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## Conference Paper

# Evaluation of Cross-Border Leakages in Community Support Frameworks. The case of Andalusia (Spain).

44th Congress of the European Regional Science Association: "Regions and Fiscal Federalism", 25th - 29th August 2004, Porto, Portugal

### Provided in Cooperation with:

European Regional Science Association (ERSA)

*Suggested Citation:* Morillas, Antonio; Moniche, Laura; Castro, Marc (2004) : Evaluation of Cross-Border Leakages in Community Support Frameworks. The case of Andalusia (Spain)., 44th Congress of the European Regional Science Association: "Regions and Fiscal Federalism", 25th - 29th August 2004, Porto, Portugal, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at:

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# **Evaluation of Cross-Border Leakages in Community Support Frameworks.**

## **The case of Andalusia (Spain).**

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**Key Words:** Structural Funds; Ex-post Evaluation; Convergence; Input-Output; Cross-border leakages.

**JEL classification:** C67; C82; R58

### **Abstract**

The enlargement of the European Union to 25 members implies that relative position of Andalusia will improve with regard to the new GDP per capita average. This fact may derive a reduction in structural funds support for this Spanish region objective 1. This paper is focused in the ex-post assessment of the CSF 1994–99 in Andalusia. Direct and indirect effects, as well as cross-border leakage are analysed. We aim to compare *stimuli* induced from structural funds in the rest of the national economy with those remaining in Andalusia. If effects on the rest of Spain were important in relative terms, the central idea of regional policy, which defines community convergence tools, would be questioned. Results show evidences for this hypothesis in the case of Andalusia, given the importance of the effects generated in the rest of Spain and the biases of CSF funds towards sectors with a high need for imports, some of which are characterized by an intensive use of the region's natural resources.

## 1. Introduction

The enlargement of the European Union towards eastern countries implies an improvement in the relative position of the present Objective 1 regions, such as Andalusia, with regard to the new GDP EU-25 *per capita* average. This increase in regional inequalities will demand a restructuring of the instruments and funds involved actually in the regional and cohesion policies. These imminent financial constraints renew the relevance of evaluation processes for regions Objective 1 in order to improve the efficiency of each unit of structural funds invested in the region.

The touchstone of the European regional policy still remains in the cause-effect principle implicit in the push/pull impulse, providing incentives for development through investment (push effect) and producing structural changes in key sectors that pull on the regional economy. From a practical point of view, this practice has always dealt with the fragile balance between economic efficiency and equity (OKUN, 1975) when assigning funds and modifying factor localization tendencies. In the successive reforms of the Structural Fund Regulations, this cause-effect principle has gained more and more relevance, starting from the so-called Delors I Package (1988) when appear the first Community Support Frameworks (CSF 1989–93).

However, several studies question the accuracy of the European regional policy based on CSF and push/pull effects (BACHTLER and TUROK, 1997; CUADRADO and PARELLADA, 2002). As BOLDRIN and CANOVA (2001) point out, the aim of the CSF's should not be reinforcing demand *stimuli* aimed towards establishing redistribution policies and income/activities maintenance, but rather helping self-sustained development in the least developed regions. Nevertheless, the most of studies carried out in this sense remark not only the slow nature of convergence processes (ARMSTRONG and VICKERMAN, 1995), but also the fact that regional convergence may have reached certain limits (MARCER and CANOVA, 1995) or be concentrated in certain areas or clusters (QUAH, 1996).

Along this debate, many CSF's evaluations have been carried out at national and regional level from several theoretical frameworks, in particular input output analysis or productive functions (see a recent survey in MAIRATE and HALL, 2002). The mainstream of these analyses considers that total investments remains in the region, something very improbable. This paper tries to evaluate the efficiency of the CSF tools in one of the most relevant regions objective 1, Andalusia (Spain). Focusing in the direct and indirect effects derived from the invested funds, cross-border leakages are estimated by comparing *stimuli* induced from structural funds in the rest of the national economy with those remaining in the region.

## **2. Evaluation of Regional Community Policy**

Assessments of the impact of the funds have increased notably in recent years, alongside the importance of Regional Community Policy (1). However, in the Southern regions, these evaluations were of little impact or even non-existent up until very recently. Faced with initial problems of heterogeneity and subjectivity in methods of evaluation, the Regional Policy Directorate has played a crucial part in co-ordination and information of appraisal of structural funds (2). Since the reform in 1988, the new regulations demanded ex-ante and ex-post evaluation for the CSF's of the different regions on three levels: Community, regional and individual.

Criticisms of the excessive bureaucracy and inflexibility of the annual evaluation documents, the increase in the structural funds budget as well as special valuation in terms of economic and social cohesion after the Maastricht Treaty, led to the inclusion of evaluation guidelines in the Regulations of funds for the period 1994 –1999, with special emphasis on Objective 1 regions. Monitoring Committees, ex-ante, mid-term and ex-post valuations all gained strength after this reform (3).

Efforts to statistically quantify advances in terms of cohesion or convergence are designed to strengthen regional statistics (REGIO) in EUROSTAT. Among the advances in this sense, the

MEANS Programme (*Methods for Actions of a Structural Nature*) and the series of annual conferences on evaluation of structural funds are remarkable (4).

The general problems in any approximation to the evaluation of structural policies of the European Union are (BACHTLER and MICHIE, 1995):

- The multiplicity of measures, different concepts of the same and availability of information.
- The confluence of various financing instruments and actuations from various institutional levels (national, regional, local) and evaluation (projects, programmes, global CSFs).
- The principle of subsidiarity, where political and technical problems arise on calculating the exact EU partnership.
- The recent setting up of the CSFs. The inexistence of historical series to analyse the trend hinders the application of trend analysis techniques.

