IEB (Institut d´Economia de Barcelona)
RESEARCH GRANTS ON FISCAL FEDERALISM
Granted Researcher: Juan González Alegre (Universidad Pablo de Olavide)

Title: Fiscal Decentralization and Intergovernmental Grants: The European Regional policy and Spanish Autonomous Regions.

Abstract:

Most of the Structural Actions are designed as an incentive to increase public investment in less-developed areas. However, we suspect that the efficiency of the policy is related to the level of fiscal autonomy of the subsidized government. In this paper we construct a paned data model in order to estimate the role of fiscal federalism on the effectiveness of the EU Structural Actions in enhancing public investment. We use data from the seventeen Spanish regions for the period 1993-2007. The estimation is run upon three alternative strategies: firstly we break the sample according to the level of fiscal autonomy of the units; secondly, we insert an interaction term capturing the join effect of both variables, fiscal decentralization and EU Structural Actions; finally, we estimate a simultaneous equation model in which public investment and the EU transfers are decided simultaneously. Results unambiguously support the hypothesis that the effectiveness of the Structural Funds decreases with larger decentralization. Our results suggest also that this could be due to the fact that regions find it more difficult to be eligible for additional EUSF as they gain fiscal autonomy. The general conclusions include the recommendation that the future design of the European Cohesion policy should take into account the heterogeneity of Fiscal Federalism across the Member States in order to the get the most out of it.

JEL classification: H72, H77, C33, C23.

Keywords: Fiscal Federalism; Intergovernmental Grants; European Union; Regional Policy; Panel Data; Simultaneous Equations for Panels.

1. Introduction

The Cohesion Policy designed by the European Union has been contributing actively to the achievement of sustainable economic growth in European regions over the last decades. The recent political and economic developments in the EU may justify the revision of some of the principles driving the Cohesion Policy so as it can perform its duty with equal success in the coming years. One of the main challenges to tackle, which is already taking place, is the transition of the Cohesion Policy to the new European Union after the more recent enlargements of the Union, which have leaded to a larger and, in particular, more heterogeneous, field of application of the policy. The recent economic crisis, will, in addition, put more pressure on the consolidation of the public budget in all levels of the public administration in the coming years. In this scenario, the effective functioning of the tools that form the Cohesion Policy becomes crucial for its sustainability in the long run.

One of the aspects that must be put into consideration, and the issue covered in this paper, is the role that the different levels of fiscal decentralization achieved in every Member State have on the mechanisms ruling the Cohesion Policy. In particular, we will study the programs design under the Structural Actions[1] that pursue the increase of public investment on key areas for growth. We will, therefore, focus our attention in these policies whose purpose is enhancing Public Investment, and will try to evaluate whether the level of fiscal decentralization of the member states play a role in their effectiveness.

Both issues, Fiscal decentralization and EU intergovernmental grants, have been addressed separately in numerous empirical studies**.** In most of the cases the focus of the studies has been centred in estimating the effect of these policies on economic growth. Only very recently, some researches have put their attention on the impact on the distribution of public expenditures. But, to our knowledge, there is no previous work trying to address the importance of the simultaneous effect of both policies.

Economic theory has also traditionally modelled the issues of fiscal decentralization and effectiveness of intergovernmental grants separately. Nevertheless, very recent developments of economic theory in the field of intergovernmental grants have identified the role of fiscal autonomy of granted government in the efficiency of the grants. Results, if not totally contradictory , are not coincident among the few studies.

Volden (2007), for example, develops a model based on a game, solved through subgame perfect equilibrium and backward induction, in which elected politicians in a national and subnational governments compete with each other to claim credit for providing goods and services in a given policy area. He finds that the effect of grants depends on the capacity of the recipient government to efficiently raise taxes. Governments with greater tax-efficiency[2] would experience higher crowding-out induced by the grant, meaning that the grant becomes less effective in enhancing public expenditure in a particular policy area[3].

Kappeller (2007), uses a model with three tiers of government and matching-grants designed to promote public investment that compensate the externalities of re-distribution policies. While the model in Volden (2007) is more general and the grant is assumed to be attached to any policy area, this one suits better the case of the European Cohesion Policy since matching-grants are intended to promote public investment. He finds, instead, that the granted governments would under-invest when tax-autonomy is restricted, particularly in rich regions. In this case, the level of the matching-grants devoted from the medium to the lower level of the administration is also suboptimal.

Economic theory probably needs of further empirical studies identifying stylized facts over which build assumptions and develop richer models. But also the public

[1] In the nomenclature of the European Union, the term "Structural Funds" usually refer to the four Funds conforming the so-called Regional Policy (ERDF, ESF, EAGGF, FIFG) while the "Structural Actions" include, in addition, the Cohesion Fund. In this paper, we will use both terms indistinctively.

[2] Defining tax-efficiency as the capacity that the subsidized government has to efficiently raise taxes. One could think that this variable may be closely linked to the level of fiscal autonomy.

[3] Gil-Serrate and López-Laborda (2005) link the causality in the other direction, stating that economies with a higher "flypaper effect" (expenditure response to an intergovernmental grant) would have a lower optimal level of tax-decentralization.

administrations and the society in general, need of better instruments to judge the results of the several policies taken over. Based on the declared target that the Structural Actions –exclusive of the ESF- are intended to promote Public Investment in key areas for growth, this paper tries to show that the effectiveness of these policies will depend on the level of fiscal decentralization of the country or region of application. Being this the case, the policy implication yield by this result would include taking into account the different levels of fiscal federalism achieved in the Member States in the rules governing the Structural Actions. The one-size-fits-all strategy, that has given reasonably good results in the past, may be improved in order to serve a larger and more heterogeneous European Union in a new scenario in which, most likely, taught constrains in the public budget are going to remain for years after the crisis is overcome.

Spanish regions are, probably, the better example of the development on both policies over the past few years. Spain have, simultaneously, experienced an important decentralization process as well as benefited greatly of the Cohesion Policies run through the Structural Actions. Both processes have been asymmetric and independent: asymmetric because while fiscal federalism has affected differently in time and degree the several Spanish regions, the allocation of Structural Action shows also important differences across regions; and independent, because both policies are completely unrelated, since there is no economical, social or geographical aspects running the processes of decentralization. Therefore, the stronger effect of the Structural Actions devoted to poorer regions affect, equally, to regions with high or low level of fiscal autonomy.

The paper proceeds as follows. Section 2 gives an overview of the main facts and figures describing fiscal decentralization and Structural Funds in Spain, Section 3 present the data and variables, Section 4 describes the methodology and the results, and Section 5 concludes.

2. Fiscal Decentralization and Regional policy in Spain.

We focus our empirical analysis to the period 1993-2007[4]. There are some studies that examine more carefully the process of fiscal decentralization in Spain and the introduction of the Structural Actions in the Spanish regional economy[5]. In this section, we introduce the main figures governing the dynamics of fiscal policy in Spain in this period, in particular, with respect to the two issues that attain this paper: fiscal decentralization and the Structural Actions.

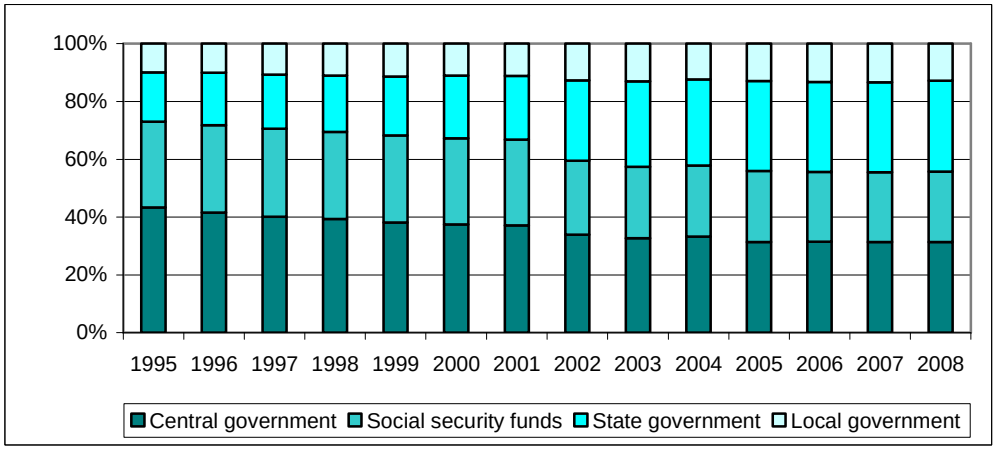
The recent process of decentralization of public financing in Spain starts with the Spanish Constitution of 1978. The Constitution set the bases for the ulterior establishment of the seventeen regional bodies, defined as “Autonomous Communities”, which are the main beneficiaries of the decentralization process. As will see later in more detail, the level of competencies assumed by each regional government and the pace at which these competencies are assumed is not homogeneous among all regions.

[4] Although the first allocation of the Structural Funds in their current structure started in 1989, our sample begins in 1993 due to the lack of homogeneous series of allocation of the Funds, at the regional level for Spain

[5] See for example Molero, 2001 for an impact of decentralization on the fiscal scheme in Spain, and Pardo García (2003) for the Structural Funds. In González-Alegre (2008) both problems are also introduced more extensively.

The constitution of the regional governments finished in 1983[6]. The regional governments are considered NUTS 2 by the European Commission, using its own nomenclature.

