ERSA 39th EUROPEAN CONGRESS 1999

THE TITTLE OF THE PAPER: ANALYSIS OF THE CONCENTRATION OF THE STRUCTURAL FUNDS IN THE AUTONOMOUS COMMUNITIES IN SPAIN

THE AUTHORS NAMES: J. BARÓ LLINÀS, M.A. CABASÉS PIQUÉ, M.J. GÓMEZ

THE AFFILIATION OF THE AUTHORS: Professors Applied Economics Department

THE ADDRESS OF EACH AUTHOR

Dr. JOAN BARÓ LLINÀS
Departamento de Economía Aplicada
Facultad de Derecho y Economia
Plaza Victor Siurana, 1   25003   LLEIDA
Tf.   973 70 20 31

Dra. Mª ANGELS CABASES PIQUE
Departamento de Economia Aplicada
Facultad de Derecho y Economia
Plaza Victor Siurana, 1   25003   LLEIDA
Tf.   973 70 20 31

Mª JESÚS GÓMEZ ADILLÓN
Departamento de Economia Aplicada
Facultad de Derecho y Economia
Plaza Victor Siurana, 1   25003   LLEIDA
M.Jesus.Gomez@econap.UdL.es
Tf.   973 70 20 31
Fax   973 70 21 15

THE THEME TO WICH PAPER RELATES: THEORY AND METHODOLOGY OF REGIONAL SCIENCE

ANALYSIS OF THE CONCENTRATION OF STRUCTURAL FUNDS IN THE AUTONOMOUS COMMUNITIES IN SPAIN

ABSTRACT

In this paper we analyse the distribution in Spain, of the European Regional Development Fund community structural help, considering its importance in volume. This survey is carried out in each autonomous community and in two five-year periods, being the first period 1989-1992 and the second one 1994-1999.

First of all we work out measures of concentration in order to point out the difference in the concentration of the ERDF per capita, assigned by the European Union to the Autonomous Communities in the two periods which are analysed.

The indicators propose are measures derive from the concentration graph, so that we can observe the existence of greater or minor concentration depending on the degree of convexity of the graph line, and obtaining distances of interest between the straight line of equidistribution and the graph line which reflect the inequality in the distribution of the ERDF per capita.

Secondly, a typological analysis of the Autonomous Communities is carried out, for the two periods, taking into account the economic variables which affect the distribution of the European Regional Fund and with the purpose of describing repercussions of the implementation of the MAC.

INTRODUCTION

Since its incorporation into the EEC in 1986, Spain has benefited from European Community Structural Fund aid. The Treaty of Rome, which constituted the EEC and was signed in 1958, referred directly to the reduction of inequalities between the member states, but only did so in a general way. During 1958 the ESF (European Social Fund) was created and in 1962 the EAGGF- Guidance Section (European Agricultural Guidance and Guarantee Fund) was created, and these intervened in European community regional policy, in a modest and implicit way. It was not until seventeen years later, in 1975 that with the creation of the ERDF (European Regional Development Fund) a boost was given to the Community's regional policies.

The incorporation of the Spain and Portugal (1986), considerably increased the discrepancies in income between the different regions of the European Community. Shortly after this the Treaty underwent a major modification with the adoption of the Single European Act (1987). The principle of Cohesion was established, reflected in Article 130 of the new Treaty, which reinforces the European Community regional policy and its instruments of implementation.

Article 130 announced the reform of the Structural Funds (ERDF, ESF and EAGGF-G) which implied a new design of these funds and the doubling of their economic value.

The objectives of this reform of the structural funds are identified with problems, which in a general way affect an entire region or administrative territory within the European Union. The areas eligible for structural funds are indicated, with five different objectives:

Objective 1: To promote the development and adaptation of less advanced regions.
Objective 2: To reconvert those regions gravely affected by the industrial crisis.
Objective 3: To fight against long-term unemployment.
Objective 4: To facilitate professional occupation of young people.

Objective 5: Contains two objectives:

> Objective 5a: To adapt the structures of production, transformation and commercialisation in agriculture and forestry.
>
> Objective 5b: To promote the development of rural areas.

In 1989, a new stage began, as the reform of the structural funds entered into force and the European Community regional policy now had at its disposal instruments to redress imbalances between the different regions of the European Union. The same year saw the birth of the CSFs (Community Support Frameworks) applying to periods of several years, and these were to designed coordinate actions and available resources. In 1993 the CSF for 1989-1993 ended and the 1994-1999 was negotiated.

In Spain, out of the total volume of aid proceeding from structural funds, the ERDF (with Objectives 1, 2 and 5b) contributes more than 50% of the total aid. If we study the aid by objectives, it is concentrated in areas eligible for Objective 1, an important part of the funds being received for this objective (aid for less advanced regions).

This study analyses the distribution, in Spain, of the community structural aid from the ERDF, given its importance in terms of volume, by autonomous region and during two five year periods, the first running from 1989 and 1993, and the second period between 1994 and 1999.

