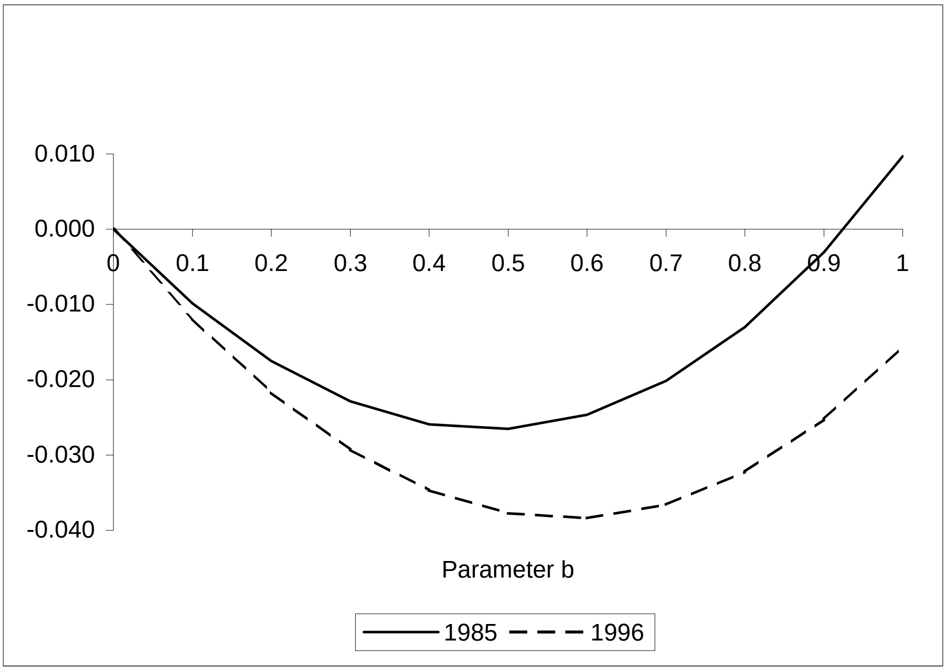
Given the positive correlation between monetary income and household size on would expect a positive correlation between equivalent income and household size for values of *b* close to zero, and a negative correlation for values of *b* close to one. Table 9 shows that, indeed, the covariance between equivalent income and household size is positive for values of *b* smaller than 0.6 and negative for values of *b* greater than that.

Table 9. Covariance between equivalent income and household size for different values of the parameter *b* (for *a*=1), and correlation between monetary income and household size, 1985-1996

	$\left[\mathrm{cov}(y,\log(n_h))/y\right]$											Corr(x, n_h)
	value of parameter *b*											
Year	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	
1985	0,11	0,09	0,07	0,04	0,02	-0,01	-0,03	-0,06	-0,09	-0,11	-0,14	0,22
1986	0,13	0,10	0,08	0,06	0,03	0,01	-0,02	-0,04	-0,07	-0,10	-0,13	0,33
1987	0,13	0,11	0,09	0,07	0,05	0,03	0,00	-0,02	-0,04	-0,07	-0,10	0,34
1988	0,12	0,10	0,08	0,06	0,04	0,02	-0,01	-0,03	-0,06	-0,08	-0,11	0,36
1989	0,14	0,12	0,09	0,07	0,05	0,03	0,00	-0,02	-0,05	-0,07	-0,10	0,36
1990	0,14	0,12	0,10	0,08	0,06	0,03	0,01	-0,01	-0,04	-0,06	-0,09	0,33
1991	0,14	0,11	0,09	0,07	0,05	0,02	0,00	-0,03	-0,06	-0,08	-0,11	0,38
1992	0,14	0,11	0,09	0,07	0,05	0,02	0,00	-0,03	-0,05	-0,08	-0,11	0,41
1993	0,13	0,11	0,09	0,06	0,04	0,02	-0,01	-0,03	-0,06	-0,09	-0,12	0,38
1994	0,12	0,10	0,08	0,05	0,03	0,01	-0,02	-0,04	-0,07	-0,10	-0,12	0,34
1995	0,11	0,09	0,07	0,05	0,03	0,00	-0,02	-0,05	-0,08	-0,10	-0,13	0,33
1996	0,13	0,11	0,09	0,07	0,04	0,02	-0,01	-0,03	-0,06	-0,08	-0,11	0,35

Moreover, due to the equalizing and disequalizing effects mentioned above, when the equivalisation parameter increases, inequality changes more rapidly for the more equal distribution, that is, for 1996 —see Figure 9, where I_0 is normalized to 0 for b = 0 in both years. Therefore, when going from family to per capita income, the observed inequality fall between 1985 and 1996 increases monotonically.