Figure 1: Shares of Public Expenditure by level of administration



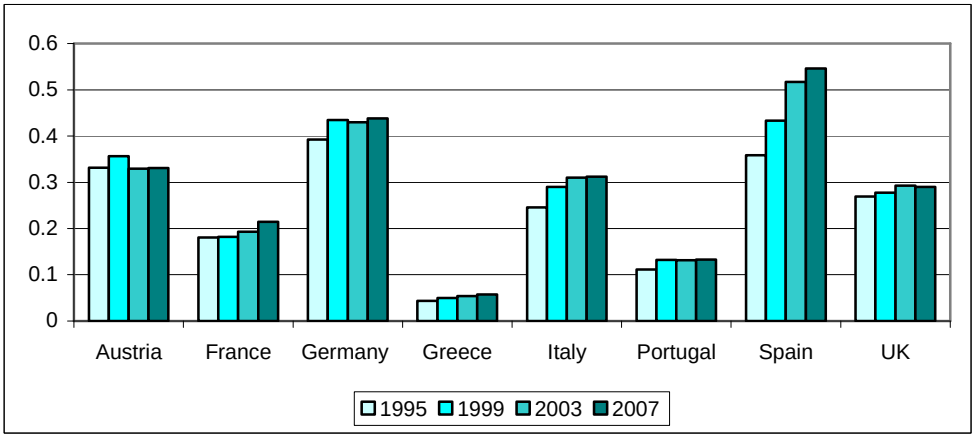
Source: Eurostat, Government Finance Statistics

Simultaneously to this process of political adaptation to the new Constitution, occurred the most important increase of public spending. Total public spending moved from representing less than thirty percent of GDP in the late seventies to lay around fifty percent in the last years. Figure [1] shows how the main beneficiary of the decentralization in the last years has been the regional sector. Local public expenditure has only increased its share over total expenditure 2 percentage points in thirteen years, while the regional level has increased to over 30% of total public expenditure in 2008, compared to 1995 when it represented around 17 %.

Figure [2] shows the share of non-central government expenditure to total public expenditure in several countries. The process of decentralization that Spain has suffered is not a general pattern of behaviour of the countries in its economic environment. The level of this ratio has risen in the recent years to reach a situation comparable to federal countries like Germany.

[6] Although later, in 1995, were constituted the Statutes of the two Autonomous cities, Ceuta and Melilla. These have been excluded from our analysis due to data availability.

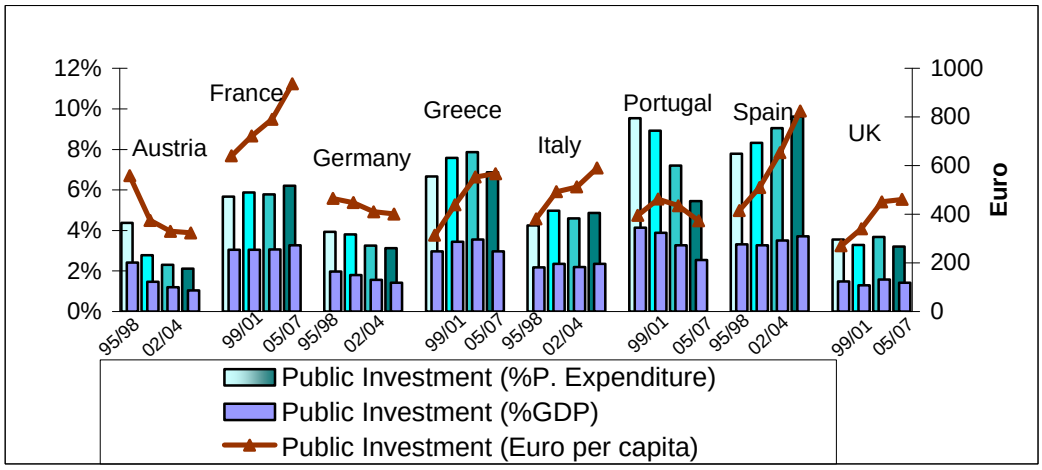
Figure [2]: Ratio of state and local public expenditure to general government expenditure. 1995 2007.



Source: Eurostat, Government Finance Statistics.

The behaviour of public investment in Spain does not seem to correspond, either, to an international trend. If we consider the consolidated public sector, the level of public investment in Spain has growth slightly in the last two decades, in contrast to most of the countries on its economic environment. Public investment –expressed as of percentage over GDP or total public expenditure- is, in general, higher in those economies with a lower per capita income. But for the case of Spain, even in per capita Euro, the raise of Public investment has been remarkable in comparison to other economies in the EU, as shown in Figure [3]:

Figure 3: The Evolution of Public Investment.



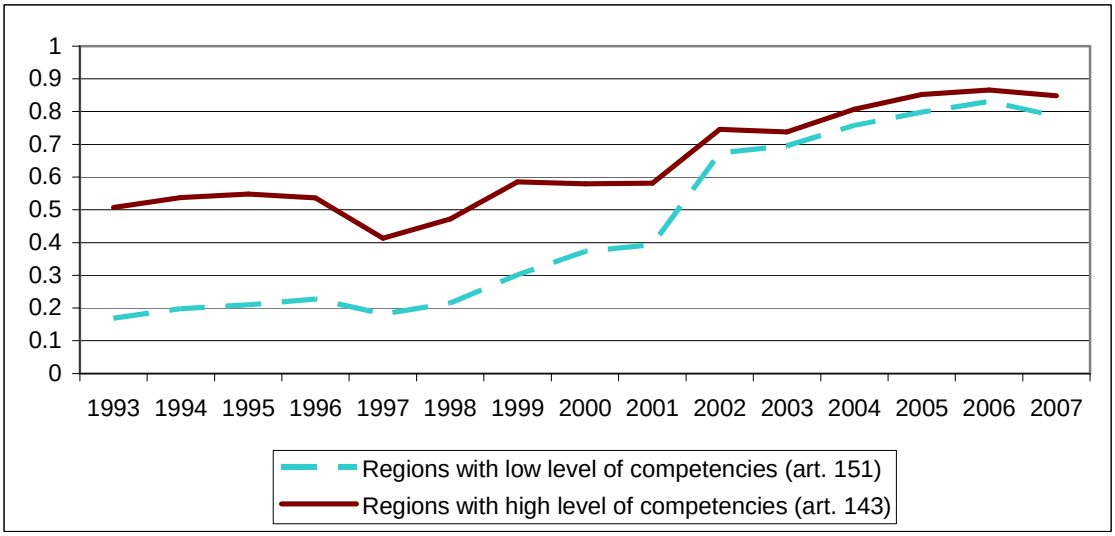
Source: Eurostat, Government Finance Statistics

As we have briefly mentioned before, the level of competencies of every region is not identical. Each region has its own Statute of Autonomy that defines the activities in which the regional government is competent to legislate and govern. In fact, the Spanish Constitution discriminates between two types of regions: the first one is the so-called "historic nationalities" or regions with a high level of competencies. These regions are described in the article 143 of the Spanish Constitution[7].

The second group consists of the ten remaining regions[8] (and the two autonomous cities) that in principle assume a lower level of competencies, and are described in the article 151 of the Spanish Constitution. In practice, the regions with high levels of competencies experienced a higher level of decentralization in the beginning, but the differences have been reduced as long as the decentralization process has been taking place.

We can observe this phenomenon if we build a ratio of fiscal decentralization as the coefficient between per capita expenditure at the regional level to the per capita expenditure at the central level. The average evolution of this indicator in both groups of regions (with high and with low level of competencies) is shown in Figure [4]:

Figure [4]: Decentralization Ratio. Ratio of per capita public expenditure of the regional government to the per capita public expenditure of the central government (excluding social security).



Source: Badespe and "Liquidación del presupuesto de las CC AA"

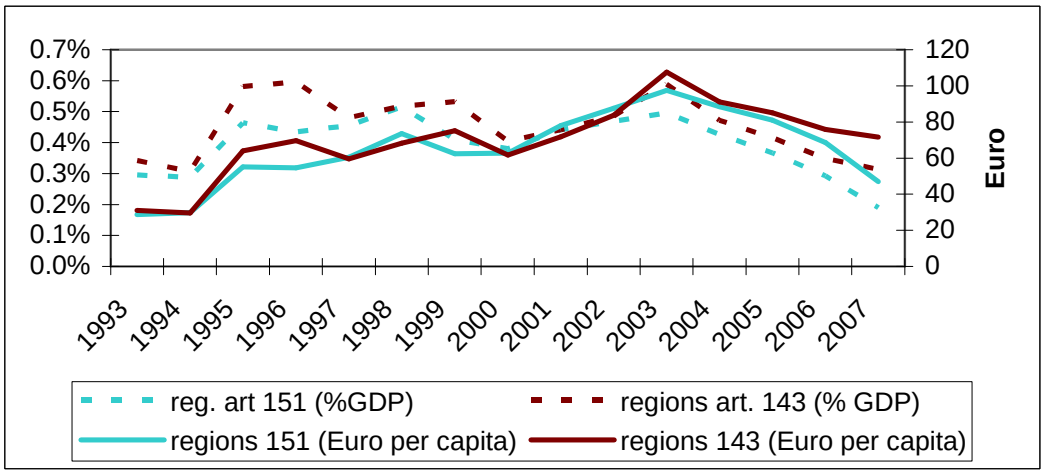
This ratio formed as a coefficient of per capita public expenditures between the regional and central government may present some weaknesses. The main shortcoming may be the fact that the coefficient depends on expenditure policies run by the central

[7] Andalusia, Basque Country, Canary Islands, Catalonia, Galicia, Navarre and Comunidad Valenciana.
[8] Aragon, Asturias, Balearic Islands, Cantabria, Castile La-Mancha, Castile and Leon, Comunidad de Madrid, Extremadura, Murcia and La Rioja.

government[9]. However, for our purpose of intra-country analysis this does not represent a great problem, since the denominator is common for all our regions.

Both groups of regions are not representing either geographical concentration or economic characteristics, meaning that there is no other common denominator between regions with high level of autonomy or between regions with low level of autonomy other than their political status. The next figure has the purpose that there is no systematic difference in the way both groups of regions receive the Structural Funds from the EU. The level of transfers is slightly larger for regions with high level of autonomy since they run more competencies.