TABLE 1: PERIOD 89-93

AUTONOMOUS REGIONS	OBJECTIVE 1 (MECU)	OBJECTIVE 2 (MECU)	OBJECTIVE 5b (MECU)	ERDF (MECU)	ERDF PER CAPITA (ECU per capita)
ANDALUSIA	1729			1729	249,1
ARAGÓ		74	25	99	91,0
ASTURIES	351			351	320,9
BALEARS			7	7	22,6
CANÀRIAS	560			560	374,9
CANTABRIA		55	4	59	111,9
CAS.-LA MANXA	779			779	469,7
CASTILLA-LLEÓ	705			705	276,9
CATALUNYA		426	5	431	98,7
C. VALENCIANA	510			510	132,2
EXTREMADURA	426			426	401,2
GALÍCIA	566			566	207,2
MADRID		103	3	106	77,9
MURCIA	197			197	188,4
NAVARRA		37	3	40	132,5
EUSKADI		257	2	259	123,1
RIOJA (LA)		17	4	21	138,1
CEUTA MELILLA	85			85	684,2

TABLE 2. PERIOD 94-99

AUTONOMOUS REGIONS	OBJECTIVE 1 (MECU)	OBJECTIVE 2 (MECU)	OBJECTIVE 5b (MECU)	ERDF (MECU)	ERDF PER CAPITA (ECU per capita)
ANDALUSIA	1692			1692	243,8
ARAGÓ		49,4	72,8	122,2	112,3
ASTURIES	234			234	213,9
BALEARS		8,8	12,2	21	67,9
CANÀRIAS	390			390	261,1
CANTABRIA	105			105	199,1
CAS.-LA MANXA	416			416	250,8
CASTILLA-LLEÓ	600			600	235,7
CATALUNYA		402,2	36	438,2	100,3
C. VALENCIANA	607			607	157,4
EXTREMADURA	382			382	359,7
GALÍCIA	727			727	266,1
MADRID		113,7	13,2	126,9	93,3
MURCIA	197			197	188,4
NAVARRA		17,7	12,1	29,8	98,7
EUSKADI		267,8	4,5	272,3	129,4
RIOJA (LA)		10,5	10,1	20,6	135,4
CEUTA MELILLA	38			38	305,9

Specifically, measures of concentration are calculated with the sole objective of underlining the differences in ERDF concentration per capita, assigned by the European Union to the Autonomous Regions during the two periods under study. A purely quantitative calculation is performed of the differences, without entering into the analysis of the volume of projects financed in the different Autonomous Regions.

The indicators presented are measures derived from the concentration curve, since the Lorenz Diagram, with an initial graphic approach, allows us to visualise the existence of greater or lesser concentration according to the degree of convexity of the curve.

From this representation distances of interest arise between the straight line of equal distribution and the curve which reflect the inequality in the distribution of the ERDF funds per capita, always taking into account only the population assigned for objectives 1, 2 and 5b. The surface area separating the straight line from the curve is a good measure of concentration of the variable.

Taking into account the empirical observation of the data and the economic nature of the ERDF variable per capita, different theoretical functions of concentration are estimated:

- Kakwani-Podder model (1973): $q(p) = p^{\alpha} \cdot e^{-\beta(1-p)}$ with $\alpha \geq 1$ $\beta > 0$
- Kakwani model (1980): $q(p) = p - A \cdot p^{\alpha} \cdot (1-p)^{\beta}$ with A, α and $\beta > 0$
- Gupta model (1984): $q(p) = p \cdot A^{p-1}$ with $A > 1$

The three equations possess the usual properties of a concentration curve:

- Range between 0 and 1: $p \in (0,1) \rightarrow q(p) \in (0,1)$
- Increasing monotony: $q'(p) \geq 0$
- Convexity: $q''(p) \geq 0$

In addition these are equations which are highly operative for the calculation of the different indicators of concentration.

In the context of this study, identification in terms of random variable is applied to
p as the fraction of population up to a level x, and
q(p) as the fraction of ERDF funds accumulated up to level x
distributions being ordered in terms of per capita.

The models are estimated using the squared minimums after conversion method:

- $\ln q(p) = \alpha \ln + \beta (p-1) + \varepsilon$
- $\ln (p-q(p)) = \ln A + \alpha \ln p + \beta \ln (1-p) + \varepsilon$
- $\ln q(p) - \ln p = \ln A * (p-1) + \varepsilon$

These models have been chosen, firstly because they were created as concentration curves that allow the calculation of measures of inequality in the distribution of funds, and secondly because they are models which can be suitably adapted to the data presented.

CONCENTRATION MEASURES USED

From the estimations concentration measures have been calculated which are obtained from the curves and which allow the quantitative calculation of the differences in, and concentration of, the ERDF funds per capita during the two periods under consideration. So they show a greater concentration when the value that they take is greater and therefore the greater the inequality existing in the distribution of the ERDF funds per capita.