Figure 9. measure I_0 for different values of *b* and *a*=1, 1985 and 1996.
(I_0 normalized to 0 for b=0)



5.2. Changes in the income definition

As the Spanish literature shows,[32] trends in income inequality differ according to the income definition employed. This literature uses 3 definitions of income: adjusted income, expenditure and monetary income (before and after tax). At the same time, expenditure adjusted for actual and imputed rents has been also employed as a proxy for permanent income. In accordance with this practice, next we show how trends in income inequality change for the six definitions shown in Table 11.

Table 10. Different definitions of income

[1]	Net income	monetary income + non-monetary income
[2]	Before tax income	[1] + income tax (IRPF)
[3]	Gross income	[2] + social security contributions
[4]	Expenditure	total expenditure
[5]	Adjusted expenditure	expenditure adjusted for actual and imputed rents, self-consumption and in kind payments
[6]	Income adjusted to National Accounts	monetary and non-monetary income, adjusted to National Accounts

The main conclusion of this robustness analysis is that inequality not only falls for the period 1985-1996 regardless of the income definition employed, but its trend is also similar over the whole period —see Figure 10. As expected, inequality is greatest for gross income and smallest for net income. Before tax income inequality is smaller but its trend parallels that of gross income —

[32] See the references cited in section 3.

implying a nearly constant (negative) relative redistributive effect (RRE)[33] of social security contributions over the period. The RRE of the direct tax is greater for the second half of the Eighties (about 20%) than for the first half of the Nineties (about 18%), and it is specially important in 1990, for which EER is maximum.[34]

Expenditure inequality is slightly greater to net income inequality,[35] and adjusted income inequality is greater than expenditure inequality. That is, the distribution of rents (actual and imputed) has a clear disequalizing effect. Finally, inequality of income adjusted to the National accounts lies between that of net and gross income, and follows a distinct trend.

Table 11. Inequality of 6 definitions of income (equivalent, OCDE), 1985-1996.

Year	NI	GI	BTI	Expenditure	Adj. Expenditure	Adjusted to NA	RRE
				I_0			
1985	0.202	0.277	0.251	0.184	0.205	0.226	19.5
1986	0.178	0.251	0.223	0.185	0.214	0.203	20.0
1987	0.165	0.234	0.211	0.174	0.203	0.196	21.8
1988	0.162	0.227	0.205	0.172	0.202	0.187	20.9
1989	0.154	0.219	0.195	0.173	0.198	0.180	21.1
1990	0.153	0.226	0.201	0.169	0.197	0.216	23.6
1991	0.156	0.216	0.193	0.172	0.199	0.207	19.0
1992	0.148	0.210	0.179	0.164	0.192	0.189	17.1
1993	0.150	0.216	0.183	0.162	0.191	0.193	17.9
1994	0.156	0.218	0.189	0.164	0.193	0.197	17.8
1995	0.148	0.210	0.184	0.167	0.201	0.210	19.5
1996	0.148	0.211	0.182	0.153	0.188	0.185	18.9
				Gini			
1985	0.331	0.392	0.372	0.330	0.346	0.360	10.9
1986	0.309	0.372	0.349	0.331	0.352	0.343	11.6
1987	0.298	0.360	0.340	0.322	0.345	0.337	12.5
1988	0.291	0.351	0.331	0.322	0.344	0.330	12.1
1989	0.291	0.353	0.334	0.322	0.342	0.325	12.6
1990	0.293	0.359	0.339	0.318	0.341	0.355	13.7
1991	0.294	0.349	0.329	0.322	0.343	0.347	10.7
1992	0.282	0.340	0.316	0.316	0.338	0.335	10.9
1993	0.291	0.352	0.326	0.313	0.336	0.340	10.8
1994	0.292	0.352	0.325	0.313	0.336	0.342	10.1
1995	0.293	0.351	0.328	0.317	0.344	0.353	10.5
1996	0.289	0.348	0.323	0.305	0.333	0.332	10.4

NI: Net income; GI: Gross income; BTI: Before tax income; E: Expenditure; AE: Adjusted Expenditure; IANA: Income adjusted to National accounts; RRE: Relative redistributive effect = 100[(BTI-NI)/BTI].