Figure [5]: Capital transfers from the EU to the Spanish regional governments. (% GDP and Euro per capita)



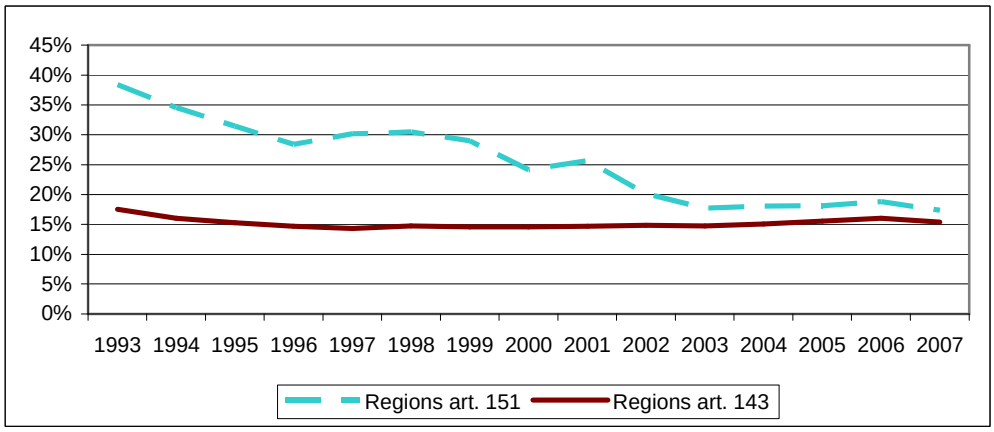
Source: "Liquidación del presupuesto de las CCAA"

The increase in the size regional governments has also affected the distribution of public regional spending among the different economic categories. The regions have augmented the share of current spending, devoting a minor part of their funds to increasing their stock of capital Figure [6].

One might think that this situation could be induced by a certain reallocation of competencies between the central and regional governments. However, the Central Government has not increased its share of capital expenditure, but has, on the contrary, slightly decreased it. The fall in capital share of public expenditure is clearly more relevant in the regions with low levels of competencies, which are also those that have undergone a more profound process of decentralization.

[9] For example, a great increase of Central Government Expenditure in 1987 due to financial operations after the entrance of Spain in the EU has induced an "abnormal" decrease of the value of the ratio for all regions in this year.

Figure [6]: Ratio Capital to Total Expenditure



Source: "Liquidación del presupuesto de las CCAA"

A deeper analysis of the functional categories[10] reveals that the category "Social Public Goods" -using the nomenclature of the functional classification used by the Spanish "Ministerio de Economía y Hacienda"- is the main area of decentralization for the regions with a low level of competencies as well as the main component of the public budget. Other functional categories that have experienced a significant level of decentralization have been "Social Security and Promotion", "Economic regulation of Productive Sectors", "General Public Services" and "Economic Public Goods"

3. Sources of Data

The model is estimated for a balanced panel of the seventeen Spanish regions over the period 1993-2007. The sample begins in 1993 because of the lack of data from previous years in our series of capital transfers to the regional governments. Nevertheless, the first allocation of the Structural Actions under their current format takes place in 1989. We use data until 2007 due to data availability.

The main datasource for our variables of interest, disaggregated public expenditure for the Spanish regions, is the database "Liquidación de Presupuestos de las Comunidades Autonomas" published by the Ministry of Economy of Spain. Some of these data are also available online in the BADESPE database, elaborated by the "Instituto de Estudios Fiscales".

3.2 Dependent variable.

The dependent variable is public investment, expressed as a share of GDP, of the Spanish regional governments.

The data for Public Investment –defined as public capital expenditure, which includes real investment as well as capital transfers- have been extracted from the database "Liquidación de los Presupuestos de las Comunidades Autónomas" published by the

[10] **See González-Alegre (2008)**

Ministry of Economics. The series for GDP have been extracted from the National Statitical Institute (INE).

3.3 Explanatory variables.

The independent variable in which we focus most of our attention is the capital transfers from the European Union to the Spanish regional governments, and we call it EUSF. It includes the accrual revenues of the regional governments corresponding to transfers from the European Union budget to the capital account, under the concept of any of the Structural Funds or the Cohesion Fund. Most of these tranfers will correspond to the three Structural Funds devoted to promote Investment (ERDF, EAGGF and FIFG) or to the Cohesion Fund.

In some of our estimations we include also a measure of Fiscal Decentralization, that we denote "DEC". We recall here the controversy described in Martinez-Vazquez and McNab (2005) about the construction of a variable representing fiscal autonomy. In principle, such a variable should be able to quantify the activities of sub-national governments resulting from their independent decisions. Very often, there are some expenditures are carried out by some levels of the public administration while the effective control of these policy remain on a higher level of the public administration.

In practice, the available data do not let us to address properly these issues. The literature has adopted the standard measure[11] of fiscal decentralization described by Oates (1972) based on local or sub-national to total public expenditure ratio. It seems reasonable to assume that the level of fiscal autonomy is correlated to the share of public resources managed by a regional government.

Alternatively, the level of fiscal autonomy could be instrumented according to the revenues side of the budget, as the ratio between the public revenues collected at the regional level to the national level (Ebel and Yilmaz (2002)). We have discarded the use of a decentralization measure based on the revenue side of the budget as made by other authors[12]. The main reason is that in our set of regions the expenditure side of the budget accommodates better the implementation of new competencies in regional governments, while the sources of revenues, especially tax revenues, is more dependent on the subsequent reforms made to the financing system of the regions[13].

The level of decentralization is built as the ratio of per capita regional expenditure to per capita central government expenditure. The ratio has been constructed using data on regional public expenditure extracted from the database "Presupuestos de las Comunidades Autonomas"; the data on public expenditure by the central government has been extracted from BADESPE; the series of population are from EUROSTAT.

[Table 1 . Variable description and sources of data]

[11] Zang and Zou (1998), Martinez-Vazquez and McNab (2005), Iimi (2004) and Jin, Qian and Weingast (2005), make use of this definition in order to account for fiscal decentralization.
[12] De Haan, Sturm and Sikken (1996), Diaz-Cayeroet al. (2002).
[13] See González-Alegre (2008)

The selection of the remaining control variables has been largely based on studies focused on the determinants of public capital spending, keeping in mind that most of these studies use country data and some of the variables that they include would not fit in our regional panel data (budget deficit or industrialized country dummy, for example).

The set of control variables includes Public Consumption[14], Private Investment population growth, GDP growth, and regionalized central government capital expenditure. Private Investment is a key determinant of Public Investment according to De Haan et al. (1996) and Sturm (2001). The motivation to include an indicator of the expenditure capacity of the government –Public Consumption- can be found, among others, in Kneller et al. (1999 who) suggest that we should also include a variable to account for the public spending not devoted to investment. Increases in the level of public consumption and in general, in the spending possibilities of the country should naturally have an effect on Public Investment. We consider Public Consumption as an indicator of the variations of the spending capacity in the budgets of the public bodies of the country.

Changes in population could be a determinant of the necessities of public capital relative to publicly provided consumption goods. It might also explain the possible scale effects existing in particular kinds of investment via the marginal cost of additional users, in the case of "pure" public goods. Population has been included as an approximation of labour force supply in many studies that examine the productivity of public capital (Ramirez (1998) and Everaert and Heylen (2001)).

The rate of production growth is traditionally included as a determinant of public expenditure.[15] It has been argued that the income elasticity of the demand of some public goods could affect the allocation of public expenditure as growth rates fluctuate. (This is a version of Wagner's Law) It could also take cyclical factors into account, especially when there is no other variable attached to the business cycle in the model.

Central government capital expenditure tries to control for the policy of the central government regarding public capital, and the substitution effect that could induce to regions. We have retrieved these series, with regional level of breakdown, from two datasources: IVIE database (until 2000) and the General Budget ("Presupuestos Generales del Estado") from 2001 onwards. We were able to check the consistency among both series, since we had data from the General Budget prior to 2000.

Restrictive fiscal policy measures may also be induced by high levels of budget deficits or government debt. Roubini and Sachs (1989) show that capital expenditures suffer more drastically under the implementation of these restrictive fiscal policies. This is a consequence of the fact that very often this kind of expenditure is less rigid than other public expenditure categories (De Haan et al (1996)). More recent results by Mehrotra and Valila (2006) using cointegration techniques support this hypothesis. In our case, since we work with regional-level data and the leeway of Spanish deficit to incur into deficit in the period under consideration was extremely limited, we have decided to omit

[14] Defined as public current expenditures.
[15] See for example Miller and Russek (1997), Knelleret al. (1999) Bose et al. (2003).

a variable capturing public deficit at the regional level. We will include this variable only in the equivalent estimation using country-level data, whose results are shown in table [11].

There have been several studies trying to link political variables to the tendency to alter patterns of public spending. The political variables that could affect government spending might be the kind of party in power, the kind of government (coalition, majority government or minority government) and the political influences of lobbying. The more conclusive results have been found in studies that link the influence of political variables on the level of public spending (Roubini and Sachs (1989)) or debt-related issues.[16] However, studies focused on public investment have not been able to find any significant link of the current level of public investment with political variables. We recall here the results in Sturm (2001), for non OECD countries, De Haan, Sturm and Sikken (1996), for OECD countries, and Mizutani and Tanaka (2005), who use regional data from Japan prefectures. Therefore, we do not include any political variable among our set of controls.

[Table 2: Summary Statistics]

4. Empirical Methodology and Results

In this section we construct and estimate a panel data model evaluating the efficiency of the European Regional policy by estimating the response of public investment towards the grants that tend to promote it.