Faced with these limitations, most evaluations are macroeconomics and at national level. However, this task has been afforded from various methodological standpoints, basically the following (MAIRATE and HALL, 2002):

- a) Demand Models based on input-output techniques. Among these, numerous applications stand out (BEUTEL, 1995). Input-output analysis is one of the most common techniques used in impact studies and evaluation of regional policy, modelling a demand shock which affects investment and consumption with short term effects.
- b) Supply Models (PEREIRA, 1994; RODRIGUEZ-POSE and FRATESI, 2002). Starting from the definition of a production function with various inputs, a dynamic growth model is implemented for long term convergence. In many cases a convergence analysis  $\beta$  is carried out with panel data.
- c) Mixed Models (BRADLEY *et al.*, 1995). These models, among them HERMES; HERMIN and QUEST II, are widely accepted and used by several countries (5) and the European Commission.

Several evaluations have been implemented for the Spanish regions objective 1 (6). In DE LA FUENTE (2003), a panel data model is used in the ex-ante evaluation of the CSF 1994-999. Among the ex-post evaluations on the impact of the CSF in Andalusia (7), we can highlight the recent one carried out for the Regional government by MURILLO and SOSVILLA-RIVERO (2003) through a supply model, focused on the production function for the CSF 1994-99.

### **3. The specification of the IO evaluation model of CSF 1994-99 in Andalusia**

Upon the base of a previous study (MORILLAS *et al.*, 2000; CASTRO *et al.*, 2002), in this paper we present a demand model (input-output) for ex-post evaluation of the CSFs which aims to evaluate direct and indirect effects, as well as cross-border leakages.

To carry out a correct evaluation of the direction pointed out by the impact of the investment of Structural Funds, it would help to have a matrix of interindustrial technical coefficients for each year of the CSF 1994-1999. As this information does not exist, we will use only the Input-Output Framework for Andalusia for 1995 (MIOAN95), specifically the symmetric table. For the whole of Spain we will part from the symmetric input-output table for 1995 (TIOE95) (8). The results of the calculation of the effects must be interpreted as if the entire investment had been made in that year.

As a previous task, a distribution matrix is needed to determine the conversion of the investments from the different projects collected in the CSF into a sectorial aggregation structured by sectors. In this case, we used an intermediate typology developed by the DGXXII proposal (BIPE, 1991; CCE, 1991) (9) that clustered the investment funds into eight axes.

In this report the investments of funds on eight different axes connected with activity branches of R44 NACE-CLIO, which are different to the classification by the CSF. It was necessary, therefore to establish a new correspondence between both classifications. This double exercise necessitated adding the matrixes which contain the original tables (the symmetric MIOAN95 of 89 branches and

the TIOE95 also of 70 branches) to 40 branches of activity (see Annex 1). With regard to this, it must be reflected that, as is widely known, the results obtained for the multipliers calculated in the Leontief model are not neutral to the number of branches used in the addition (10).

Finally, this matrix has been updated to estimate the possible variations its coefficients could have experienced. With this aim we took into account rates of variation occurred in the indexes of industrial prices, of consumer prices and salaries, as well as specific construction and agriculture prices, during the period 1991-1995. Logically this is an approximation based exclusively on changes in relative prices, which obviates possible variations in quantity (11).

The two next points are focused on determining both the impacts in Andalusia (variations in the gross added value and the imports) and the rest of Spain.

### 3.1. Impact on Andalusia

For evaluating the increase in the regional gross added value we take the coefficients of the gross added value (VAB) from the symmetric input-output table for the region (MIOAN95) at market price ( $v_j^R$ ) and apply them to the new increase of the calculated regional production:

$$\Delta VAB^R = \hat{v}^R \Delta x^R = \hat{v}^R (I - A^R)^{-1} \Delta y^R, \quad \text{for/to give } v_j^R = \frac{VAB_j^R}{x_j^R}$$

Where  $\Delta VAB^R$  is the vector of the increase of the gross added value, the  $VAB_j^R$  are the added values of the MIOAN 95 for the sector  $j$  and, ultimately,  $\hat{v}^R$  is the diagonal matrix composed of the coefficients of the added value taken from the MIOAN95. The coefficients of the added value are taken as remaining constant.

The calculation of the increment of the imports, from both the rest of Spain and the world has been undertaken in the following way. The first are obtained through the sum of intermediate imports from the rest of Spain and from the equivalent imports,  $\Delta y_m^{RE}$  :

$$\Delta m^{RE} = M^{RE} \Delta x^R + \Delta y_m^{RE} \Rightarrow \Delta m^{RE} = M^{RE} (I - A^R)^{-1} \Delta y^R + \Delta y_m^{RE}$$

We assume the matrix of coefficients of intermediate imports from the rest of Spain is constant.

The second ones, imports from the rest of the world, are determined by the sum of the intermediate imports from the rest of the world and from the equivalent imports from the same place,  $\Delta y_m^{RM}$  :

$$\Delta m^{RM} = M^{RM} \Delta x^R + \Delta y_m^{RM} \Rightarrow \Delta m^{RM} = M^{RM} (I - A^R)^{-1} \Delta y^R + \Delta y_m^{RM}$$

We assume the matrix of coefficients of the intermediate imports from the rest of the world is constant.

Therefore, the total imports would be calculated in the following way:

$$\Delta m^R = M^{RE} \Delta x^R + M^{RM} \Delta x^R + \Delta y_m^{RE} + \Delta y_m^{RM} = \left[ (M^{RE} + M^{RM}) (I - A^R)^{-1} \right] \Delta y^R + (y_m^{RE} + y_m^{RM})$$

The final demand imports,  $(y_m^{RE}, y_m^{RM})$ , are obtained by applying to the global funds investment, the coefficient that corresponds to the Gross Capital Formation (GCF) table, which we also take as invariable.