1.- g Index.

Gini's coefficient of concentration, which is well known, and corresponds to double the area enclosed between the two lines of distribution, that is, double the average of all the distances between population and ERDF accumulation, as shown by graph 1.

$$g = 2E(p-q(p)) = 1 - 2E(q(p))$$

The expression of the index in the models considered takes on the following form:

Calculation of the Gini (g) index.

Kakwani-Podder	$1 - 2e^{-\beta} \sum_{i=0}^{\infty} \frac{\beta^{i}}{(a+1+i)\, i!}$
Kakwani	2A B(α+1, β+1); with B(α+1, β+1) Beta Euler
Gupta	$\frac{A\ln^{2} A - 2A\ln A + 2A - 2}{A\ln^{2} A}$

2. - P Index

The P for Pietra coefficient is associated to the greater distance existing between the population and ERDF accumulations, a distance which is observed in the ERDF volume expected:

$$P = p_{\mu} - q(p_{\mu})$$

It is known that the concentration curve has a unitary gradient at the point $((p_{i\,,}\; q\; (p_{i}))$, the moment in which the distances between the two lines is at its maximum (Graph 2).

$\max\,[F_{\xi}(x) - q_{\xi}(x)] = p_{\mu} - q\,(p_{\mu}) \rightarrow q'(p) = 1$

The coefficient P is normally used as the lowest level in the Gini index, at the same time that it responds to the double of the area of the greatest triangle that can be inscribed within the figure, i.e., that it coincides with half of the average relative difference and which in any case fulfils that $P = \underline{DMR} \leq g$

3.- d* Index

Picks up the lack of phasing between the accumulated population and ERDF both in the mean (Ml) and in the median (ME). On the one hand, p(Ml)-0.5 measures the inequality between two groups with equal ERDF and on the other, 0.5-q(p(ME)) measures the inequality of the two groups with equal population, both correspond with the distances which separate the line of equal distribution and the concentration curve from the geometrical centre of the graph (Graph 3), its simple aggregation leads us to the index:

$$d^* = p(Ml) - q(p(Me))$$

Its usage is not widely extended and it is rarely used in theoretical studies on concentration.

4.- d' Index

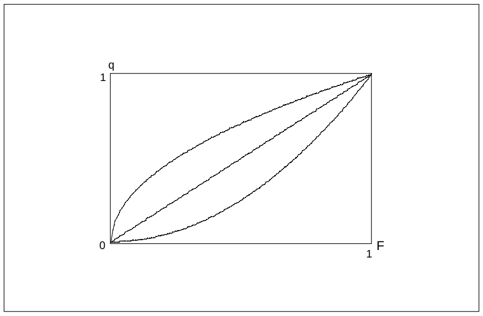
In the same way that we have considered central distances in the curve, it makes sense to measure the inequality gap that exists in the first quartile (0.25-q(p(Q1)) and in the third quartile (0.75-q(p(Q3)) (Graph 4.) The sum of these two distances gives sense to the d' coefficient:

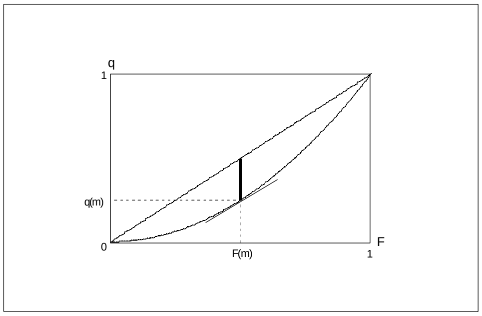
$$d' = 1 - [q(p(Q1)) + q(p(Q3))]$$

This is not a very widely used indicator either, its advantage lies in the fact that it admits the generalisation of any of the other quartiles, and in addition its calculation is immediate in any concentration function.

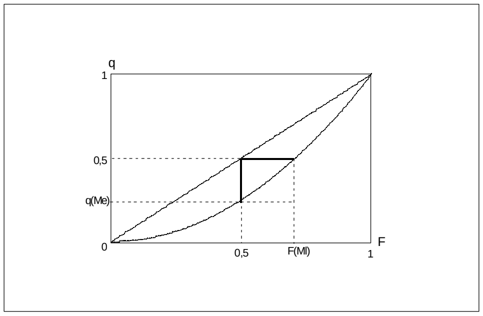
Graph 1: g Index

Graph 2: P_Index

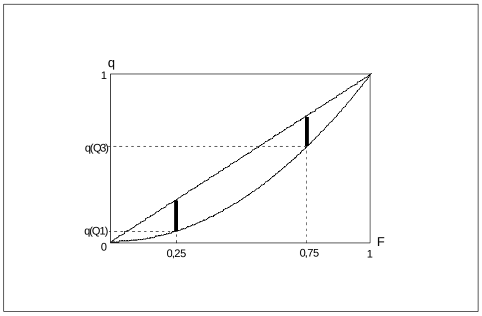




Graph 3: d* Index



Graph 4: d' Index



CONCENTRATION MODEL ESTIMATES

The three models offer adaptations of quality and an elevated degree of adherence for the two periods considered. Below we present the results of the estimates of the three models in tables 1, 2 and 3.