In order to asses the importance of fiscal decentralization in these mechanisms, we try different methodological strategies. First of all, we will split the sample in two sub-sample groups with different levels of fiscal autonomy. We will use two alternative criteria for splitting the sample: one according to the level of fiscal autonomy recognized in the Spanish Constitution and the second one depending on the time-dimension of the panel, taking advantage of the evolution of fiscal decentralization across time.

Secondly, we will introduce the variable "fiscal decentralization" in our panel, and an interaction term relating this variable with the structural actions´ transfers that will capture the joint effect of both variables

Finally, we consider the possibility of estimating a system of equations that determines, simultaneously, the two variables in which we focus our interest: Public Investment and EUSF.

4.1 Breaking the Sample

In order to test the hypothesis that public investment may be affected by European Structural Funds ' grants, we have constructed a model in which the dependent variable

[16]De Haan and Sturm (1997), see Sturm (2001) for a detailed literature review

is Public Investment at the regional level for the seventeen Spanish regional bodies. The set of explanatory variables includes our main variable of interest, EUSF, represent the capital transfers from the EU to the regional government allocated to the region "i " in the current year "t ". We have also introduced in the model other control variables: private investment, public consumption, GDP growth, population growth, and central government investment, included in the vector x:

$$PubInv_{i,t} = \delta\ eusf_{i,t} + \beta\ x_{i,t} + \alpha_i + \varepsilon_{i,t} \qquad (1)$$

Where δ is the coefficient that describes the impact of Structural Funds on Public Investment and the main target of our estimation; x is a vector, (*1x5*), of explanatory variables and β is the set of parameters, (5*x1*) associated to these control variables that must be estimated; α_i is the unobservable unit-specific effect and $\varepsilon_{i,t}$ is the unobservable error term.

In order to estimate equation (1), we have split the sample attending to the level of fiscal autonomy of the regions. We have taken two alternative criteria into consideration in order to consider sub-samples: firstly, we have classified Spanish regions into two subgroups according to the level of fiscal autonomy that the Spanish Constitution recognizes them. Therefore, we create a group of what the Spanish Constitution considers[17] "Historic Nationalities", and a second group of the remaining ten regions[18], for which the Constitutions recognized a lower level of Autonomy.

Secondly, we have considered the time-dimension of the series in order to consider two alternative subgroups with remarkable differences in their level of fiscal autonomy. If we examine Figure NUMBER, we may notice that the evolution of fiscal autonomy across time will let us split the sample and create two groups in which the level of fiscal decentralization achieved is reasonably stable across years in each group but different between them. We have selected the year 2000 as the break point, which in addition will leave us two subsamples of similar length.

The use of two alternative criteria to divide the sample will let us overcome some of the shortcomings which are attached to each criteria. On the one hand, splitting the sample according to the role recognized in the Constitution may arise the doubt that we may be accounting for a systematic difference between both groups of regions that may not come from the level of fiscal autonomy but from an ignored source[19]. On the other hand, breaking the sample into two time-periods may be interpreted as a the identification of some structural change across time.

Primary estimations of equation (1) suggest the presence of autocorrelated errors. Therefore, the original model in equation has been estimated in the presence of serially correlated errors[20].

---

[17] Andalusia, Basque Country, Canary Islands, Catalonia, Galicia, Navarre and Valencian Community.

[18] Aragon, Asturias, Balearic Islands, Cantabria, Castile and Leon, Castile-La Mancha, Extremadura Comunidad de Madrid, Murcia, La Rioja.

[19] Although, there are no remarkable differences in the level of economic development between both groups of regions. There are no, either, geographical, commercial or cultural differences among them.

[20] Preliminary estimations suggest also the use of fixed-effects models. The results of the random effects estimations, as well as the Hausman test are omitted for the sake of brevity.

Initially, we also assume strict exogeneity of the explanatory variables:

$$E[x_{i,s}, \varepsilon_{i,t}] = 0 \qquad t,s=1,2,...T.$$

This assumption may be considered too strong for our model. Many results[21] show that the allocation of public expenditure may be endogenous to the allocation of grants. The distribution of the Structural Funds may be thought to respond to some unobserved necessities and conjuncture that simultaneously drives decisions on public investment. We must admit the possibility that some of the explanatory variables, in particular eusf, must be correlated to the error term since the propensity to increase public investment may incentive larger allocation of Structural Funds (thus, making causality run in the opposite direction to the one assumed in the paper).

The immediate solution to the problem would be to find some instrumental variables correlated to structural funds but orthogonal to public investment. Alternatively, we can use lags of the dependent and explanatory variables as instruments. The GMM estimation method developed by Arellano and Bond (1991) relies on the orthogonality of the dependent and explanatory variables with the first differences of the error component in lagged periods. This method allows us to include endogenous and predetermined dependent variables.

These GMM methods construct moment conditions that reflect this orthogonality, under assumption of serially uncorrelated shocks, error components and predetermined initial conditions[22]. The problem would be, therefore, that we have previously admitted the possibility of the existence or AR(1) errors in the original model, which implies that lagged values of the dependent and explanatory variables are correlated with past shocks and the moment conditions that should be used[23], are no longer valid in the original model

For that reason, we transform the static model into a dynamic one with serially uncorrelated shocks by substracting the autocorrelation term attached to the original errors:

$$\text{PubInv}_{i,t} = \delta\ \text{eusf}_{i,t} + \beta\ \text{x}_{i,t} + \alpha_i + \varepsilon_{i,t} \qquad \text{where } e_{i,t} = \rho e_{i,t-1} + u_{i,t}$$

$$\text{PubInv}_{i,t} = \rho * \text{PubInv}_{i,t} + \delta\ \text{eusf}_{i,t} - \rho\delta\ \text{eusf}_{i,t} + \beta\ \text{x}_{i,t} - \rho\beta\ \text{x}_{i,t} + (1-\rho)\alpha_i + u_{i,t} \quad (2)$$

Equation (2) represents a model with serially uncorrelated shocks that we can estimate using Arellano and Bond (1991) GMM estimator for dynamic panels. The explanatory

[21] Knight (2002), Becker (1996), Besley and Case (2000)

[22] $E[\alpha_i] = E[\varepsilon_{i,t}] = E[\alpha_i \varepsilon_{i,t}] = 0$; $E[\varepsilon_{i,s}\varepsilon_{i,t}] = 0$ *for* $t \neq s$ *and* $E[PubInv_{i,1}\varepsilon_{i,t}] = 0$ *t=2,...T.respectively.*

[23] $E[PubInv_{i,t-s}\Delta\varepsilon_{i,t}] = 0$ *for t=3,…T and* $s \geq 2$; $E[x_{i,t-s}\Delta\varepsilon_{i,t}] = 0$, *for t=3,…T and* $s \geq 2$ *if variables in x are endogenous*

variables are correlated with the individual effects and are assumed to be endogenous with respect to the serially uncorrelated shocks.

4.1.1 Estimation Results

Table [5] shows the results of estimating equations (1) and (2) when we divide our sample according to the level of autonomy recognized for the regions in the Spanish Constitution. Columns [1] to [4] include the estimation for the regions with a lower level of autonomy -as described in the article 151 of the Constitution- while columns [5] to [8] include the estimations for the remaining seven regions, with a larger level of fiscal autonomy, as described in the article 143 of the Spanish Constitution.

Columns [1]-[2] and [5]-[8] assume a fixed-effects[24] model with autocorrelated errors, while [3]-[4] and [7]-[8] are estimates for equation (2) obtaining assuming engogeneity of explanatory variables using one-step version of the GMM estimator developed by Arellano and Bond (1991). In addition, we assume two sets of control variables, one more general and one more restrained.

Results are quite homogeneous among models for every set of regions. The Structural Actions (EUSF) seem to be a significant determinant of Public Investment in the regions with low level of competencies, being the coefficient estimated significantly larger that 0 and smaller than one. However, for the regions with a high level of competencies, the coefficients estimated are smaller and generally insignificantly positive.

As for the remaining control variables, the main source of variability between both data-sets in the coefficient attached to Public Consumption that show a behaviour quite similar to the one described for EUSF. Public consumption will capture the effects of the size of the regional administration. It is expected to increase with larger fiscal autonomy and, therefore, induce further increases also in Public Investment. Private investment is a positive determinant of Public Investment in all cases while the remaining control variables do not seem to play a key role.

Having estimated a different effect of the Structural Actions on Public Investment for the two groups of regions, we also make a second estimation by splitting the sample through the time dimension. If we examine Figure [4], we can see how the level of fiscal autonomy of both groups of regions has increased over time. If we break the sample around year 2000, we observe that the level of fiscal autonomy has remained relatively stable for both groups of regions across time, keeping a significant difference among them.

The results of the equivalent estimations are shown in Table [6]. We have estimated an impact of the EUSF on Public Investment larger and significantly positive for the period 1993-1999, while the estimates for the period 2000-2007 show poor levels of significance. Regarding Public Consumptions, the differences observed in the previous estimation remain but are less strong The behaviour of the other control variables remains stable.

[24] The selection of the fixed-effects model has been made upon estimation of the equivalent random-effects model and the corresponding Hausman (1979) test. Acordingly, the autocorrelated errors have been included upon estimation of preliminary models.

Finally, we run an equivalent estimation using country-level data from the fiveteen oldest Member States of the EU[25]. The data are described in table [4] while the results are shown in table [7]. We have used the same model except for minor modifications with respect to the control variables: the inclusion of central government public investment has been discarded for obvious reasons, while we add to the level of deficit or surplus as a percentage of GDP, as motivated earlier. For the interpretation of the different models with alternative fiscal variables, we recall controversy described in Kneller et al. (1999) about the omitted variable issue.

This additional estimation with country-level data do not yield interesting conclusions over the previous results, since the variable object of our interest, the EUSF, is found to be significantly zero in all possible models. Or course, this could be due to the fact that the effectiveness of the EUSF in Spain is larger than the European average, but there are many other possible explanations for this result and we do not intent to deep into the controversy here, since is not the purpose of this paper.