### 3.2. Impact on the rest of Spain

To calculate the effects on the rest of Spain, we estimate, via the RAS method, the matrix of coefficients for the region “rest of Spain” (RE), and apply later, a final demand impulse the same as  $(y_m^{RE} + \Delta m^{RE})$ . That is to say, the demand formed by direct GCF imports from the rest of Spain and by the variation in intermediate import needs stimulated by the growth in interior production in Andalusia. The increase in production in the rest of Spain would be, therefore:



$$\Delta x^{RE} = (I - A^{RE})^{-1} (y_m^{RE} + \Delta m^{RE})$$

To calculate the TIO of the rest of Spain (12) we begin conceptually from a model of two regions (BLAIR and MILLER, 1983), in which Spanish production is considered to be made up of Andalusian production and production from the rest of Spain. The RAS method is applied beginning with the structure of coefficient input-output from the Spanish table. Production of the fictitious region, “rest of Spain” and the total of intermediate consumption in rows and columns are calculated by the differences in the figures from the Spanish and Andalusian tables.

We approximate the table of input-output coefficients of Spain,  $A^E$ , to said totals by the iterative RAS process, in such a way that the new matrix obtained,  $A^{RE}$ , is concordant with the figures calculated for the rest of Spain (PULIDO and FONTELA, 1993).

It is clear that we are using a matrix of estimated coefficients, whose results could be questioned. However, it is a much less restrictive supposition than considering that the coefficients of the table for the rest of Spain are merely differences between the Spanish and the Andalusian ones. This last process imposes a more concrete structure on the table than the previously exposed method. As in any of the other processes mentioned before the effects of feedback between one region and another are ignored, although empirical evidence states its importance as minimal (ISARD, 1971), never above 14%, supposing that the rest of Spain imports little from Andalusia in this investment context. Finally, we must remember that there is a great additional methodological weakness in obtaining the most significant of the two addends,  $(\Delta m^{RE})$ , applied to the corresponding inverse. The matrix  $M^{RE}$ , from which this addend derives, is not only unstable from year to year, but the difficulty in a statistic “estimation” for a region throws up more than reasonable doubts as to the final results. In any case, this solution seems more acceptable than using differences in the symmetry of the MIOAN95 regarding the TIOE95.

#### **4. Statistical data**

The specific objectives of the CSF 94-99 for Objective 1 regions in Spain approved by the European Commission are (CCE, 1996): Improvement in production; utilization of human resources and improvements in the quality of life; integration and territorial organization; and support for water and energy facilities.

Only the investment in the CSF (CEH, 2001) (13) has been taken into account, since there is not complete information about Community Initiatives. However, these effects are more atomized in the regional economy.

Based on the information on final expenditures (CEH, 2001), as can be seen in Table 1, the total investment in Andalusia exceeded 4,600 Meuros. This amount, taking into account the evolution of prices, is very similar to the one destined previously in the CSF 1989-1993 in Andalusia for the FEDER and FEOGA-O funds, supposing in average the 0,64% of the Andalusian GDP in the period 1994-1999.

(Table 1, Page 25)

Funds from the FEDER are clearly the most important, and represent 78% of the total investment. The FEOGA occupies second place with a 12% of the total, and is concentrated fundamentally in axis 4, "Agriculture and rural development"; although there is a significant amount – a bit higher than 3% which represents the IFOP, orientated towards the fishing sector – directed towards axis 2, "Development of the economic structure". The European Social Fund represents 7% of the total and is destined almost entirely for axis 6, "Valorisation of human resources."

From a finalist perspective, axis 1 "Territorial integration and organization" is still the one which receives most resources from the FEDER (32%), although in a far lower proportion than the axis

called “Territorial Social Overhead Capital” in the previous framework (84.1%), which played a crucial role in the policies of the Andalusia’s government. This was, as is well known, large investments in infrastructure, basically roads and railways. The second axis benefited from greater investment (27%), is “Support infrastructure for economic activities”, which with the 14% for “Development of the economic structure”, reaches a significant figure (41%) and highlights the emphasis of regional policy on fomenting productive activity.

## **5. Empirical results**

With the hypothesis of territorial application of the expenditure following the structure of the TIOAN95, the 73.42% of the total is assigned to Andalusia, 20.19% to the rest of Spain and the remaining 6.39% to abroad. In Appendix 2 the distribution via branches of activity and the territorial application of funds finally assigned to the different axes can be observed. The most important branches in this respect are the *Non-metallic industry* (14%), *Construction* (12.49%) and *Services to businesses* (10.83%). These three branches absorb 37.40% of the total of the funds between them. Elsewhere, the branches where the spending in the rest of Spain is more important, which represents 20.19% of the total, are in *Non-metallic industry*, *Metallic industry*, *Non-electric machinery*, and *Office machinery*. Finally, the ones with the greatest repercussion in the rest of the world, with a percentage which reaches 6.39% of the total, are by far *Service companies for business* and *other transport material*.

### **5.1. Impact of the CSF 1994-99 in Andalusia**

The effects on production and added value within Andalusia are shown in table 2, as well as the need for imports, which causes an investment of 4,679.63 Meuros of 1999, and which we assume are directly applied to Andalusia. The global growth of production and added value is slightly above 4%. If we assume a lineal distribution, the average annual growth generated by the funds in the period 1994-99 can be valued at around 0.7%, for both magnitudes. This is quite a higher figure

than that obtained in MURILLO and SOSVILLA-RIVERO (2003), appraising a supply model, from the so-called Aschauer effect (ASCHAUER, 1989), which we feel lacks credibility because of what is unappreciable (only 0.010 additional points for annual economic growth in Andalusia are obtained), in light of the amount of investment represented by the MCA in relation to the VAB in Andalusia. However, as has been referred to earlier, this is only three tenths lower than the average value obtained in DE LA FUENTE (2003), which does not take into account any deviation from spending towards other regions.