Table 1: Results of the Kakwani-Podder model estimation

	Predictor	Coef	DesvEst	razón-t
1989-1993	Ln p	1,32011	0,04609	28,64
	p-1	0,5071	0,1273	3,98
	s = 0,1280	F = 3.110,36		
1994-1999	Ln p	1,07240	0,01389	77,22
	p-1	0,68232	0,03832	17,81
	s = 0,03935	F = 27.035,42		

Table 2: Results of the Kakwani model estimation

	Predictor	Coef	DesvEst	razón-t
1989-1993	Constante	-0,34140	0,03357	-10,17
	Ln p	0,97566	0,01561	62,52
	Ln (1-p)	0,78323	0,01351	57,98
	s = 0,06175	R-cda = 99,7%	R-cda(ajda) = 99,6%	
1994-1999	Constante	-0,59677	0,07352	-8,12
	Ln p	0,96058	0,03179	30,22
	Ln (1-p)	0,90906	0,03651	24,90
	s = 0,1177	R-cda = 98,6%	R-cda(ajda) = 98,3%	

Table 3: Results of the Gupta model estimation

	Predictor	Coef	DesvEst	razón-t
1989-1993	p-1	1,3137	0,1014	12,96
	s = 0,2489	F = 167,84		
1994-1999	p-1	0,86511	0,02463	35,12
	s = 0,06271	F= 1233,74		

VALUES OF THE FUNCTIONS AT CRITICAL POINTS

Once the models were estimated, we have calculated the value of the functions of concentration at critical points such as the median, the mean and the quartiles, which are presented in tables 4, 5 and 6.

Table 4: Value of the functions at critical points according to the Kakwani-Podder model

		μ	Q_1	Me	Q_3	Ml
89-93	p	0,520	0,250	0,500	0,750	0,676
	q(p)	0,330	0,109	0,310	0,588	0,500
93-99	p	0,535	0,250	0,500	0,750	0,655

	q(p)	0,372	0,135	0,338	0,619	0,500

Table 5: Value of the functions at critical points according to the Kakwani model

		μ	Q_1	Me	Q_3	Ml
89-93	p	0,555	0,250	0,500	0,750	0,697
	q(p)	0,342	0,103	0,289	0,568	0,500
93-99	p	0,513	0,250	0,500	0,750	0,645
	q(p)	0,363	0,138	0,349	0,631	0,500

Table 6: Value of the functions at critical points according to the Gupta model

		μ	Q_1	Me	Q_3	Ml
89-93	p	0,570	0,250	0,500	0,750	0,725
	q(p)	0,324	0,093	0,259	0,540	0,500
93-99	p	0,550	0,250	0,500	0,750	0,667
	q(p)	0,372	0,130	0,324	0,604	0,500

The values obtained in the three functions of concentration for the critical points considered are very close, and therefore they lead us to very similar conclusions.

Thus for example, if we consider the critical point of the median of the distribution, as a value which differentiates the total of communities in two groups (in the first group the volume of funds does not reach half of the total and in the second it exceeds half), practically 50% of the communities have received a volume of funds above the total median in the second period. Continuing with this line, and taking the median as the dividing point of the groups, we can establish relationships between the volume of ERDF funds in each group and the volume of funds of all the communities. The values obtained for the three functions are presented in tables 7, 8 and 9.

Table 7: Kakwani-Podder model

	$\frac{1-q(p_\mu)}{1-p_\mu}$	$\frac{p_\mu}{q(p_\mu)}$	$\frac{1-q(p_\mu)}{q(p_\mu)} * \frac{p_\mu}{1-p_\mu}$
89-93	1.39	1.57	2.18
94-99	1.35	1.43	1.93

Table 8: Kakwani model

	$\frac{1-q(p_\mu)}{1-p_\mu}$	$\frac{p_\mu}{q(p_\mu)}$	$\frac{1-q(p_\mu)}{q(p_\mu)} * \frac{p_\mu}{1-p_\mu}$
89-93	1.47	1.62	2.38
94-99	1.30	1.41	1.83

Table 9: Gupta Model

	$\frac{1-q(p_\mu)}{1-p_\mu}$	$\frac{p_\mu}{q(p_\mu)}$	$\frac{1-q(p_\mu)}{q(p_\mu)} * \frac{p_\mu}{1-p_\mu}$
89-93	1.57	1.75	2.74
94-99	1.39	1.47	2.04

In the first five year period and for the Kakwani model the average volume of funds received by the communities corresponding to the group of greatest volume, exceeds by 2.38 times that of the group of lowest volume, and presents an average funds volume which is 1.47 times greater than the total volume of funds.