To sum up, by splitting the sample according to the level of fiscal autonomy of the regions we observe that the impact of the Structural Actions on Public Investment is larger in the group with a smaller level of fiscal autonomy. We have shown this by using two alternative criteria in order to split the sample: the level of fiscal autonomy recognized in the Spanish Constitution and the time-evolution of fiscal decentralization in the country as a whole.

4.2 Interaction Term.

In order to take into account for the effect of the evolution Fiscal Decentralization on the relationship between the Structural Actions and Public investment, we will make use of an Interaction term. Interaction terms may be added to a model in order to incorporate the joint effect of two variables on a dependent variable, over and above their separate effects. These are usually added as the cross-product of two independent variables, typically placing them after the simple "main effects".

In this subchapter, we will analyze the interaction of fiscal decentralization (represented by the variable “dec”) and the capital transfers received by regional governments (represented by “eusf”). The separate effect of both variables are expected to be positive, since an increase in the level of fiscal decentralization (measured as the ratio of per capita regional over national public expenditures) is assumed to increase the size of regional governments and, therefore, increase on public expenditures –compressive of public investment-. The effect of the capital transfers through the Structural Actions (eusf) would follow the arguments examined in the previous subchapter.

$$PubInv_{i,t} = \delta_{(1)}\ eusf_{i,t} + \delta_{(2)}dec + \delta_{(3)}eusf*dec + \beta\ x_{i,t} + \alpha_i + \varepsilon_{i,t} \qquad (3)$$

The interaction term would capture, therefore, the joint effect of these two variables. We can see in table [8] the results of estimating the model represented by equation (3) for the whole sample. We have expanded our set of alternative control variables, since we

[25] We use data retrieved from Eurostat for the period 1999-2007, expressed in the same units as in the previous estimations.

expected that the correlation between "Public Consumption" and DEC might be problematic. The results, however, look quite robust with respect to this issue. As for the estimation assumptions and methodology, we have follow similar guidelines as tables [5]-[7].

We have estimated a negative coefficient attached to the interaction term in all cases. The level of significance, however, is variable and seems to depend on the set of controls. The negative coefficient means that the join effect of additional decentralization and public investment becomes weaker. If we assume a fixed level of decentralization, for example, additional EUSF will induce an effect on Public investment equal to the coefficient estimated for EUSF plus the coefficient estimated for the interaction term times decentralization. Given that the coefficient estimated for the interaction term is negative, the effect of EUSF on public investment is positive, but decreasing for larger decentralization.

Crossproduct interaction terms may be highly correlated with the corresponding simple independent variables in the regression equation, creating problems with assessing the relative importance of main effects and interaction effects. Because of this, sometimes it may well be desirable to use centered variables (where one has subtracted the mean from each datum). This transformation often reduces multicollinearity. For the sake of robustness, we have also run equivalent estimation using a centered interaction term and the results do not change significantly (see table [9])

4.3 Simultaneous Equation model

We want to check the robustness of our result to the introduction of a simultaneous equation model (SEM), in which we capture causality in both directions. One could think that the two variables in which we focus our interest: eusf and public investment, are jointly determined by a system of equations. In fact, the political decision of investing is closely related to the political decision of allocating –or making use of- the Structural Funds. Also the economic realization of the payments is closely related given that both variables are often related to common investment projects.

In addition, each one of the variables may be a determinant of the other one. So far we have considered that the allocation of Structural Funds may encourage Public Investment, but me must be aware that the propensity to invest in the public sector may also incentive the allocation of Structural Funds in a particular region.

The system would consist on two structural equations, on in which the dependent variable is Public Investment, while in the other the capital transfers allocated through the Structural Funds. This SEM would be *autonomous*, since each equation has economic meaning in isolation of the other. Each of the equations includes one of the variables as dependent variable but also the other one as an explanatory –endogenous- variable. In addition to these, we also include a set of exogenous variables[26]:

[26] One might be tempted to think that Public Current Expenditures should take part of the simultaneous equations model as an endogenous variable. As Wooldridge (2002) describes for an example relating *hours devoted to crime* with *hours devoted to work*, the choice of the share of the public budget devoted to current expenditures and to investment is the solution of the maximization problem of the utility function of the government and depends on exogenous factors –like the population, level of education,

$$PubInv_{i,t} = \delta_{(1)}\, eusf_{i,t} + \beta_{(1)}\, x_{(1)i,t} + \alpha_{(1)i} + \varepsilon_{(1)i,t} \qquad (4)$$

$$eusf_{i,t} = \delta_{(2)} PubInv_{i,t} + \beta_{(2)}\, x_{(2)i,t} + \alpha_{(2)i} + \varepsilon_{(2)i,t} \qquad (5)$$

Where $x_{(1)}$ and $x_{(2)}$ are two vectors, (*1xm*) and (*1xn*) respectively, of exogenous explanatory variables. Both vectors are not identical, but they can share some variables. $\beta_{(1)}$ and $\beta_{(2)}$ are the set of parameters, (*mx1*) and (*nx1*) respectively, associated to the exogenous variables that must be estimated. $\alpha_{(1)i}$ and $\alpha_{(2)i}$ are the unobservable unit-specific effects and $\varepsilon_{(1)i,t}$ and $\varepsilon_{(2)i,t}$ are the unobservable error terms.

We estimate the model above following different alternative estimation methods in order to check for the robustness of the results[27]. First of all, we assume that the source of endogeneity is present through a positive correlation between the endogenous variables and the error term $\varepsilon_{(1)i,t}$. In this setup, the model may be estimates assuming Fixed-Effects through two-stage least-squares (FE-2SLS) and assuming Random-Effects through the Error-Component two-stage least-squares estimator developed by Baltagi(1981)[28]. Results obtained using this estimation strategy are presented in table [10]

Alternatively, we may assume that the source of endogeneity comes from the positive correlation between the idiosyncratic term and the endogenous variables. The explanatory variables are, then, orthogonal to the structural errors and the exogenous variables are, in addition, orthogonal to the idiosyncratic term, α. If we assume Fixed-Effects, the model can be estimated by OLS after the within transformation, as shown by Cornwell et al. (1992).

For the cases in which the unit-specific effects are random, we make use of the Two-stage least-square Hausman and Taylor (1981) procedure (HT-2SLS) estimator[29]. The method of 2SLS is the most common method used for estimating simultaneous-equations models, because of their simplicity and asymptotic efficiency. In this case, we include also additional variables on equations NUMBER AND NUIMBER, $z_{(1)}$ and $z_{(2)}$ respectively, which are two vectors of time-invariant explanatories[30], including both endogenous and exogenous variables:

---

private investment, etc-. Of course, some endogeneity may arise when estimating the relations among both variables, but we consider that this possibility is more related to an omitted variables problem –or even to measurement error- rather than to simultaneity. The case for Public Investment and Capital Transfers (EUSF) is different since in this case both expenses are accrued simultaneously when referred to the same investment project.

[27] We use limited information estimators, which means that every equation of the system is estimated at a time, in contrast to full-information systems, in which the estimators are based on the entire systems of equations.

[28] See Baltagi (2005) for details on this estimator.

[29] There are alternative procedures to the HT, for example the Amemiya and Mc Curdi (1986) or the Breusch, Mizon and Schmidt (1989), which make use of additional instruments but at the cost of additional assumptions about the exogeneity of the explanatory variables and all their future and past values. See Cornwell et al. (1992) for a detailed description of the different estimators and their properties.

[30] The time-independent variables included for the estimation through the Hausman-Taylor procedure are described in table []

$$PubInv_{i,t} = \delta_{(1)}\, eusf_{i,t} + \beta_{(1)}\, x_{(1)i,t} + \varphi_{(1)} z_{(1)i} + \alpha_{(1)i} + \varepsilon_{(1)i,t} \qquad (6)$$

$$eusf_{i,t} = \delta_{(2)} PubInv_{i,t} + \beta_{(2)}\, x_{(2)i,t} + \varphi_{(2)} z_{(2)i} + \alpha_{(2)i} + \varepsilon_{(2)i,t} \qquad (7)$$

Usually, as we are not interested in their effect, time-invariant variables are omitted since their effect may be captured by the idiosyncratic-term. However, for the HT 2SLS estimator, they are used as instruments to estimate the system, so it may be useful to include them**.** We describe in table [3] the time invariant variables included in the HT 2SLS regression. These are, basically, determinants of the Investment needs and economic performance at the beginning of the sample and its selection has been made upon consultation of several studies addressing public investment[31]. Results upon the assumption that the endogenous variables are correlated with the unit-specific term are shown in table [11].

Both, tables [10] and [11], show similar results with respect to most of the variables under consideration. The results previously observed with respect to the impact of the Structural Funds on Public investment are reinforced in after this estimation, although it must be stressed that the option in which we assume fixed-effect and orthogonality of the endogenous variables with the error term (table [11]) yields poor significant coefficients. Public Investment, simultaneously, seems to be a key determinant of the volume of Structural Funds allocated to each region in each period, although the coefficients attached to this direction of the causality are significantly smaller than those from equation (4) and (6).

Decentralization is a positive determinant of public investment. This result was know from the previous estimations of the paper and it was also expected, since the variable fiscal decentralization is an indicator of the size of the regional government[32] and, therefore, of its expenditure power.

Nevertheless, we find a significant negative coefficient when estimating the impact of fiscal decentralization on the Structural funds (equations (5) and (7)). This result may be linked to the main hypothesis of this paper that relates the efficiency level of the Structural Funds to the degree of fiscal autonomy of subsidized governments. At a first glance, one might be tempted to think that after increasing the level of fiscal autonomy of a region, Public investment may be spread over more heterogeneous policy areas. This expansion may be attached to competencies that are not eligible for the Structural Funds, reducing, therefore, the possibility of the government to maintain the relationship between Structural Funds and public investment.