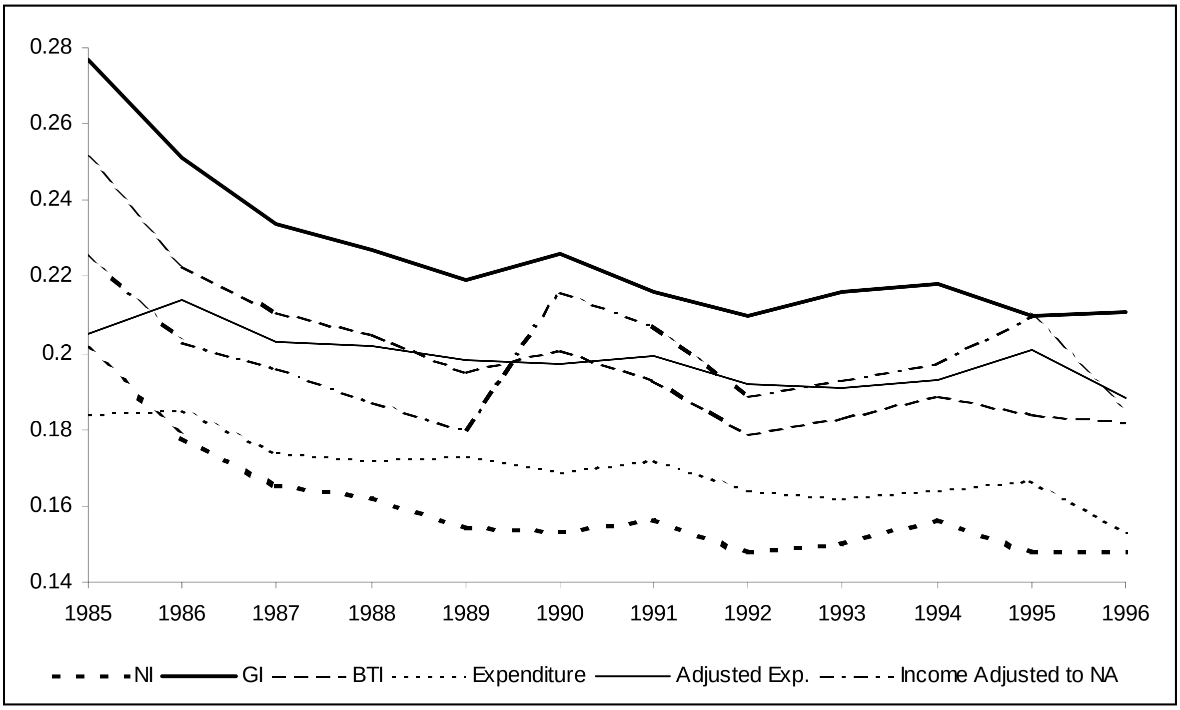
Note: see table 10 for the exact definitions of the 6 income variables.

[33] Relative redistributive effect (RRE), is defined as the percentage change of the redistributive effect according to the inequality measure I_0 —the results for the Gini coefficient are very similar.

[34] This maximum is surely related to the reform in the income tax implemented in 1989, which allowed individuals to file separately. Lambert and Ramos (1997) obtain the same evidence for the period 1985-1991 using the panel of tax files, and attribute such improvement to a fall in horizontal inequity.

[35] Actually, the correlation between net income and expenditure is positive and high —see Figure 11 in Appendix 2. Since joint densities for other years are very similar, they are not shown.

Figure 10. I_0 for 6 definitions of income (equivalent, OCDE). 1985-1996.



5.3. Robustness to trimming

One of the problems that arise when working with survey micro data concerns the quality of the data: these may be misreported, miscoded, or just missing. Obviously, poor quality data may lead to misleading conclusions if the observed income distribution differs substantially form the true and unobserved one. Even, when dealing with relatively big samples, one or two anomalous observations may hamper or drive the estimation of inequality measures and other distributional tools such as the Lorenz curve.[36]

The aim of this section is to check the robustness of our main conclusions to dirty data. Following Cowell and Victoria-Feser's suggestions we strategically trim the income distribution and implement dominance criteria to the modified distributions.

Data imperfections could be modelled using data contamination models (Cowell, 1998).[37] These models assume that the observed distribution is a mixture of two distributions: the true and an 'alien' contamination distribution. Unfortunately, we do not have sufficient information to model such data imperfections. Instead we compare dominance results from strategically trimmed

[36] See Cowell and Victoria-Feser (1996, 1998) for analyses of the robustness of several distributional tools usually employed to assess income distributions.
[37] To model certain types of data contamination, such as the systematic income misreporting of well-identified groups (e.g. self-employed), error measurement models are thought to be the most appropriate ones.

distributions. Given that dominance outcomes are more likely to be affected if random 'spots' of contamination occur in either tail of the distribution (Cowell *et al*., 1999), we compare dominance outcomes under 1% and 5% 'balanced' and 'unbalanced' trims. A 'balanced' trim removes a small percentage (q) of observations from each tail of the distribution (that is, removes a $2q$ percentage of the sample), whereas 'unbalanced' trims remove a small percentage (q) from only one tail.

Table 12 shows the results of the trimming in terms of Lorenz and generalized Lorenz dominance for three equivalent scales: OECD's (*i.e*. a = 0.69 and b = 0.82 in *CK*), household income (*i.e*. b = 0), and per capita income (i.e. a = 1 and b = 1). In general, the Lorenz dominance conclusion of the 1996 income distribution on the 1985's is robust to all trims and for the three equivalence scales. Moreover, both Lorenz and generalized Lorenz dominance outcomes are also quite robust when dividing the whole period in 4 sub-periods that replicate the phases of the Spanish economic cycle.

Table 12. Effect of trimming on Lorenz and generalized Lorenz dominance, 1985-1996.