(Table 2, Page 26)

From a sectorial perspective, the branches where the impact in Andalusia is greatest in absolute terms, are *Construction*, *Non-metallic industry*, and *Services to businesses* with a 36.4% between them. As we can observe, the effects can be noted on branches connected to activities related to construction and its materials (in *construction* and *non-metallic industry*), and *Services to businesses*, which includes a wide range of activities of growing importance in developed economies and, in particular, in the Spanish economy. *Non-metallic industry*, *Metallic industries*, *Electrical machinery* and *services to businesses* are the ones which generate a great number of imports (about 50% of the total). *Non-metallic industry* and *Services to businesses* stand out in terms of relative increase, surpassed only by *Other transport material*. Elsewhere, the activities related to metallurgy, *Metallic industries* and *machinery*, also reflect higher values in the rest of Spain (presumably in the more developed regions which specialize in these products) than in Andalusia.

The global figure for imports needs is 44.1% of production in Andalusia, and it surpasses by more than 10 points the results we obtained in the evaluation of the previous Community framework (MORILLAS et al., 2000), which was 33.6%. Observe that in Table 2, while production and added value increase by more than 4%, imports increase by 7%. In this way, we can state that 4.5 euros of every 10 invested in Andalusia has an effect in other areas outside the region. If the absolute figure

is important, no less is the fact that this drain of activity on the Andalusian economy (rent and employment, in other words) has been accentuated with this new framework.

## **5.2. Impact of the CSF 1994-99 in the rest of Spain**

The global production figure generated in the rest of Spain is 2,858.89 Meuros of 1999, which makes up a bit more than 58% of the figure for Andalusia (Table 3). The added value surpasses 50% of the figure for Andalusia. It can be seen that as a result of investments made in Andalusia from Community funds, the higher values in the rest of Spain are the industrial sectors 4 to 13, with 60.2% of the total, followed by *Services to businesses* (7.41%) and *Land transport* (7.17%).

(Table 3, Page 27)

It is not rash to suppose that being industrial and qualified service sectors, this production, in reality, arises sporadically in clearly defined areas – the most developed in the country. That is to say, the activity drain should be pinpointed to far more reduced areas and regions than the region here known as “rest of Spain”. It is hoped, therefore, that the real multiplying effect on these areas, in addition to fomenting the development of industrial, commercial and service activities, be in relative terms even higher than that obtained for the region “rest of Spain”. It is clear, on the other hand, that as regards quality and from the perspective of development, it is very different from what occurs in Andalusia.

To this effect on these more developed regions, we would have to add the effect of the rest of the Objective 1 regions in Spain, whose dynamic will undoubtedly be very similar to the one here. The necessary imports of industrial articles and services stimulated by Community funds, due to a weak productive structure, also come from the same more developed areas (north east of Spain and Madrid). It would be interesting to quantify the combined effect of investments in the whole of the Objective 1 regions, on the more developed regions of Spain, but it is not difficult to guess what

would happen; the discriminating effect of funds would dilute and disparities remain, effectively, the same.

The arguments above may be seen more clearly on the map and in the data in the table in Figure 1. Catalonia, leading the way in industry (25.3% of the industrial VAB of Spain), and Madrid are – along with the Basque Country at a slightly lower level – by far the Autonomous Communities which most specialize in industry and services. The probability that the main cross border leakage effects previously outlined are concentrated in these three regions is from what can be seen, very high. We can be virtually sure of it. See, besides, how each of these three Communities separately – even the three together – represent a minimal part of the national territory, which is nothing comparable to the Objective 1 regions. So, it is not only that the combined effects may be important, but that besides, they must be concentrated in the most developed regions, stimulating a negative effect for convergence.

(Figure 1, Page 28)

## **6. Conclusions**

Faced with the effects derived from the progressive implantation of the single market, as well as the natural tendencies towards expansion shown by the European Union, which will reach 25 members from 2004, the interest in an efficient regional policy is gaining renewed impetus.

To evaluate the results it is necessary to begin from an agreed definition of the concept of cohesion, with the aim of determining if advances have really been made towards that objective. The European Union considers a GDP *per capita* as the main indicator of monitoring. However, regional differences must also be studied in connection with other aspects more related to qualitative questions: differences and efficiency in productive structures, disparities in labour markets, and differences in infrastructure and social overhead capital. At the same time, it is

convenient to bear in mind that according to the variables and sources consulted to measure the convergence, just how near the objective of cohesion has been reached will vary considerably.

Traditional criticisms (14) of the Union's distributive policy have been aimed at the direction and intensity of regional policy, more concretely on the effects of the market on the spatial, social and sectorial concentration of wealth (CUADRADO and SUÁREZ-VILLA, 1992).

In conclusion, taking into account existing limitations, in both available statistical information and those derived from the input-output model used, there is no doubt about the quantitative importance and the real impact that European funds have on the Andalusian economy and some of its most significant macro indicators. Investment in transport infrastructure, one of the main recipients of the funds, has a double effect which has been widely analysed. On the one hand, it is undeniable that for local economies generally it has been a boost, creating the necessary conditions for the localisation of businesses and the exportation (15). The funds have also brought about a good number of resources to social policies and on the environment in Andalusia. However, there have been certain deficiencies as in its priorities as in its execution, drawing shadows which should make us reflect seriously, from a local, national and European perspective.

First of all, investment in the framework 1994-99 is centred on the public construction sector, something which is completely necessary yet which reproduces and reinforces the disorganized productive structure in Andalusia, which is probably dependent on excess construction and exploitation of natural resources (MORILLAS, 1995). This type of investment has served more to improve relations with the exterior than to integrate the space and economy of the Andalusian region. Expounding on this idea, it is widely known in regional policy (the *Mezzogiorno* effect) that the development of a good transport infrastructure is a necessary, yet not sufficient, condition for development. From the results obtained, both in quantity and type of imports, it would seem that they do not help to palliate the patent lack of integration of the regional productive structure, one

of the main problems facing the Andalusian economy, nor the objective of helping towards a self-sustainable development (BOLDRIN and CANOVA, 2001).

Secondly, the funds do not appear to contribute to any significant degree towards a more balanced and interdependent development of the services and industrial sectors which could help towards a solution for the serious problem of excess regional specialization, limited productive integration, and consequently, the fight against unemployment. As RODRÍGUEZ-POSE and FRATESI (2002) stated, European integration can be favouring an unbalanced development over the base of concentration of activities of a high added and technological value in the centre, while the peripheral regions specialize in low added value sectors. The drain of activity towards industrial sectors located in more developed regions as a result of this lack of coordination is very significant, so the possible compensatory effect of funds could be severely distorted.