Of course there are many alternative interpretations that could justify the coefficient estimated. In any case, most of them would be related to the fact that the Structural Funds become less efficient when related to administrations with larger levels of autonomy.

[31] With a particular attention to Mitze (2007), since he uses also this simultaneous equation estimator

[32] As well as the variable "Public Consumption. In fact, one might expect a significant level of colinearity between both variables, which would justify the use of the alternative models estimated, as introduced before.

The coefficient estimated for the exogenous variables are, in general, expected and consistent across models. Among them, the level of significance of "population growth" as a negative determinant of public investment becomes relevant with respect to previous subchapters of this paper. It is not surprising, in any case, that public investment should depend negatively on the level of population growth since an increasing population will naturally demand for larger current expenditures and will constraint further the budget possibilities of the government to invest.

Tables [12] and [13] replicate the SEM estimation after splitting the sample into the group of regions with low level of competencies (art. 151) and the regions with high level of competencies (art. 143). Table [13] presents the results assuming that the source of the endogeneity is the correlation of the variables with the unit-specific effect, while table [13] assumes correlation with the error term. We have estimated only the reduced versions of the models assuming both, random and fixed-effects.

The estimations have to be taken cautiously since the number of observations, in particular in the case of the regions with high level of autonomy, is a bit limited. In general, the coefficients estimated for the regions with low level of autonomy a larger in absolute value and level of significance for the variables of our interest. The results for the equations explaining Public Investment confirm our previous chapters.

Public investment, as a determinant of EUSF is stronger also in the regions with low level of autonomy, while in the regions with high level of autonomy, EUSF seem to depend very few of the propensity of the government to invest. This result could motivate the previous one: if the matching-mechanism of the grants do not work so well in decentralized regions, one should naturally expect also the grants to be less effective there.

Finally, also the level of fiscal decentralization as a determinant of EUSF seems to be more –negatively- important in regions with low level of autonomy. That is somehow an expected result since these regions have experienced the larger decentralization process and, in any case, confirm our previous suspicious that by gaining fiscal autonomy regions find it more difficult to be eligible for additional grants.

44..Previous literature.

In this section we present a brief review of empirical studies related to the issue address here. To our knowledge, there are no empirical studies trying to link the Structural Actions with the response of public expenditure in governments that perceive it. In addition, the issue of fiscal decentralization has been usually addressed linked to economic growth. Therefore, none of the studies presented ahead will be comparable to the research we undertake in this paper, but they have a common denominator with one of the main issues introduced here: fiscal decentralization, intergovernmental grants or the Regional Policy of the EU.

Decentralization

The first empirical studies about decentralization have traditionally focused their attention towards the relationship of decentralization with enonomic growth. The literature has not been able to find a clear relationship between additional fiscal decentralization and higher economic growth. While some studies suggest that decentralization may foster growth[33] (Iimi (2004), using panel data from 1997 to 2001 for 51 countries), other studies find no clear relationship (Xie, Davoodi and Zou (1999) for the US; Woller and Phillips (1998) for a panel of developing countries) and some other studies show that fiscal decentralization may be detrimental for growth (Zhang and Zou (1998) for China; Davoodi and Zou (1998) for developing countries; and Thornton (2006) for developed countries). With respect to the Spanish case, Carrion-i-Silvestre et al. (2008) find that fiscal decentralization has a positive effect on economic growth for the regions with the highest levels of fiscal and institutional decentralization, but the opposite effect is found for those regions with lower levels of competencies. Esteban (2006), however, find a positive correlation for the regions with low level of competencies. In contrast, Perez and Cantarero (2006) find insignificant correlation between fiscal decentralization and economic growth for the Spanish regions.

Of course, the dimension of the results will depend on the origin of the data, since the impact of fiscal decentralization on the economy shall necessarily depend on the quality of many other economic or institutional variables. Thiessen (2003), using a panel of developed OEDC countries, unmasks one of the more intuitive factors that could play a role in fiscal decentralization. He concludes that there is an optimal level of decentralization over which no additional gains are obtained from decentralizing. In fact, on might think that, in addition to any other institutional and economic factors, the actual level of fiscal decentralization may be a key determinant of the success of decentralization policies.

Some other empirical studies have tried to find the channel through which fiscal decentralization could affect economic growth. The impact that decentralization could have on the level of inflation has been found to be insignificant (Treisman (2000), Rodden and Wibbels (2002)). Martinez-Vazquez and McNab (2006) examine the impact that decentralization could have on macroeconomic stability finding a positive relation that would imply an indirect positive impact with economic growth. Other links have been established betweeen decentralization and the level of corruption (Fisman and Gatti (2002) and the level of political participation (Huther and Shah (1998)).

[33] Gil-Serrate and Lopez-Laborda (2005) also find a positive impact of fiscal decentralization on economic growth for Spain, when decentralization is referred to tax autonomy.

The branch of this literature that show a closer link to this study is probably the area that look at the link of fiscal decentralization with the composition of public expenditures[34]. This issue has only begun to be addressed recently. Arze , Martinez-Vazquez and McNab (2005) find strong evidence of the hypothesis, especially for developing countries, that higher levels of fiscal decentralization increase the shares of consumption expenditures in the public budget (in particular, they refer to education and health expenditures as publicly provided private goods). González-Alegre (2009) shows a similar result for the Spanish regions regarding the share between current and capital expenditures. Faguet (2004) analyses the effects of the process of decentralization in Bolivia at the local level, and finds that the functional composition of public expenditure changes with decentralization to a more efficient allocation. He looks at several functional categories of expenditure and shows that the distribution of public expenditure is more adapted to local needs after the decentralization process that experienced this country in 1994.

The European Cohesion Policy as Intergovernmental Grants

The Structural Actions that we study here is part of the so-called, European Cohesion policy or European Regional Policy, whose target is to foster economic growth in these less-developed areas of the Union. Many opinions are relatively pessimistic with respect to the results of this policy. In fact, the map of the geographical areas that are the target of structural actions in the several programs run by the EU, has showed little change through the several programs.[35] There are many empirical studies that support this opinion: Dall 'Erba and Le Gallo (2003) use a model that controls for spatial spillover effects among regions, since they detect the presence of a growth diffusion process, especially on the core regions of the EU. They suggest that the small extent of spillover effects in peripheral regions could be an explanation of their backwardness, and that even greater targeted funds do not allow spillovers in periphery. Rogríguez-Pose and Fratesi (2004) use panel data analysis to identify the lack of upward mobility of assisted regions and the absence of regional convergence. They think that the failure of the EU Structural policy may come from the excessive skewness towards infrastructure and business support of development strategies in Objective 1 regions.

There are also some more optimistic results, especially in studies focused on particular member countries. Percoco (2005) analyses the effect of the Structural Funds on the economic growth of the Italian Objective 1 regions and finds that induced growth rates depend highly on the institutional behaviour of the subsidized government. At the European level, the analysis by Ederveen et al. (2002) comprises most of the issues arised by the EU to evaluate the performance of the policies and yield a positive

[34] Molero (2002) incluye a detailed analisys of the evolution of public expenditure in Spanish regions for the period in which fiscal decentralization takes place. Alvárez et al. (2000) relates the relationship of fiscal decentralization in Spain to the size of the public sector.

[35] 1994-1999 and 2000-2006 and 2007-2013.

evaluation of the past performance of the Structural Funds although arising also some questions about their future. Ederveen and Gorter (2002) are, however, more pessimistic when it comes to the effects in terms of convergence.

There are a great number of studies focused on the particular case of Spain. De la Fuente (2002) suggest that the impact of the Structural Funds in Spain has added around a percentage point to annual output growth in the average Objective 1 region and 0.4 points to employment growth. The results in Sosvilla-Rivero (2005) are more optimistic in term of employment growth. Lima and Cardenete (2007) share this view and arise the importance of the long-term effects of the policies. Pardo Garcia (2003) is equally optimistic about their impact and suggest that in the future the policies should take care of enhancing human capital. Farrell (2004) shows the importance of institutional quality on the effectiveness of the Structural Actions, in a compared analysis with Ireland.

In this paper, however, we look at the impact of the Structural Actions on the behaviour of public investment since we think that one of the main scopes of these actions –with the exception of the European Social Fund- is to promote investment in the public sector. None of the aforementioned studies address this issue. We have made a first attempt to look at the problem in Gonzalez Alegre (2008), and show the impact that, at a European level, the funds may have in enhancing public investment. In contrast, there are many studies that address the same problem for a different economic environment, in particular with US data. The closer to this one is probably the work[36] by Knight (2002) who studied the response of state expenditure on public highways to grants provided by the Federal aid highway program. The target of this Federal grants program is to enlarge public expenditure in a determinate area but he finds that federal grants do significantly crowd out state expenditure on highways, so expenditure finally would increase around 18% of the grant received.