	Equivalent Income (OCDE)				household Income				Per Capita Income			
Period	NT	BT	UU	UL	NT	BT	UU	UL	NT	BT	UU	UL
Lorenz dominance												
1% Trimming												
1985-1996	D	=	=	=	D	=	=	=	D	=	=	=
1985-1989	D	=	=	=	D	=	=	=	D	=	=	=
1989-1991	Ca1	=	=	=	Ca2	Ca5	Ca4	=	Ca1	d	Ca1	=
1991-1994	Cb1	Ca2	Ca2	=	Cb1	=	D	=	Cd4	=	Ca5	=
1994-1996	Cb1	=	=	=	Ca1	d	d	=	Ca1	=	=	=
5% Trimming												
1985-1996	D	=	=	=	D	=	=	=	D	=	=	=
1985-1989	D	=	=	=	D	Ca1	Ca2	=	D	=	=	=
1989-1991	Ca1	d	d	=	Ca2	Cb3	Ca1	=	Ca1	d	d	=
1991-1994	Cb1	D	D	=	Cb1	D	D	=	Cd4	Ca5	Ca3	Ca3
1994-1996	Ca1	=	=	=	Ca1	=	=	D	Ca1	=	=	=
Generalized Lorenz dominance												
1% Trimming												
1985-1996	D	=	=	=	D	=	=	=	D	=	=	=
1985-1989	D	=	=	=	D	=	=	=	D	=	=	=
1989-1991	D	=	=	=	D	=	=	=	D	=	=	=
1991-1994	D	=	=	=	Cb1	D	D	=	D	=	=	=
1994-1996	D	=	=	=	D	=	Ca4	=	D	=	=	=
5% Trimming												
1985-1996	D	=	=	=	D	=	=	=	D	=	=	=
1985-1989	D	=	=	=	D	=	=	=	D	=	=	=
1989-1991	D	=	=	=	D	=	=	=	D	=	=	=
1991-1994	D	=	=	=	Cb1	D	D	=	D	=	=	=
1994-1996	D	=	=	=	D	Cb1	Cb1	Ca2	D	=	=	=

NT: No trimming; BT: Balanced trim; UU: Upper tail Unbalanced trim; UL: Lower tail Unbalanced trim. D: Dominance of the final year of the period's curve over that of the first one. d: Dominance of the first year of the period's curve over that of the final one. Cb#: the final of year period's curve crosses from below that of the first one # times. Ca#: the final of year period's curve crosses from above that of the first one # times. =: same result as that for the whole untrimmed sample.

6.Conclusion

In this paper we analyse the Spanish income distribution for the period 1985-1996 using data from the ECPF and a wide range of visual and analytical techniques. Our results corroborate the existing evidence on falling income inequality for the second half of the Eighties and show that this trend extends over the first half of the Nineties. Moreover, we also find that this trend is robust to changes in the equivalence scale, to changes in the income distribution and to data contamination.

Taking advantage of the socioeconomic information contained in our data set, we also study some of the causes which may be explaining the overall picture of income inequality and its change over this period by means of three decomposition analyses. Three main responsible factors clearly stand out: the socioeconomic situation and education attainment of the household head, and household composition.

Those trends and the factors accounting for them raise important policy issues to be tackled in further investigations. In particular our analysis by population subgroups identifies several key subgroups such as the lower educated, the retired or the lone parents, and which denote the importance of the demographic change our economy is experiencing. The link between the distribution of labour income and the distribution of total income is also specially important if we want to understand the impact of certain changes such as the increasing number of temporary contracts, the growing female participation rates, technical change, the growing terciarization of the economy or the increasing proportion of public sector contracts.

References

Alba-Ramírez, A. and Collado, L. (1999), "Do wives' earnings contribute to reduce income inequality?: evidence from Spain", Working Paper, AD99-11, IVIE.

Alcaide Inchausti, J. (1989): "La distribución de la renta española en la década de los ochenta", Documentos de Trabajo de la Fundación FIES, 38/1989 (publicado también en *Cuadernos de Información Económica*, abril 1989).

Alcaide Inchausti, J. (1991): "Política de distribución de la renta", *Revista de Economía*, **11**.

Ayala, L., Martínez, R. and Ruiz-Huerta, J. (1996), "La distribución de la renta en España desde una perspectiva internacional: tendencias y factores de cambio", *Actas del II Simposio sobre desigualdad y distribución de la renta y la riqueza*, Vol. 6, *La desigualdad de recursos*, Fundación Argentaria, Madrid.

Atkinson, A.B. (1970): "On the measurement of inequality", *Journal of Economic Theory*, **2**: 244-63.

Atkinson, A.B. (1987): "On the measurement of poverty", *Econometrica*, **55**, 749-64.

Atkinson, A.B., Rainwater, L. and Smeeding, T.M. (1995), *Income Distribution in OECD countries*, Social Policy Studies, **18**, OECD.