Finally, as has been seen in this paper, regional growth stimulated by funds produces development in industries and services to businesses in the most industrialized areas of the rest of Spain, repeating and accentuating the scheme of classic productive dependence of the Andalusian economy (DELGADO, 1981). As a consequence of this, with the results obtained for Andalusia and the similar results which are sure to come for the other Objective 1 regions, there are sufficient indications to believe that the positive discrimination the funds pursue is weakened by cross border leakage, which occurs in the most developed areas of the country. This fact may be causing the real effects on convergence to be practically null, if not the opposite of the desired effect. In fact, different studies (HALL, 1999; BIESCAS, 1999; CUADRADO, 2001; BOLDRIN and CANOVA, 2001) seem to confirm that this convergence has not been happening, independently of the fact that the contribution of the funds towards a better socioeconomic situation in Andalusia, specifically, could not be called into question.

All of these aspects, the consideration of which is vital for a broader understanding of the long term future of the assisted regions, are frequently forgotten in the processes of evaluation of the impact



of European funds, to be replaced by formalizations, supposedly more scientific, which predominate over the economic-conceptual reality of these regions. Unfortunately, after many years of Community aid, official statistics lead us to conclude that these questions are much more important than some analysts think (16). With regard to this, and without underestimating the positive effects the funds produce in Andalusia, it must be pointed out that the average annual growth rate, in nominal terms, of the GDP per inhabitant in the years of the CSF 1994-99, was 6 points in the region. That is, less than the yearly average for the rest of the Spanish economy; a 6.3% increase (17). In terms of national convergence, at least, it can be argued that the distance between the country's most dynamic regions and Andalusia has not been reduced, on the contrary it has also increased over this period.

## **Endnotes**

- (1) See MOLLE and CAPPELLIN, 1998; BACHTLER and MICHIE, 1995; NIJKAMP and BLAAS, 1995 and McELDOWNEY, 1991 among others.
- (2) It must be pointed out that the Regional Policy Office has explicit orders to co-ordinate evaluation of regional policy in Objective 1 and 2 regions.
- (3) In 1998 an intermediate evaluation of the structural funds for 1994–99 was carried out (CCE, 1998), and with information from which funds have been redirected – especially in Italy and Spain.
- (4) The aim of the MEANS (CCE, 1999) work group is to promote a “Culture of Community evaluation” to establish this type of process and to increase the usefulness of structural policy evaluation processes.
- (5) See HERCE and SOSVILLA-RIVERO, 1995; MODESTO and NEVES, 1995; CHRISTODOULAKIS and KALYVITIS, 2000.
- (6) See HERCE and SOSVILLA-RIVERO, 1995; CORONADO, 1995; GONZÁLEZ-PÁRAMO and MARTÍNEZ, 2001.

- (7) Other ex-post evaluation on the CSF 1989–93 are FONTELA and MORILLAS, 1991; GONZÁLEZ *et al.*, 1997; MORILLAS *et al.*, 2000; CEH, 2001.
- (8) See IEA (1999) and INE (2001) for data sources. Information does not exist for the region we will name “rest of Spain”.
- (9) This document allows us to pass the investments of the different projects included in the CSF to a sectorial classification structured in axes. To achieve this it adds a percentage of the investment of the funds of each of the eight axes to the different branches of activity of R44. The problem of disintegration of the investment between the 44 branches is solved then by classifying each of the projects and actions of the Structural Funds on one concrete axis of the eight budgets in this document.
- (10) For an evaluation of these effects based on the statistical theory of information, see GARCÍA and RAMOS, 2001.
- (11) See CAÑADA and TOLEDO, 2003; PRADO, 2003.
- (12) The first paper on the construction of a regional table based on a national one was carried out by CZAMANSKI and MALIZIA, 1969 and developed further by McMERNAMIN and MARING, 1974.
- (13) To evaluate the impact of the CSFs it is also necessary to consider Spanish Public investments as they are complementary. In this way, when Structural Fund investments are mentioned, those made both by the EU and the Spanish Public Sector will be included.
- (14) According to neoclassical theory, the free mobility of factors finishes sooner or later in regional convergence. However, reality is very different, as it has been shown that mobility is not as high in Europe as in some countries – USA – and neither does it depend so heavily on strictly economic aspects such as salary or qualifications.
- (15) See ASCHAUER, 1989; DRAPER and HERCE, 1994.
- (16) In this sense, the different methods used need not be considered conflicting or exclusive, rather that they can be complementary and mutually enriching.

(17) Source: INEBase (2003). We have to take into consideration the change of method that occurred with the implantation of the SEC95, which is why the GDP per capita figure for Andalusia for the year 1994 is an approximation from the provisional data for that year.