[36] A complete review of the empirical literature analyzing intergovernmental grants may be found in Gonzalez Alegre(1998)

Autor/s (year)	Main Issue	Data coverage	Methodology	Main Results
Alvárez , Arizaga and Aparicio (2000)	The impact of fiscal **decentralization** on the size of the public sector	Spanish public sector at the regional level, 1993	Estimation of a model for cross-sectional data	Fiscal decentralization has a negative impact on the size of the public sector
Molero (2002)	Public Spending and **Fiscal Federalism** in Spain	Spanish Public Administrations, 1988 1998	Descriptive Statistics	Fiscal decentralization is more related to Public Expenditure related to *economic intervention* in regions with low level of competencies, while in regions with a high level of competencies is more related to *Redistribution.*
De la Fuente (2002)	Impact of **EU Cohesion Policy** on Spanish Objective 1 Regions	Spanish Region-level data, 1994-2006	Panel-data estimation of growth model, and calibration of the impact.	The EU Funds add one percentage point to annual output growth in and 0.4 percentage points to employment growth.
Pardo Garcia (2003)	**European Cohesion Policy** in Spanish Regions	Spanish Regions, 1988-1999	Descriptive analysis of the Community Support Framework	The weakest regions have improved their infrastructures, but there are many differences about their innovation capacity, knowledge access, information, and the training of human resources.
Farrell (2004)	Effect of **European Cohesion Policy** on Spanish and Irish Economies.	National-level data, 1990-2000	Descriptive Statistics	EUSF promoted economic growth, but more efficiently in Ireland. In Spain, regional disparities actually increased. Part of the explanation lies with the institutional differences and policy decisions taken in each Public Administration.
Sosvilla Rivero (2005)	Impact of **EUSF** on growth and employment	Spanish Objective 1 Regions (1989 2006)	Adaptation of the HERMIN model to the Spanish regions (demand and supply effects of the EUSF).	Average increase of 0.56 percentage points in the growth rates . Average increase in *per capita* income of 425 euros at 1999 prices. Increase of 1.46 per cent in employment.
Perez González and Cantarero Prieto (2006)	Fiscal **decentralization** and Economic Growth	Spanish Regional Data, (1986-2001)	Panel data model. Fixed-Effects and Instrumental Variables.	The impact of fiscal decentralization on economic growth is insignificant.
Gil-Serrate and López-Laborda (2005)	Tax-**decentralization** and economic growth	Spanish national and regional data, 1980-1997	Calibration of growth model that accounts for tax decentralization	An increase in the level of tax decentralisation in the Spanish economy compared to the level existing in the taken period would result in economic growth.
Carrion-i-Silvestre, Espasa and Mora (2008)	Contribution of fiscal **decentralization** to economic growth	Spanish Regional Data, 1964-2000	Panel Data model estimated by GMM	For the regions with higher level of competencies, fiscal decentralization has positive and significant effects on economic growth, but fiscal decentralization has negative effects on the regions with lower level of competencies.

5. Conclusions

The impact and efficiency of the Structural Actions carried over by the European Union in order to enhance sustainable development in European Regions may depend of the level of fiscal federalism of the Member States. In this paper, we address the particular case of the Actions designed to enhance Public Investment in key areas for growth.

Spain have experienced a process of fiscal decentralization in the recent years and, simultaneously, has been recipient of an important share of the Structural Actions. Due to the heterogeneous level of economic development and also to the diverse political status of Spanish regions, both policies have affected them in an asymmetric way. These conditions make Spanish regions the perfect benchmark in order to analyze the role of fiscal decentralization on the mechanisms driving the Structural Actions.

We test whether the impact of the European Union Structural Funds (EUSF) on Public Investment at the regional level is affected by the level of fiscal autonomy of the recipient government. For this purpose, we build and estimate a panel data model in which Public Investment is the dependent variable and the EUSF is among the set of explanatory variable. We use Spanish data at the regional level for the period 1993-2007.

In order to capture the role of fiscal decentralization, our first exercise is to break the sample into sub-groups with similar levels of fiscal decentralization among them. By comparing the different estimates we are able to identify whether the level of fiscal autonomy determines the impact of the EUSF on Public Investment. We first separate these regions with have a higher level of autonomy recognized on the Spanish Constitution –and experience de facto larger autonomy- with the remaining regions. The estimates reveal that the impact of EUSF is significant for the groups with lower level of fiscal autonomy and not for the others. Then, taking advantage of the fact that fiscal decentralization in Spain is an ongoing process, we split the sample into two sub-periods (1993-1999 and 2000-2007) in which all regions experienced heterogeneous but stable over time levels of fiscal autonomy. The results confirm the previous findings and the coefficients estimated for EUSF in the first subperiod –in which all regions experienced a lower level of fiscal autonomy- were larger and with stronger levels of significance in comparison to the ones estimated for the period 2000-2007.

Secondly, we construct a model that we estimate for the entire sample, in which we introduce a measure of Fiscal Decentralization (DEC) as well as an interaction term of both variables (DEC and EUSF) among the set of explanatory. The purpose is that the interaction term captures the join effect of both variables in Public Investment. We estimate a negative coefficient attached to the interaction term, this meaning that an the effect of one of the variables on the Public Investment depends, negatively, on the value of the other.

Finally, we construct a simultaneous equation model in which Public Investment and EUSF are decided simultaneously and each one is a determinant of the other. This model will allow us to identify the extent to which Public Investment may also be a

determinant of the allocation of Structural Funds as well as the role of Fiscal Decentralization (DEC) on the process of allocating funds across regions. In fact, we conclude that, although to a minor extend, the decision of the regional government of investing may also determine the amount of EUSF allocated to it on that year. We also estimate that DEC is a negative determinant of EUSF, meaning that regions with larger fiscal autonomy –being equal the level of public investment- will receive less Funds. This situation may be induced by the larger dispersion of the policy areas in which these regions decide their investment. Many of these "new" policy areas may be not eligible for the Funds. Of course, there may be other interpretations of this negative coefficient estimated, but always under the premise that regions with larger level of fiscal autonomy find less incentives to increase their investment through the Structural Actions.

The main conclusion of the paper is, therefore, related to the fact that the optimal design of the Structural Actions should internalize the extremely heterogeneous levels of fiscal federalism that we observe across the Member States. In particular, after the recent enlargements of the European Union, we observe a great degree of heterogeneity in the design of the regional sector across countries, with extremely different levels of fiscal federalism and allocation of competencies. The Structural Actions are now able to respond to this heterogeneity only under the condition that they may be allocated either to national or sub-national levels of administration. However, the rules governing the Funds are equal in all cases, and we can show that, at least with respect to the level of efficiency of the Funds, the fiscal autonomy of the recipient government makes a difference.

Bibliography

ALVAREZ GARCIA, S., ARIZAGA JUNQUERA, M.C. and APARICIO PEREZ, A. (2000), “Descentralización Fiscal y Crecimiento del Gasto Público en España. Un Análisis desde los Principios de la Economía Política Constitucional”, Anales de Economía Aplicada, XIV Reunión AEPELT

AMEMIYA, T., and MaCURDY T. (1986): “Instrumental-Variable Estimation of an Error-Components Model”, Econometrica, 54(4), 869.881

ARELLANO, M. and BOND, S. (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", Review of Economic Studies, 58, 227-297.

ARZE, F.J., MARTINEZ VAZQUEZ, J. and MCNAB, R. (2005) “Fiscal Decentralization and the Composition of Public Expenditures”, International Studies Program Working Papers, 05-01

BALTAGI, B. (1981) “Simultaneous equations with error components.”, Journal of Econometrics 17, 189-200

BALTAGI, B. (2005), “Econometric analysis of panel data”, John Wiley & Sons (3rd ed.), Chichester.

BECKER, E. (1996), "The illusion of fiscal illusion: Unsticking the flypaper effect ", Public Choice, 86, 85-102.

BESLEY, t. and CASE, A. (2000), "Unnatural Experiments? Estimating the Incidence of Endogenous Policies ", The Economic Journal, vol. 110, No. 467.

BHARGAVA, A.,FRANZINI, L. and NARENDRANATHAN, W. (1982), "Serial Correlation and the Fixed Effects Models " Review of Economic Studies, 49 , 533-549.

BOSE, N., HAQUE, M.E., and OSBORN, D.R. (2003), "Public Expenditure and Economic Growth: A Disaggregated Analysis for Developing Countries", Centre for Growth and Business Cycle Research Discussion Paper Series (University of Manchester), No. 30.

BREUSCH, T., MIZON, G. and SCHMIDT,P. (1989), "Efficient Estimation Using Panel Data", Econometrica, 57(3), 695-700

CARRION-I-SILVESTRE, J.L., ESPASA, M. and MORA, T. (2008), “Fiscal Decentralization and Economic Growth in Spain”, Public Finance Review, 36 (2), 194-218.

CORNWELL, C., SCHMIDT, P. and WYHOWSKI, D. (1992), "Simultaneous equations and panel data," Journal of Econometrics, 51(1-2), 151-181.

DALL 'ERBA, S. and LE GALLO, J. (2003), "Regional Convergence and the Impact

of European Structural Funds over 1989-1999: An Spatial Econometrics Analysis ", Regional Economics Applications Laboratory (REAL), University of Illinois, Discussion paper.

DAVOODI, H., and ZOU, H. (1998): "Fiscal decentralization and economic growth: a cross-country study", Journal of Urban Economics 43: 244-257.

DE HAAN, J., STURM, J.E. and SIKKEN, B.J. (1996), "Government Capital Formation: Explaining the Decline ", Weltwirtschaftliches Archiv, vol 132 (1).

DE LA FUENTE, A. (2002), "The effect of Structural Fund Spending on the Spanish Regions: an Assessment of the 1994-99 Objective 1 CSF", CEPR Discussion Paper, no. 3673.

DIAZ-CAYEROS, A., McELWAIN, K.M., ROMERO, V. and SIEWIERSKI, K.A. (2002), "Fiscal Decentralization and Particularistic Spending across Countries,", Conference on Comparative Analysis of Political Institutions, Princeton University, April 18-19.

EBEL, R.D. and YILMAZ, S. (2002), "On the measurement and Impact of Fiscal Decentralization", World Bank Policy Research Working paper, no. 2809.

ESTEBAN, S (2006) "La descentralización fiscal y el crecimiento económico. Aplicación a las Comunidades Autónomas de Régimen Común (1997-2001)", Tesis Doctoral, Universidad de Valladolid.

EVERAERT, G. and HEYLEN, F. (2001), "Public Capital and Productivity Growth: Evidence from Belgium, 1953-1996", Economic Modelling, 18, 97-116.