Bandrés, E. (1990), *Los efectos de los gastos sociales sobre la distribución de la renta en España*, Madrid: Instituto de Estudios Fiscales, Monografía, **92**.

Bandrés, E. (1993), "La eficacia redistributiva de los gastos sociales. Una aplicación al caso español (1980-90), in I Simposio sobre igualdad y distribución de la renta y la riqueza*.* Volum 7, Fundación Argentaria: 123-171, Madrid.

Barceinas, F., J. Oliver-Alonso, J.L. Raymond and J.L. Roig (2000): "Private rates of return to human capital in Spain: New evidence", *Documentos de Trabajo No. 162/2000, FUNCAS*, Madrid.

Buhmann, B., *et al.* (1988): "Equivalence scales, well-being, inequality, and poverty: sensitivity estimatesacross ten countries using the Luxembourg Income Study (LIS) Database". *Review of Income & Wealth*, **34**(2):115-42.

Castañer, J.M. (1991), "El efecto redistributivo del IRPF 1982-1988", *Hacienda Pública Española*, monográfico, **2**/1991.

Cowell, F. (1980): "On the structure of additive inequality measures", *Review of Economic Studies*, **47**:521-31

Cowell, F. (1995): *Measuring Inequality*, 2ª edición, Hemel Hempstead: Harvester Wheatsheaf, Londres.

Cowell, F. (1998): "Measurement of Inequality" in *Handbook of Income Distribution*, (eds. A.B. Atkinson y F. Bourguignon), North Holland, Amsterdam, chapter 2.

Cowell, F. and M.P. Victoria-Feser (1996): "Robustness properties of inequality measures", *Econometrica*, **64**(1): 77-101.

Cowell, F. and M.P. Victoria-Feser (1998): "Distributional dominance with dirty data", Working Paper, STICERD, London School of Economics, Londres.

Cowell, F., J.A. Litchfield and M. Mercader-Prats (1999): "Income inequality comparisons with dirty data: the UK and Spain during the 1980s", *DARP Working Paper* **45**, STICERD, London School of Economics, Londres.

Cutler D. and L. Katz (1992): "Rising Inequality? Changes in the Distribution of Income and Consumption in the 1980s. *AER Papers and Proceedings*.

Díaz, C. and F. Melis (1993), "La distribución sectorial y personal de la renta de las empresas personales", en I Simposio sobre igualdad y distribución de la renta y la riqueza*.* Volum II *La distribución de la renta*, Fundación Argentaria: 171-198, Madrid.

Duclos, J.-Y. and Mercader-Prats, M. (1999): "Household needs and poverty: with application to Spain and the UK", *Review of Income and Wealth*, **45**(1): 77-98.

Esteban J.M. and D. Ray (1994): "On the measurement of polarization", *Econometrica*, **62**, 819-51.

Esteban J.M., C. M. Gradín and D. Ray (1997): "A new measure of polarization", mimeo.

Fields, G. (1998): "Accounting for income inequality and its change", *Cornell University*, mimeo.

Garde, J.A., Martínez, R. and J. Ruiz-Huerta (1996), "Los estudios sobre distribucion de la renta en España: fuentes, resultados, perspectivas de futuro", in II Simposio sobre igualdad y distribución de la renta y la riqueza*.* Volum 6 *La desigualdad de recursos*, Fundación Argentaria: 257-314, Madrid.

Gimeno, J.A. (1993), "Incidencia del gasto público por niveles de renta (España 1990 vs. 1980), Actas del I Simposio sobre Igualdad y Distribución de la Renta y la Riqueza, Vol. VII: 63-121, Madrid.

Goërlich, F.J. and Mas, M. (1999), "Medición de la desigualdad: contribución a una base de datos regional", Documento de Trabajo, IVIE, septiembre.

Gottschalk, P. and Smeeding, T.M. (1998), "Empirical Evidence on Income Inequality in Industrialised Countries", in Atkinson, A.B. and Bourguignon, F. (eds) *Handbook of Income Distribution*, North Holland, Amsterdam, chapter, 3.

Gradín, C. (1997): “The measurement of bipolarization: Decomposition by subpopulation. The case of Spain, 1973-1991”, Universidad de Vigo, mimeo.

Gradín, C. and M.S. Otero (1999): “Incorporación laboral de la mujer en España: efecto sobre la desigualdad en la renta familiar”, *Documento de Trabajo 9905*, Universidad de Vigo.

Imedio, L.J, E.M. Parrado and M.D. Sarrión (1997): “Evolución de la desigualdad y la pobreza en la distribución de la renta familiar en España en el periodo 1985-1995”, *Cuadernos*, **32**: 93-109.

Jenkins, S.P. (1991): “The measurement of economic inequality”, in *Readings on Economic Inequality*, L. Osberg (ed.). M.E. Sharpe, Armonk, N.Y.