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## APPENDIX 1

### Aggregation of symmetric tables of Andalusia and Spain to 40 homogenous branches

R40	Concept	CNAE93	Branches TSIO95	Branches MIOAN95
1	Agriculture, livestock and fishing	A, B	1-3	1-6
2	Coal, cookeries and radioactive material	10	4	7
3	Oil	11, 12, 23	5 and 8	8, 9 and 27
4	Water, gas and electricity	40, 41	9-11	47-49
5	Basic Metal industries	13, 27	6 and 29	10 and 34
6	Non-metallic industries	14, 26	7, 25 - 28	11, 31-33
7	Chemical	24	23	28 and 29
8	Metallic industries	28	30	35
9	Non electric machinery	29	31	36
10	Office machines and treatment	30, 33	32 and 35	37 and 40
11	Electric material and accessories	31, 32	33 and 34	38 and 39
12	Vehicles, cars and engines	34	36	41
13	Other materials for transport	35	37	42 and 43
14	Meat processing	151	12	12
15	Dairy industries	155	13	15
16	Other food industries	The remains of 15	14	13, 14, 16 and 17
17	Drinks	159	15	18 and 19
18	Tobacco products	16	16	20
19	Textile and clothing	17, 18	17 and 18	21 and 22
20	Leather goods and footwear	19	19	23
21	Wood and wood furniture	20	20	24
22	Paper, paper articles and printing	21, 22	21 and 22	25 and 26
23	Rubber and plastic products	25	24	30
24	Other manufacturing	36	38	44 and 45
25	Construction	45	40	50 and 51
26	Commerce	50, 51, 52, 37	39, 41- 43	46, 52-55
27	Hotel and catering	55	44	56 and 57
28	Land Transport	60	45 and 46	58 and 59
29	Maritime, air transport and related activities	61, 62 and 63	47- 49	60-62
30	Communications	64	50	63
31	Credit and Insurance institutions	65, 66	51 and 52	64 and 65
32	Services for Businesses	67, 71, 72, 74, 911	53, 55, 56 and 58	66, 68, 69, 71-76
33	Renting of immovable assets	70	54	67
34	Services for Education – sale	80 p	59	79
35	Services for Health – sale	85 p	60	81 and 83
36	Recreational and cultural services	92p, 93	62 and 63	86-88
37	General services for Public Administration	75, 90	61, 64 and 67	77 and 84
38	Services for Education – not sale	80 p, 73	57 and 65	70 and 78
39	Services for Health, private, non-profit	85 p	66	80 and 82
40	Domestic services and others, not sale	95, 912, 913, 92p	68, 69 y 70	85 y 89

Source: author's own



APPENDIX 2

<b>Distribution by branches of activity and territorial applications of Structural Funds (millions euros 1999)</b>								
<b>BRANCHES OF ACTIVITY</b>	<b>Andalusia %</b>		<b>R.Spain %</b>		<b>RWorld%</b>		<b>T. Branch %</b>	
1 Agriculture, livestock and fishing	205,874	5,99%	15,721	1,66%	8,120	2,71%	229,716	4,91%
2 Coal, cookeries and radioactive material	0	0,00%	0	0,00%	0	0,00%	0	0,00%
3 Oil	192,244	5,60%	0	0,00%	0	0,00%	192,244	4,11%
4 Water, gas and electricity	211,971	6,17%	0	0,00%	0	0,00%	211,971	4,53%
5 Basic Metal industries	0	0,00%	0	0,00%	0	0,00%	0	0,00%
6 Non-metallic industries	390,150	11,36%	246,675	26,11%	20,976	7,01%	657,801	14,06%
7 Chemical	144,899	4,22%	0	0,00%	0	0,00%	144,899	3,10%
8 Metallic industries	169,411	4,93%	201,656	21,34%	3,757	1,26%	374,824	8,01%
9 Non electric machinery	18,268	0,53%	177,718	18,81%	32,487	10,86%	228,473	4,88%
10 Office machines and treatment	30,117	0,88%	91,765	9,71%	14,944	4,99%	136,826	2,92%
11 Electric material and accessories	0	0,00%	0	0,00%	0	0,00%	0	0,00%
12 Vehicles, cars and engines	0	0,00%	0	0,00%	0	0,00%	0	0,00%
13 Other materials for transport	219,640	6,39%	55,666	5,89%	79,968	26,73%	355,274	7,59%
14 Meat processing	0	0,00%	0	0,00%	0	0,00%	0	0,00%
15 Dairy industries	0	0,00%	0	0,00%	0	0,00%	0	0,00%
16 Other food industries	0	0,00%	0	0,00%	0	0,00%	0	0,00%
17 Drinks	0	0,00%	0	0,00%	0	0,00%	0	0,00%
18 Tobacco products	0	0,00%	0	0,00%	0	0,00%	0	0,00%
19 Textile and clothing	0	0,00%	0	0,00%	0	0,00%	0	0,00%
20 Leather goods and footwear	0	0,00%	0	0,00%	0	0,00%	0	0,00%
21 Wood and wood furniture	0	0,00%	0	0,00%	0	0,00%	0	0,00%
22 Paper, paper articles and printing	0,763	0,02%	2,180	0,23%	0	0,00%	2,943	0,06%
23 Rubber and plastic products	0	0,00%	0	0,00%	0	0,00%	0	0,00%
24 Other manufacturing	0,835	0,02%	0	0,01%	0	0,00%	0,887	0,02%
25 Construction	584,292	17,01%	0	0,00%	0	0,00%	584,292	12,49%
26 Commerce	24,915	0,73%	0	0,00%	0	0,00%	24,915	0,53%
27 Hotel and catering	27,135	0,79%	0	0,00%	0	0,00%	27,135	0,58%
28 Land Transport	24,383	0,71%	88,161	9,33%	8,932	2,99%	121,476	2,60%
29 Maritime, air transport and related activities	36,411	1,06%	0	0,00%	6,052	2,02%	42,463	0,91%
30 Communications	213,688	6,22%	0	0,00%	0	0,00%	213,688	4,57%
31 Credit and Insurance institutions	28,759	0,84%	0	0,00%	0	0,00%	28,759	0,61%
32 Services for Businesses	317,888	9,25%	65,161	6,90%	123,970	41,43%	507,019	10,83%
33 Renting of immovable assets	54,785	1,59%	0	0,00%	0	0,00%	54,785	1,17%
34 Services for Education – sale	341,671	9,94%	0	0,00%	0	0,00%	341,671	7,30%
35 Services for Health – sale	0	0,00%	0	0,00%	0	0,00%	0	0,00%
36 Recreational and cultural services	0	0,00%	0	0,00%	0	0,00%	0	0,00%
37 General services for Public Administration	0	0,00%	0	0,00%	0	0,00%	0	0,00%
38 Services for Education – not sale	197,567	5,75%	0	0,00%	0	0,00%	197,567	4,22%
39 Services for Health, private, non-profit	0	0,00%	0	0,00%	0	0,00%	0	0,00%
40 Domestic services and others, not sale	0	0,00%	0	0,00%	0	0,00%	0	0,00%
<b>TOTAL</b>	<b>3.435,666</b>	<b>100,00%</b>	<b>944,751</b>	<b>100,00%</b>	<b>299,211</b>	<b>100,00%</b>	<b>4.679,627</b>	<b>100,00%</b>
<b>% total funds</b>	<b>73,42%</b>		<b>20,19%</b>		<b>6,39%</b>		<b>100,00%</b>	