As regards the second five year period, these differences are reduced. We also observe that the same conclusions are reached with the other two models.

In addition, the median in the three concentration models analysed, discriminates in two equal groups the target population and analyses in each of them the value of the volume of the funds received. The period with the least concentration is the second five year period where it can be seen that the disparity between the volume of funds received by one group or another is the lesser of the two periods. Thus the communities situated above the median in the first five year period absorb 28.90% of the volume of funds, and in the second five year period, they absorb 34.93%. The same conclusion is reached through any of the three models analysed.

MEASURES OF CONCENTRATION

To follow we present the calculation of the different measures of concentration for the three models considered.

Table 10. Concentration measures for the Kakwani-Podder model.

	P	d*	d'	g
89-93	0,189	0,365	0,301	0,260
94-99	0,162	0,316	0,245	0,216

Table 11. Concentration measures for the Kakwani model

	P	d*	d'	g
89-93	0,213	0,407	0,327	0,291
94-99	0,150	0,295	0,230	0,205

Table 12. Concentration measures for the Gupta model

	P	d*	d'	g
89-93	0,246	0,472	0,366	0,324
94-99	0,177	0,342	0,265	0,235

It is possible to observe how the indices derived from the three curves indicate that the tendency of the concentration is lesser in the second period from 94-99 than in the first period 89-93. Taking into account that in the two five year periods and in the three functions, the values are low, i.e., the inequality is not very great. The second period presents lesser inequality in the distribution of the ERDF funds among the populations eligible for the objectives.

CONCLUSIONS

In the concentration curves representation for the two periods under study, and for the three models considered, according to figures 1, 2 and 3, we can see how the ERDF funds concentration per capita has decreased in the second five year period with respect to the first, as the measures previously described indicate. Thus, the curve for the 94-99 period is much closer to the imaginary line of equal distribution, and therefore less inequality exists in the distribution of the funds. We can conclude that with the application of the Community Support Framework for this second five year period, the difference existing in the assignation of funds to the Autonomous Regions of the State of Spain has reduced with respect to the previous period.

This study corroborates the conclusions of the European Commission with representation in Barcelona, according to which the reduction of ERDF per capita in the second five year period is palpable in the Spanish Autonomous Regions, in which it has been managed to reduce the inequality of the distribution of the ERDF funds per capita amongst the eligible populations.

FIGURE 1: KAKWANI-PODDER MODEL CONCENTRATION CURVES

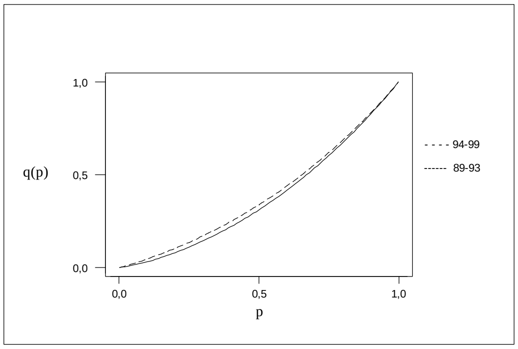


FIGURE 2. KAKWANI MODEL CONCENTRATION CURVES

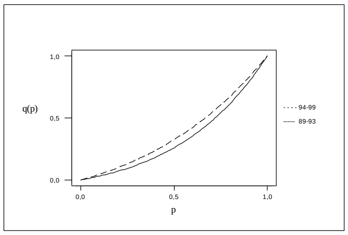
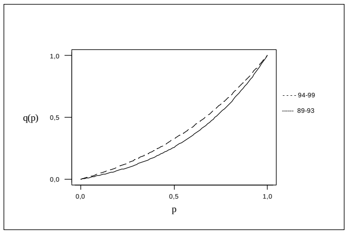