Jenkins, S.P. (1994): “Dwarfs and giants in the 1980s: Trends in the UK income distribution”, *Fiscal Studies*, **15** (1): 99-118.

Jenkins, S.P. (1995): “Accounting for inequality trends: decomposition analyses for the UK, 1971-86”, *Economica*, **62**, 29-63.

Jenkins, S.P. (1996): “Recent trends in the UK income distribution: What happened and why?”, *Oxford Review of Economic Policy*, **12** (1): 29-46.

Lambert, P. (1993): *The Distribution and Redistribution of Income*, Manchester University Press, Manchester.

Lambert and Ramos (1997): “Horizontal Inequity and Vertical Redistribution”, *International Tax and Public Finance*, **4**: 25-37.

Lasheras, M.A., Rabadán, I. and Salas, R. (1993), “Política redistributiva en el IRPF entre 1982 y 1990 y efectos redistributivos del IRPF entre Comunidades Autónomas 1982-1989”, *Actas del I Simposio sobre Igualdad y Distribución de la Renta y la Riqueza*, Vol. VII *Desequilibrios interregionales*:. 7-24, Madrid.

Medel, B., Molina, A., and Sánchez, J. (1988): *Los efectos distributivos del gasto público en España*”, FIES Documento de Trabajo, nº **28**/1988.

Melis, F. and C. Díaz (1993), “La distribución personal de salarios y pensiones en las fuentes tributarias”, en *I Simposio sobre igualdad y distribución de la renta y la riqueza.* Volumen II *La distribución de la renta*, Fundación Argentaria: 151-170, Madrid.

Oliver, J. (1997): “Ingreso, consumo y ahorro de las familias: propuesta de una metodología para la explotación de la Encuesta de Presupuestos Familiares”, *Documentos de Trabajo FIES* Nº **132**, Madrid.

Oliver, J. and J.L. Raymond (1999): “La distribución de la renta en España en el periodo 1985-1996: Resultados derivados de la Encuesta Continua de Presupuestos Familiares”, *Cuadernos de Información Económica*, **150**: 1-4.

Pen, J. (1971): *Income Distribution*, Harmondsworth, Middx, Penguin.

Revenga, A. (1991): “La liberalización económica y la distribución de la renta: la experiencia española”, *Moneda y Crédito*, nº **193**: 179-223.

Río, C. del and Ruiz-Castillo, J. (1996): “La desigualdad de recursos”, in *II Simposio sobre igualdad y distribución de recusos de la renta y de la riqueza*. Volum 6, *La desigualdad de recursos*, Fundación Argentaria, Madrid.

Saposnik, R. (1981): “Rank dominance in income distribution”, *Public Choice*, **36**, 147-51.

Shorrocks, A. (1980): “The class of additively decomposable inequality measures”, *Econometrica*, **48**(3): 613-625.

Shorrocks, A. (1982): “Inequality decomposition by factor components”, *Econometrica*, **50**, 193-212.

Smeeding, T.M. and Gottschalk, P. (1995): “The International Evidence on Income Distribution in Modern Economies: Where Do We Stand?”, Working Paper **137**, Luxembourg Income Study, CEP/INSTEAD.

Theil, H. (1967): *Economics and Information Theory*. North Holland, Amsterdam.

Zaidi, M.A. and Vos, K. de (1998): “Trends in Consumption-based Poverty and Inequality in the Member States of the European Union during the 1980s”, Discussion Paper, Economics Institue, Tilburg.

Appendix 1. Components of the real net household income

Our definition of net income is:

1. Net:

+ Monetary net income	labour net income self-employment net income capital net income net pensions net unemployment benefits other net benefits other monetary net income
+ Non-monetary net income	labour non-monetary income self-employment non-monetary income imputed rents for house ownership[38] other non-monetary income
- SS Contributions	Social Security contributions paid by the employees Social Security contributions paid by the employer Social security contributions paid by the self-employed Contributions for unemployment paid by the employees to Social Security
- Direct taxes	Tax withheld on salary to employees Tax withheld on salary to self-employed Tax withheld on capital Balance of tax payable (refundable)

2. Real. As pointed out above, we deflated nominal income by using a retail price index for each income decile. These income decile RPI was estimated using the household expenditure structure given in the ECPFs. Income is expressed in 1985 prices.

3. Equivalent: in accordance with the inequality and welfare literature we use the OECD equivalent scale. This way income becomes a better indicator of living standard.

4. Household: the unit of analysis is the household. Therefore, and consistent to our previous considerations, each household is assigned its real net equivalent income. It would be interesting to analyse to what extent our results would change if we assigned the household equivalent income to each individual.[39]

[38] We have imputed the rents of households living in their own house. See Oliver (1997) for further details on the imputation procedure.
[39] For an example of this practice, see Jenkins (1995).