Source: author's own

<b>TABLE 1. Distribution of Structural Funds by axes of development of the CSF 94-99</b>					
<i>1990 meuros</i>					
<b>AXES OF DEVELOPMENT</b>	<b>FEDER</b>	<b>FEOGA</b>	<b>FSE</b>	<b>IFOP</b>	<b>TOTAL</b>
<i>1. Territorial integration and organization</i>	1518.676	0	0	0	<b>1518.676</b>
<i>2. Development of the economic structure</i>	464.767	175.946	0	0	<b>640.713</b>
<i>3. Tourism</i>	127.941	0	0	0	<b>127.941</b>
<i>4. Agriculture/rural development</i>	20.480	400.833	0	0	<b>421.313</b>
<i>5. Fishing</i>	4.686	0	0	147.374	<b>152.060</b>
<i>6. Support infrastructure for economic activities</i>	1244.113	0	2.500	0	<b>1246.613</b>
<i>7. Valorisation of human resources</i>	217.532	0	335.300	0	<b>552.832</b>
<i>8. Technical assistance, accompaniment and information</i>	19.479	0	0	0	<b>19.479</b>
<b>TOTAL</b>	<b>3617.674</b>	<b>576.779</b>	<b>337.800</b>	<b>147.374</b>	<b>4679.627</b>

Source: CEH (2001)

<b>TABLE 2</b>						
<b>Effects of Structural Funds in Andalusia, by branch of activity</b>						
<i>(Increases in 1999 meuros)</i>						
<i>Branches of Activity</i>	<i>Prod.</i>	<i>%</i>	<i>VAB</i>	<i>%</i>	<i>Impor.</i>	<i>%</i>
1 Agriculture, livestock and fishing	225.075	3.06%	144.491	3.06%	38.621	1.92%
2 Coal, cookeries and radioactive material	8.623	10.34%	3.052	10.34%	32.854	12.29%
3 Oil	273.384	7.91%	35.138	7.91%	167.908	7.35%
4 Water, gas and electricity	364.112	12.04%	140.842	12.04%	66.812	12.03%
5 Basic Metal industries	23.089	1.20%	6.163	1.20%	96.535	5.25%
6 Non-metallic industries	539.761	25.74%	203.515	25.74%	356.044	36.55%
7 Chemical	188.189	10.97%	64.303	10.97%	82.648	2.36%
8 Metallic industries	197.242	20.05%	80.323	20.05%	248.921	22.38%
9 Non electric machinery	30.539	7.90%	13.043	7.90%	245.957	12.07%
10 Office machines and treatment	32.605	11.98%	10.738	11.98%	118.441	15.15%
11 Electric material and accessories	9.511	1.73%	4.034	1.73%	71.038	2.63%
12 Vehicles, cars and engines	0.842	0.15%	0.491	0.15%	5.274	0.31%
13 Other materials for transport	245.580	31.64%	120.163	31.64%	151.912	45.30%
14 Meat processing	1.441	0.11%	0.364	0.11%	1.350	0.36%
15 Dairy industries	0.215	0.04%	0.061	0.04%	0.246	0.07%
16 Other food industries	12.932	0.19%	2.964	0.19%	12.692	0.73%
17 Drinks	3.569	0.20%	1.183	0.20%	2.607	0.44%
18 Tobacco products	0.003	0.00%	0.001	0.00%	0.372	0.14%
19 Textile and clothing	11.578	0.90%	4.011	0.90%	6.928	0.47%
20 Leather goods and footwear	0.040	0.03%	0.014	0.03%	0.111	0.03%
21 Wood and wood furniture	8.292	2.33%	2.858	2.33%	10.821	1.96%
22 Paper, paper articles and printing	16.951	1.59%	5.199	1.59%	26.804	2.22%
23 Rubber and plastic products	7.559	1.93%	2.111	1.93%	18.187	2.56%
24 Other manufacturing	3.246	0.35%	1.109	0.35%	1.867	0.45%
25 Construction	732.461	5.48%	298.777	5.48%	0	0.00%
26 Commerce	136.094	0.83%	92.860	0.83%	6.832	2.37%
27 Hotel and catering	42.540	0.72%	20.250	0.72%	0	0.00%
28 Land Transport	126.123	3.29%	70.270	3.29%	133.698	12.55%
29 Maritime, air transport and related activities	73.330	5.46%	26.798	5.46%	25.359	7.32%
30 Communications	249.861	15.51%	209.167	15.51%	13.327	11.13%
31 Credit and Insurance institutions	169.672	4.27%	14.752	4.27%	5.557	5.34%
32 Services for Businesses	505.623	10.82%	372.003	10.82%	204.833	36.34%
33 Renting of immovable assets	97.391	1.76%	90.615	1.76%	0	0.00%
34 Services for Education – sale	346.909	42.82%	250.658	42.82%	0	0.00%
35 Services for Health – sale	1.159	0.05%	0.607	0.05%	0	0.00%
36 Recreational and cultural services	2.930	0.17%	1.100	0.17%	0.381	0.78%
37 General services for Public Administration	0.726	0.02%	0.529	0.02%	0	0.00%
38 Services for Education – not sale	198.028	5.85%	185.919	5.85%	1.088	0.00%
39 Services for Health, non-profit	0	0.00%	0	0.00%	0	0.00%
40 Domestic services and others, not sale	1.394	0.28%	1.091	0.28%	0.001	0.00%
<b>TOTAL</b>	<b>4888.618</b>	<b>4.4%</b>	<b>2481.564</b>	<b>4.2%</b>	<b>2156.024</b>	<b>7.0%</b>