FIGURE 3. GUPTA MODEL CONCENTRATION CURVES



I. Estimation of the concentration curves Kawanni-Podder model:

$q(p)_{89-93} = p^{1,3201} \cdot e^{-0,5071(1-p)}$

$q(p)_{94-99} = p^{1,0724} \cdot e^{-0,6832(1-p)}$

	p	$q(p)_{89-93}$	$q(p)_{94-99}$
2	0,01	0,00139	0,00365
3	0,02	0,00348	0,00772
4	0,03	0,00597	0,01201
5	0,04	0,00877	0,01646
6	0,05	0,01184	0,02105
7	0,06	0,01514	0,02577
8	0,07	0,01865	0,03061
9	0,08	0,02235	0,03557
10	0,09	0,02625	0,04063
11	0,10	0,03032	0,04580
12	0,11	0,03456	0,05108
13	0,12	0,03896	0,05646
14	0,13	0,04352	0,06194
15	0,14	0,04824	0,06753
16	0,15	0,05311	0,07321
17	0,16	0,05812	0,07899
18	0,17	0,06329	0,08488
19	0,18	0,06859	0,09086
20	0,19	0,07404	0,09694
21	0,20	0,07963	0,10312
22	0,21	0,08536	0,10941
23	0,22	0,09123	0,11579
24	0,23	0,09724	0,12228
25	0,24	0,10338	0,12886
26	0,25	0,10966	0,13555
27	0,26	0,11607	0,14234
28	0,27	0,12262	0,14924
29	0,28	0,12931	0,15623
30	0,29	0,13613	0,16334
31	0,30	0,14308	0,17054
32	0,31	0,15017	0,17786
33	0,32	0,15739	0,18528
34	0,33	0,16475	0,19280
35	0,34	0,17225	0,20044
36	0,35	0,17987	0,20818
37	0,36	0,18764	0,21604
38	0,37	0,19554	0,22400
39	0,38	0,20358	0,23208
40	0,39	0,21175	0,24027
41	0,40	0,22006	0,24857
42	0,41	0,22851	0,25699
43	0,42	0,23709	0,26552
44	0,43	0,24581	0,27417
45	0,44	0,25468	0,28294
46	0,45	0,26368	0,29183
47	0,46	0,27282	0,30083
48	0,47	0,28211	0,30996
49	0,48	0,29153	0,31921
50	0,49	0,30110	0,32858
51	0,50	0,31081	0,33807
52	0,51	0,32066	0,34769
53	0,52	0,33066	0,35744
54	0,53	0,34080	0,36732
55	0,54	0,35109	0,37732
56	0,55	0,36153	0,38745
57	0,56	0,37212	0,39772
58	0,57	0,38285	0,40811
59	0,58	0,39373	0,41864
60	0,59	0,40477	0,42931
61	0,60	0,41595	0,44011
62	0,61	0,42729	0,45105
63	0,62	0,43878	0,46212
64	0,63	0,45042	0,47334
65	0,64	0,46222	0,48470
66	0,65	0,47418	0,49620
67	0,66	0,48629	0,50784
68	0,67	0,49857	0,51963
69	0,68	0,51100	0,53157
70	0,69	0,52359	0,54365
71	0,70	0,53634	0,55588
72	0,71	0,54926	0,56827
73	0,72	0,56234	0,58081
74	0,73	0,57558	0,59350
75	0,74	0,58899	0,60634
76	0,75	0,60257	0,61935
77	0,76	0,61632	0,63251
78	0,77	0,63023	0,64583
79	0,78	0,64432	0,65931
80	0,79	0,65858	0,67296
81	0,80	0,67301	0,68677
82	0,81	0,68762	0,70074
83	0,82	0,70240	0,71488
84	0,83	0,71736	0,72919
85	0,84	0,73249	0,74368
86	0,85	0,74781	0,75833
87	0,86	0,76331	0,77316
88	0,87	0,77898	0,78817
89	0,88	0,79485	0,80335
90	0,89	0,81089	0,81871
91	0,90	0,82713	0,83425
92	0,91	0,84355	0,84998
93	0,92	0,86016	0,86588
94	0,93	0,87696	0,88198
95	0,94	0,89395	0,89826
96	0,95	0,91113	0,91473
97	0,96	0,92851	0,93140
98	0,97	0,94609	0,94825
99	0,98	0,96386	0,96530
100	0,99	0,98183	0,98255
101	1,00	1,00000	1,00000

II. Estimation of the concentration curves Kawanni model:

$q(p)_{89\text{-}93} = p - 0{,}710774 \cdot p^{0{,}97566} \cdot (1-p)^{0{,}78323}$

$q(p)_{94\text{-}99} = p - 0{,}550587 \cdot p^{0{,}96058} \cdot (1-p)^{0{,}90906}$