Appendix 2. Income distribution, 1985-1996

Table 13. Real net equivalent income by vingtiles, 1985-1996.
In 1985 prices

percentile	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
5	146,554	161,992	186,504	203,246	232,946	246,476	242,543	272,888	259,798	256,955	253,152	253,081
10	201,158	218,052	240,201	254,084	280,266	292,627	305,068	333,640	327,775	321,481	320,160	323,643
15	241,375	252,299	276,742	290,816	318,576	331,721	346,492	371,116	372,189	370,944	367,201	370,954
20	274,325	281,162	301,161	319,768	350,082	367,102	381,623	404,610	407,801	406,538	405,892	412,741
25	298,259	308,179	327,985	355,179	376,985	398,651	415,230	437,876	442,158	436,776	448,389	450,748
30	320,312	331,728	355,224	385,196	405,393	425,961	444,428	471,265	478,289	471,183	483,161	483,943
35	347,501	357,628	380,942	415,146	430,971	460,011	477,371	501,051	508,386	502,315	513,883	519,887
40	373,471	385,213	407,322	439,206	460,021	494,702	504,124	535,166	538,033	535,332	544,611	552,406
45	401,073	409,529	433,190	466,603	488,546	519,711	536,252	564,197	568,951	569,418	580,467	589,610
50	426,761	438,177	459,082	496,176	517,107	551,248	568,065	602,763	604,957	599,983	612,725	622,508
55	458,819	463,830	489,411	528,377	549,869	585,463	608,561	634,626	636,175	633,933	649,124	661,161
60	494,893	493,910	518,390	558,730	584,445	618,339	642,276	666,867	681,168	676,543	691,362	708,116
65	527,935	525,242	554,604	597,146	625,415	654,804	689,386	710,588	723,904	724,665	737,826	745,176
70	569,801	566,880	601,111	632,444	665,835	698,936	731,458	760,951	781,215	776,244	790,120	800,896
75	618,726	620,392	643,909	682,336	712,844	754,005	794,163	820,663	844,399	835,392	853,986	862,890
80	685,454	679,815	699,575	747,410	777,698	825,195	868,710	895,895	932,343	913,194	924,283	944,129
85	761,317	763,403	776,745	822,931	857,755	915,266	970,990	991,863	1,021,353	1,015,144	1,024,853	1,051,374
90	889,607	887,312	892,214	938,574	980,832	1,039,265	1,118,375	1,147,413	1,182,496	1,155,487	1,186,191	1,184,574
95	1,111,840	1,107,687	1,085,300	1,128,940	1,222,284	1,308,198	1,370,938	1,391,527	1,502,338	1,433,845	1,466,947	1,461,742
Mean	512,512	508,327	531,715	565,340	602,146	637,448	661,551	688,494	703,228	698,005	710,191	712,934

Table 14. Cumulative real net equivalent income, 1985-1996. (Generalized Lorenz curves co-ordinates)
In percentage