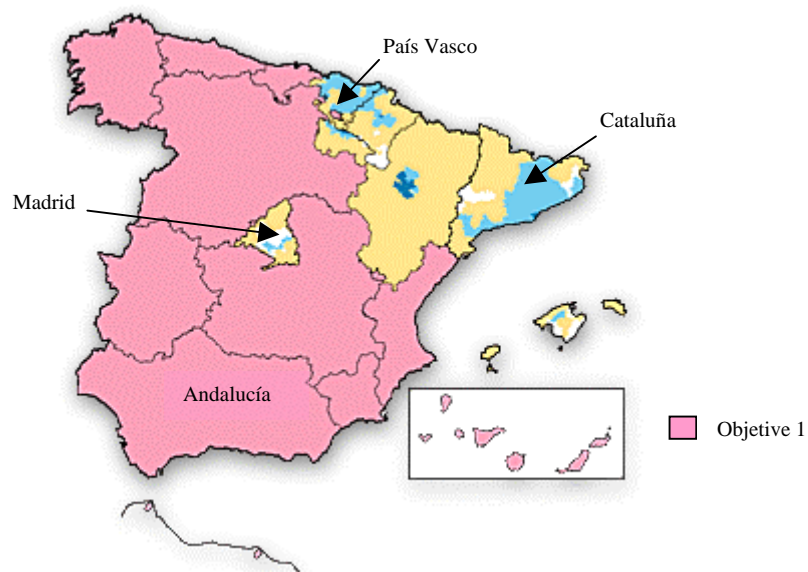
Source: Author's own.

\*Increases in relation to the total values of the symmetric matrix of the MIOAN95

**TABLE 3**  
**Effects of Structural Funds on the Rest of Spain by axes of activity**  
**(1999 meuros)**

Branch of activity		Prod. Rest Spain		VAB Rest Spain	
		Increase	%	Increase	%
1	Agriculture, livestock and fishing	39.798	1.39%	22.152	1.77%
2	Coal, cookeries and radioactive material	34.437	1.20%	24.207	1.93%
3	Oil	42.727	1.49%	9.814	0.78%
4	Water, gas and electricity	145.126	5.08%	87.593	6.99%
5	Basic metal industries	193.017	6.75%	54.116	4.32%
6	Non-metal industries	380.742	13.32%	159.648	12.73%
7	Chemical	120.462	4.21%	35.154	2.80%
8	Metallic industries	338.281	11.83%	124.209	9.90%
9	Non electric machinery	263.736	9.23%	99.861	7.96%
10	Office machines and treatment	94.743	3.31%	30.972	2.47%
11	Electric material and accessories	100.437	3.51%	34.639	2.76%
12	Vehicles, cars and engines	20.136	0.70%	4.585	0.37%
13	Other materials for transport	64.923	2.27%	24.274	1.94%
14	Meat processing	2.974	0.10%	0.508	0.04%
15	Dairy industries	1.123	0.04%	0.225	0.02%
16	Other foods	24.986	0.87%	5.897	0.47%
17	Drinks	5.076	0.18%	1.721	0.14%
18	Tobacco products	0.368	0.01%	0.099	0.01%
19	Textile and clothing	20.154	0.70%	6.787	0.54%
20	Leather goods and footwear	1.383	0.05%	0.300	0.02%
21	Wood and wood furniture	28.511	1.00%	9.425	0.75%
22	Paper, paper articles and printing	78.416	2.74%	25.329	2.02%
23	Rubber and plastic products	49.636	1.74%	17.578	1.40%
24	Other manufacturing	3.836	0.13%	1.333	0.11%
25	Construction	27.374	0.96%	10.968	0.87%
26	Commerce	100.168	3.50%	68.135	5.43%
27	Hotel and catering	16.608	0.58%	9.405	0.75%
28	Land transport	204.880	7.17%	135.219	10.78%
29	Maritime, air transport and related activities	72.338	2.53%	37.114	2.96%
30	Communications	38.565	1.35%	31.756	2.53%
31	Credit and insurance institutions	78.397	2.74%	5.213	0.42%
32	Services for businesses	211.905	7.41%	132.425	10.56%
33	Renting of immovable assets	28.670	1.00%	23.685	1.89%
34	Services for Education - sale	2.072	0.07%	1.571	0.13%
35	Services for Health – sale	3.902	0.14%	2.804	0.22%
36	Recreation and cultural services	5.520	0.19%	3.682	0.29%
37	General services for Public Administration	1.488	0.05%	1.060	0.08%
38	Services for Education – not sale	11.977	0.42%	10.551	0.84%
39	Services for Health – not sale	0	0.00%	0	0.00%
40	Domestic services and others, not sale	0.001	0.00%	0.001	0.00%
<b>TOTAL</b>		<b>2858.891</b>	<b>100%</b>	<b>1254.012</b>	<b>100%</b>

Source: Authors' own



VABpb95	Agriculture %	Industry %	Construction %	Services %
<b>Aragón</b>	4.7%	3.8%	3.0%	3.0%
<b>Baleares (Islas)</b>	1.0%	1.1%	2.0%	2.9%
<b>Cataluña</b>	7.6%	25.3%	16.6%	17.7%
<b>Madrid (Comunidad de)</b>	0.9%	13.6%	16.0%	19.2%
<b>Navarra (Comunidad Foral)</b>	2.0%	2.6%	1.5%	1.4%
<b>País Vasco</b>	2.9%	9.0%	5.1%	5.7%
<b>Rioja (La)</b>	1.6%	1.0%	0.6%	0.6%
<b>Objective 1 Regions</b>	79.4%	43.7%	55.1%	49.5%
<b>Total*</b>	18.649	93.240	31.909	259.718

\*1995 Meuros

Source: INE