	p	**q(p) 89-93**	**q(p) 94-99**		**p**	**q(p) 89-93**	**q(p) 94-99**
2	0,01	0,00211	0,00346	52	0,51	0,29925	0,35924
3	0,02	0,00461	0,00739	53	0,52	0,30866	0,36925
4	0,03	0,00732	0,01155	54	0,53	0,31821	0,37938
5	0,04	0,01022	0,01591	55	0,54	0,32792	0,38962
6	0,05	0,01328	0,02043	56	0,55	0,33777	0,39997
7	0,06	0,01649	0,02511	57	0,56	0,34778	0,41044
8	0,07	0,01985	0,02993	58	0,57	0,35793	0,42102
9	0,08	0,02336	0,03489	59	0,58	0,36824	0,43172
10	0,09	0,02700	0,03999	60	0,59	0,37871	0,44253
11	0,10	0,03078	0,04522	61	0,60	0,38933	0,45345
12	0,11	0,03470	0,05057	62	0,61	0,40011	0,46450
13	0,12	0,03875	0,05605	63	0,62	0,41105	0,47566
14	0,13	0,04293	0,06165	64	0,63	0,42215	0,48693
15	0,14	0,04724	0,06738	65	0,64	0,43341	0,49832
16	0,15	0,05169	0,07322	66	0,65	0,44484	0,50983
17	0,16	0,05627	0,07919	67	0,66	0,45643	0,52146
18	0,17	0,06097	0,08527	68	0,67	0,46820	0,53321
19	0,18	0,06581	0,09147	69	0,68	0,48014	0,54508
20	0,19	0,07078	0,09778	70	0,69	0,49225	0,55706
21	0,20	0,07587	0,10421	71	0,70	0,50454	0,56917
22	0,21	0,08110	0,11076	72	0,71	0,51701	0,58140
23	0,22	0,08645	0,11742	73	0,72	0,52966	0,59375
24	0,23	0,09193	0,12419	74	0,73	0,54250	0,60623
25	0,24	0,09754	0,13108	75	0,74	0,55553	0,61883
26	0,25	0,10329	0,13808	76	0,75	0,56875	0,63156
27	0,26	0,10916	0,14519	77	0,76	0,58217	0,64441
28	0,27	0,11516	0,15241	78	0,77	0,59579	0,65739
29	0,28	0,12129	0,15975	79	0,78	0,60962	0,67050
30	0,29	0,12755	0,16720	80	0,79	0,62366	0,68375
31	0,30	0,13394	0,17476	81	0,80	0,63792	0,69712
32	0,31	0,14047	0,18243	82	0,81	0,65240	0,71063
33	0,32	0,14712	0,19022	83	0,82	0,66712	0,72427
34	0,33	0,15391	0,19811	84	0,83	0,68207	0,73806
35	0,34	0,16083	0,20612	85	0,84	0,69728	0,75198
36	0,35	0,16788	0,21423	86	0,85	0,71274	0,76605
37	0,36	0,17506	0,22246	87	0,86	0,72846	0,78026
38	0,37	0,18238	0,23080	88	0,87	0,74447	0,79462
39	0,38	0,18983	0,23925	89	0,88	0,76078	0,80914
40	0,39	0,19742	0,24781	90	0,89	0,77740	0,82381
41	0,40	0,20514	0,25648	91	0,90	0,79435	0,83865
42	0,41	0,21300	0,26527	92	0,91	0,81167	0,85366
43	0,42	0,22100	0,27416	93	0,92	0,82937	0,86885
44	0,43	0,22913	0,28317	94	0,93	0,84750	0,88422
45	0,44	0,23740	0,29229	95	0,94	0,86612	0,89980
46	0,45	0,24581	0,30151	96	0,95	0,88529	0,91559
47	0,46	0,25436	0,31086	97	0,96	0,90511	0,93162
48	0,47	0,26305	0,32031	98	0,97	0,92573	0,94793
49	0,48	0,27189	0,32987	99	0,98	0,94745	0,96459
50	0,49	0,28086	0,33955	100	0,99	0,97090	0,98171
51	0,50	0,28998	0,34934	101	1,00	1,00000	1,00000