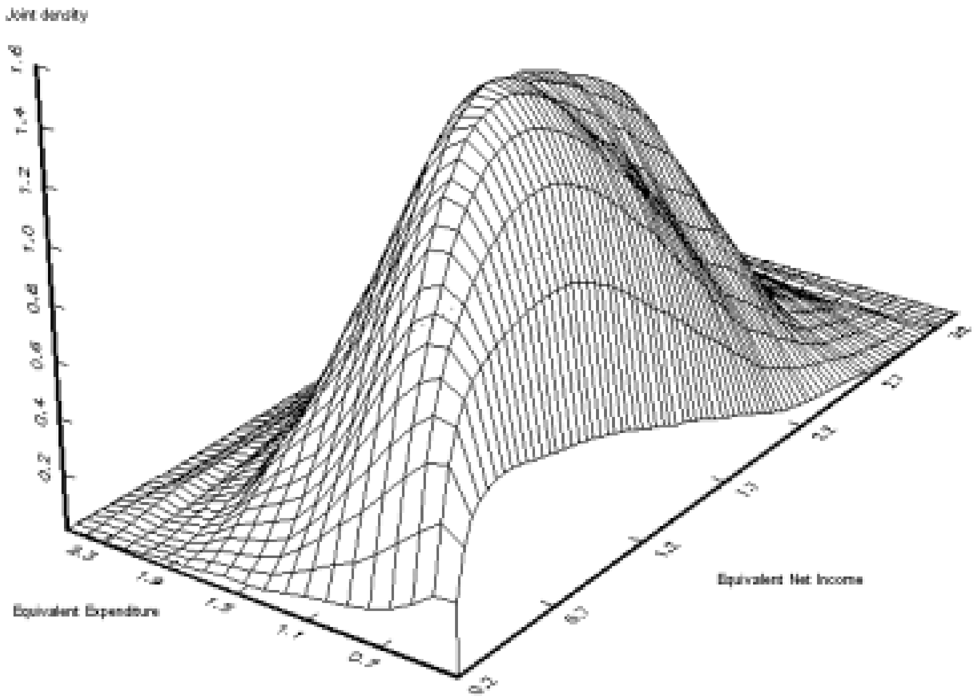
Percentile	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
5	4,041	6,505	5,978	7,128	6,020	6,112	7,838	9,056	9,615	7,944	8,104	9,485
10	12,607	15,984	16,056	17,912	16,894	17,928	20,548	22,309	22,584	21,185	21,384	23,486
15	23,112	27,321	28,354	31,255	30,680	32,596	35,800	38,655	38,460	37,295	37,592	40,197
20	35,396	39,774	42,360	46,609	46,797	49,301	53,170	57,209	56,795	55,611	56,275	59,618
25	49,134	53,899	57,732	63,425	64,855	68,451	72,235	77,751	77,366	76,134	77,209	80,846
30	64,488	69,326	74,983	81,886	84,662	89,231	93,418	100,060	99,950	98,643	100,170	103,880
35	81,297	86,425	93,430	101,809	106,215	111,844	116,296	124,799	124,546	123,138	125,156	128,721
40	99,561	105,011	113,414	123,011	129,128	136,290	141,292	151,084	150,931	149,620	152,168	155,594
45	119,279	124,898	134,765	145,859	153,983	162,367	167,983	179,578	179,329	177,867	180,981	184,500
50	140,614	146,458	157,482	170,352	180,197	190,481	196,792	209,839	209,739	208,320	211,819	215,213
55	163,564	169,504	181,565	196,489	208,353	220,428	227,507	242,309	242,608	240,760	244,909	247,957
60	188,131	194,224	207,699	223,906	238,062	252,209	260,129	276,767	277,713	275,186	279,799	282,961
65	214,476	220,802	235,369	253,334	269,907	285,823	294,870	313,434	315,055	312,260	317,166	319,996
70	242,922	248,867	264,918	284,407	303,889	321,678	332,152	352,088	355,080	351,761	357,234	359,516
75	273,792	279,162	296,859	318,038	340,394	359,978	371,977	393,615	397,564	393,690	399,778	401,971
80	307,249	312,059	331,190	354,046	379,618	401,130	415,190	438,233	443,402	438,929	445,923	447,588
85	344,261	348,116	368,597	393,161	422,531	446,356	461,793	486,607	493,042	488,361	495,670	497,270
90	385,960	388,448	410,614	437,028	470,105	496,472	513,480	540,281	547,824	543,089	550,595	552,597
95	434,124	435,284	458,781	488,573	524,669	554,533	573,005	601,908	610,880	605,320	615,199	616,732
100	512,512	508,327	531,715	565,340	602,146	637,448	661,551	688,494	703,228	698,005	710,191	712,934

Table 15. Lorenz and generalized Loren dominance for three definitions of income, (equivalent, OECD)

Period	NI	GI	Expenditure	Period	NI	GI	Expenditure
Lorenz dominance				**Generalized Lorenz dominance**			
1985-1996	D	=	=	1985-1996	D	=	=
1985-1989	D	=	=	1985-1989	D	=	=
1989-1991	Ca1	=	Ca2	1989-1991	D	=	=
1991-1994	Cb1	=	D	1991-1994	D	=	=
1994-1996	Ca1	=	D	1994-1996	D	=	Ca1

NI: Net income; GI: Gross income;
D: Dominance of the final year of the period's curve over that of the first one. Cb#: the final of year period's curve crosses from below that of the first one # times. Ca#: the final of year period's curve crosses from above that of the first one # times. =: same result as that for the whole untrimmed sample.

Figure 11. Joint density of net equivalent income and equivalent expenditure, 1996



Appendix 3. Definition of the variables used in the decomposition analyses of section 4

Variable	Description
Socioeconomic classification (of the household head)	Unemployed Entrepreneurs with dependent employees Agricultural entrepreneurs without dependent employees Agricultural workers Entrepreneurs without dependent employees Other employees Retired and pensioners Blue collar employees Other non-active
Education Level (of the household head)	Illiterate Without studies Primary education (1st cycle) Primary education (2 nd cycle) Secondary education Short BA & BSc. BA, BSc. & Doctors
Age groups (of the household head)	<25 26-35 36-45 46-55 56-65 >65
Cohort (of the household head)	>=1960 1950-59 1940-49 1930-39 1920-29 <1920
Sex (of the household head)	Male Female
Household size	1 Member 2 Members 3 Members 4 Members 5 Members 6+ Members
Household composition	1 adult 2 adults 3+ adults 1 adult + children 2 adults + 1 child 2 adults + 2 children 2 adults + 3+ children 3+ adults + children 1 adult, HH head>65 years 2+ adults, HH head>65 years
Civil status (of the household head)	Married Not married
Partner with salary	Partner with salary Partner without salary
Size of Municipality	< 10,000 inhabitants Between 10,000 - 50,000 inhab. (except capitals of provinces) > 50,000 inhab., and capitals of provinces Madrid and Barcelona

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