III. Estimation of the concentration curves Gupta model:

$q(p)_{89-93} = p \cdot 3{,}719911^{p-1}$

$q(p)_{94-99} = p \cdot 2{,}375267^{p-1}$

	p	**$q(p)_{89-93}$**	**$q(p)_{94-99}$**		**p**	**$q(p)_{89-93}$**	**$q(p)_{94-99}$**
2	0,01	0,00272	0,00425	52	0,51	0,26792	0,33379
3	0,02	0,00552	0,00857	53	0,52	0,27679	0,34329
4	0,03	0,00839	0,01296	54	0,53	0,28584	0,35293
5	0,04	0,01133	0,01743	55	0,54	0,29509	0,36272
6	0,05	0,01435	0,02198	56	0,55	0,30453	0,37264
7	0,06	0,01745	0,02661	57	0,56	0,31416	0,38271
8	0,07	0,02063	0,03131	58	0,57	0,32400	0,39293
9	0,08	0,02389	0,03609	59	0,58	0,33404	0,40330
10	0,09	0,02723	0,04096	60	0,59	0,34430	0,41382
11	0,10	0,03066	0,04590	61	0,60	0,35476	0,42449
12	0,11	0,03417	0,05093	62	0,61	0,36545	0,43531
13	0,12	0,03777	0,05605	63	0,62	0,37635	0,44629
14	0,13	0,04146	0,06125	64	0,63	0,38747	0,45743
15	0,14	0,04523	0,06653	65	0,64	0,39883	0,46873
16	0,15	0,04911	0,07190	66	0,65	0,41042	0,48019
17	0,16	0,05307	0,07736	67	0,66	0,42224	0,49181
18	0,17	0,05714	0,08291	68	0,67	0,43431	0,50360
19	0,18	0,06130	0,08855	69	0,68	0,44662	0,51556
20	0,19	0,06556	0,09428	70	0,69	0,45918	0,52769
21	0,20	0,06992	0,10011	71	0,70	0,47200	0,53999
22	0,21	0,07439	0,10602	72	0,71	0,48507	0,55246
23	0,22	0,07896	0,11204	73	0,72	0,49841	0,56511
24	0,23	0,08364	0,11815	74	0,73	0,51201	0,57794
25	0,24	0,08843	0,12436	75	0,74	0,52589	0,59094
26	0,25	0,09333	0,13066	76	0,75	0,54004	0,60413
27	0,26	0,09835	0,13707	77	0,76	0,55448	0,61751
28	0,27	0,10348	0,14358	78	0,77	0,56920	0,63107
29	0,28	0,10874	0,15019	79	0,78	0,58422	0,64482
30	0,29	0,11411	0,15691	80	0,79	0,59954	0,65876
31	0,30	0,11960	0,16373	81	0,80	0,61515	0,67290
32	0,31	0,12523	0,17066	82	0,81	0,63108	0,68723
33	0,32	0,13097	0,17769	83	0,82	0,64732	0,70176
34	0,33	0,13685	0,18484	84	0,83	0,66388	0,71648
35	0,34	0,14287	0,19209	85	0,84	0,68076	0,73142
36	0,35	0,14901	0,19946	86	0,85	0,69797	0,74656
37	0,36	0,15530	0,20694	87	0,86	0,71552	0,76190
38	0,37	0,16172	0,21454	88	0,87	0,73342	0,77746
39	0,38	0,16829	0,22225	89	0,88	0,75166	0,79323
40	0,39	0,17500	0,23008	90	0,89	0,77025	0,80921
41	0,40	0,18186	0,23803	91	0,90	0,78920	0,82541
42	0,41	0,18887	0,24610	92	0,91	0,80853	0,84184
43	0,42	0,19604	0,25429	93	0,92	0,82822	0,85848
44	0,43	0,20336	0,26261	94	0,93	0,84829	0,87535
45	0,44	0,21084	0,27105	95	0,94	0,86875	0,89245
46	0,45	0,21848	0,27962	96	0,95	0,88960	0,90978
47	0,46	0,22629	0,28832	97	0,96	0,91086	0,92735
48	0,47	0,23427	0,29715	98	0,97	0,93251	0,94515
49	0,48	0,24242	0,30611	99	0,98	0,95459	0,96319
50	0,49	0,25074	0,31520	100	0,99	0,97708	0,98147
51	0,50	0,25924	0,32442	101	1,00	1,00000	1,00000

REFERENCES

ANUARIO ECONÓMICO COMARCAL, 1994. Institut d'Estadística de Catalunya. Generalitat de Catalunya, pp. 30-82.

ANUARIO ESTADÍSTICO DE CATALUNYA,1997. Institut d'Estadística de Catalunya. Generalitat de Catalunya, pp. 147-155.

BARÓ, J.,1988. Función e índice de concentración de algunas distribuciones truncadas. Comunicación II reunión ASEPELT-España. Valladolid.

BARÓ, J. ,1991. Aplicaciones del modelo de kakwani al análisis de la distribución de la renta. Document de Treball núm. 9101. Institut d'Estudis Laborals. Universtitat de Barcelona.

BARÓ, J. and MORATAL,V.,1984.Concentración y distribuciones truncadas. Qüestió, Vol.8 núm.3 pp. 127-132

BARÓ, J. and TORRELLES, E.,1989. Sobre las medidas de concentración. Document de Treball 8904. Institut d'Estudis Laborals. Universitat de Barcelona.

BARÓ, J.,1989. Descomposició del índice de Gini. Comunicación en III Reunión ASEPELT-España. Sevilla

CABASÉS PIQUÉ, M.A. (1993). "Models i índex de concentració. Aplicació al volum empresarial de Lleida". Tesis Doctoral.

COMISIÓN EUROPEA (1995). "Los Fondos Estructurales en 1994". Sexto informe anual.

GASTWIRTH, J.L.,1972. Estimation of the Lorenz Curve and Gini Index. Review of Economics and Statistics, Vol.LIV nú.3 pp. 306-316

GIORGI, G. and PALLINI,A. ,1986. Di talune soglie inferior e superiore del rapporto di concentrazione". Metron, Vol XLIV, núm. 1-4

GUPTA, M.R. ,1984. Notes and comments. Functional Form for Estimation the Lorenz Curve. Econometrica , 52, pp. 1313-1314.

KAKWANI, N.C. and PODDER, N., 1973.On the Estimation of Lorenz Curves from Grouped observations. International Economic Review,14 pp. 278-292.

KAKWANI,N.C., 1980 a. On a class of Poverty Measures. Econometrica núm. 48.

KAKWANI, N.C.,1980 b. Income inequality and poverty. Oxford University Press.

PATRONAT CATALÀ PRO EUROPA (1997). " Els fons estructurals a Catalunya”. Aplicació i perspectives de la política estrctural i de cohesió de la Unió Europea.