EDERVEEN, S. and GORTER, J. (2002), "Does European Cohesion Policy reduce Regional Disparities? An empirical Analysis", Central Planning Bureau Discussion Paper no 15/02

EDERVEEN, S, De GROOT, H.L. and NAHUIS, R. (2002), "Fertile Soil for Structural Funds?", Central Planning Bureau Discussion Paper no 10/02

FAGUET, J.P. (2004), "Does Decentralization increase Government Responsiveness to Local Needs?: Evidence from Bolivia", Journal of Public Economics, 88.

FARREL, M. (2004), "Regional integration and cohesion. Lessons from Spain and Ireland in the EU" Journal of Asian Economics 14, p. 927–946

FISMAN, R. and GATTI, R. (2002), "Decentralization and corruption: evidence across countries," Journal of Public Economics, 83(3), 325-345,

GIL-SERRATE, R and LOPEZ-LABORDA, J. (2005), "Modelling Tax Decentralization and Regional Growth", Instituto de Estudios Fiscales, P. T. N. 14/05

GONZALEZ-ALEGRE, J. (2008),” The distribution of Public Expenditure in Europe”, PhD thesis, European University Institute.

GONZALEZ-ALEGRE, J. (2009),” Decentralization and the Composition of Public Expenditure in Spain”, Regional Studies, forthcoming.

HAUSMAN, J.A., (1979), “Specification Tests in Econometrics”, Econometrica 46, 1251-1270

HAUSMAN, J.A. and TAYLOR, W.E. (1981), “Panel data and unobservable individual effects”, Econometrica, 49, 1377–1398.

HUTHER, J. and SHAH, A. (1998), "Applying a simple measure of good governance to the debate on fiscal decentralization," World Bank Policy Research Working Paper Series, no. 1894.

IIMI, A. (2004), “Decentralization and Economic Growth Revisited: An Empirical Note”, Japan Bank for International Cooperation Working Paper, 17/2004.

JIN, H., QIAN, Y. and WEINGAST, B.R. (2005), “Regional Decentralization and Fiscal Incentives: Federalism Chinese Style”, Journal of Public Economics, 89, 1719-1742.

KAPPELLER, A. (2007), “Redistribution and Conditional Grants for All! Federal or Supranational Accountability?”, Munich Graduate School of Economics, mimeo

KNELLER, R., BLEANEY, M.F. and GEMMELL N. (1999) "Fiscal policy and growth: evidence from OECD countries", Journal of Public Economics 74, 171-190.

KNIGHT, B. (2002), "Endogenous Federal Grants and Crowd-out of State Government Spending: Theory and Evidence from the Federal Highway Aid Program", The American Economic Review, Vol. 92, No. 1.

LIMA, M.C. and CARDENETE, M.A. (2007), "The effects of European funds on a regional economy: an applied general equilibrium analysis," Applied Economics Letters, 14(11), 851-855

MARTINEZ VAZQUEZ, J. and MCNAB, R. (2003), “Fiscal Decentralization and Economic Growth”, World Development, 31 (9).

MARTINEZ VAZQUEZ, J. and MCNAB, R.M. (2005), “Fiscal Decentralization, Macrostability and Growth”, International Studies Program Working Paper, 05-06.

MEHRORA, A. And VALILA, T. (2006), "Public Investment in Europe: Evolution and Determinants in perspective," Fiscal Studies, 27(4), 443-471

MILLER, S.M. and RUSSEK, F.S. (1997), "Fiscal Structures and Economic Growth", Economic Inquiry, 35, 603-613.

MITZE, T. (2007), “Dynamic Simultaneous Equation Error Component Models (DSEM-EC) applied to the Analysis of Regional Equalization Policies in a Growth Model Framework for German States” DIW Macroeconometrics Workshop

MIZUTANI, F. and TANAKA, T. (2005), "Productivity Effects and Determinants of the Allocation of Public Infrastructure," ERSA conference papers 05, 412

MOLERO, J.C (2002) “Gasto Público y Federalismo Fiscal en España. Periodo 1984-1998” MPRA Paper No. 8098.

OATES, W. E. (1972), “Fiscal Federalism”, Harcourt Brace, New York.

PARDO GARCIA, I. (2003), “Spanish Regional Policy: Economic and Social Cohesion in the European Union”, Universidad de Castilla La Mancha, mimeo.

PERCOCO, M. (2005), "The Impact of Structural Funds on Italian Mezzogiorno: 1994-1999", Région et Développement, 21, 141-153.

PEREZ GONZALEZ, P and CANTARERO PRIETO, D. (2006), “Descentralización Fiscal y Crecimiento Económico en las Regiones Españolas”, Instituto de Estudios Fiscales, P. T. N.o 5/06

RAMIREZ, M (1998), “Does Public Investment Enhance Labor Productivity Growth in Chile? A Cointegration Analysis”, North American Journal of Economics and Finance, 9(1)

RODDEN, J. and WIBBELS, E. (2002), “Beyond the fiction of federalism. Macroeconomics managment in multitiered systems”, World Politics 54, 494–531

RODRIGUEZ-POSE, A.and FRATESI, U. (2004), "Between development and social policies: The impact of European structural funds in objective 1 regions ", Regional Studies 38(1), 97-113.

ROUBINI, N. and SACHS, J. (1989), "Government Spending and Budget Deficits in the Industrial Countries ", Economic Policy, 8.

SOSVILLA-RIVERO, S. (2005), “EU Structural Funds and Spain’s Objective 1 regions: An Analysis Based on the Hermin Model” FEDEA Documento de Trabajo, no. 2005-24

STURM, J.E. (2001), "Determinants of Public Capital Spending in less-developed Countries ", CESinfo, Munich.

THIESSEN, U. (2003), "Fiscal Decentralisation and Economic Growth in High-Income OECD Countries," Fiscal Studies, 24(3), 237-274

THORTON, J (2009), “Fiscal decentralization and fiscal consolidations in emerging market economies”, Applied Economics Letters, forthcoming.

TREISMAN, D (2000), “Decentralization and Inflation: Commitment, Collective Action, or Continuity?”, American Political Science Review, 94 (4), 837-857.

VOLDEN, C. (2007), "Intergovernmental Grants: A Formal Model of Interrelated National and Subnational Political Decisions ", The Journal of Federalism 37(2), 209-243.

WOOLDRIDGE, J.M. (2002) Econometric Analysis of Cross Section and Panel Data, MIT press, Cambridge, MA.

XIE, D., DAVOODI, H. and ZOU, H. (1999), "Fiscal Decentralization and Economic Growth in the United States," Journal of Urban Economics, 45(2), 228-239

ZHANG, T. and ZOU, H.F. (1998) Fiscal Decentralization, Public Spending and Economic Growth in China, Journal of Public Economics, 67, 221-240.

Tables

Table [1]: Variables and sources of data

Variable	Label	Definition	Units	Source
Public Investment	**PubInv**	Gross fixed capital formation in the Regional Government	%GDP	**Badespe** database (Instituto de Estudios Fiscales, Ministry of Economy)
EU Structural Funds	**EUSF**	EU expenditure executed corresponding to Structural funds, by Member State.	%GDP	**Liquidación de Presupuestos de las CC AA**, Ministry of Economy
Public Consumption	**PCons**	Public Current expenditure in the Regional Government	%GDP	**Badespe** database
Private Investment	**PrivInv**	Investment of tangible and intangible assets in the private sector	%GDP	**IVIE** (Valencian Institute of Economic Research)
Central Government Investmeng	**CGInv**	Public investment from the central government disaggregated at the regional level	%GDP	*1984-1999* **IVIE** *2000-2007* **PGE** (General Public Budget)
GDP growth	**GDPgr**	Real GDP growth	Growth rate	**INE** (National Statistical Office)
Population growth	**Popgr**	Population in miles persons	Growth rate	**Eurostat**
Fiscal Decentralization	**DEC**	Ratio of per capital public expenditure of the regional government to per capital public expenditure of the central government	Ratio	**Badespe** database (Eurostat for population)

Table [2]: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
PubInv	255	0.0285	0.012	0.0054	0.0586
EUSF	255	0.0054	0.005	0.0000	0.0307
PCons	255	0.1011	0.048	0.0144	0.2213
PrivInv	255	0.2335	0.043	0.1404	0.3702
CGInvest	255	0.0180	0.010	0.0017	0.0681
GDPgr	255	0.0735	0.027	0.0152	0.2088
POPgr	255	0.0083	0.010	-0.0046	0.0383
DEC	255	0.5700	0.295	0.1055	1.6255
DEC*EUSF	255	0.0030	0.003	0.0000	0.0164

Table [3]: Time invariant variables. Definition and Summary Statistics

Variable	Definition	Units	Source	Obs	Mean	Std. Dev.	Min	Max
initGDPpc	GDP per capita in 1993	Miles Euro	INE	255	9430.85	1688.62	6640.56	12389.48
Pubcapst93	Stock of public capital in 1993	Miles Euro	FBBVA-Ivie	255	7235480	5458365	1268752	21600000
Privcapst93	Stock of private capital in 1993	Miles Euro	FBBVA-Ivie	255	42900000	38800000	4980675	142000000
PobAct93	working aged population	Miles people	IVIE	255	1833.97	1547.83	210.55	5374.87
educ93	Average years of schooling in working aged population	years	IVIE	255	7.4488	0.5597	6.5000	8.4800

Table [4]: Summary Statistics. Country-level data

Variable	Obs	Mean	Std. Dev.	Min	Max
PubInv	249	0.0274	0.0092	0.007	0.055
EUSF	240	0.0053	0.0079	0.000	0.037
PCons	249	0.4546	0.0711	0.280	0.680
PrivInv	248	0.1764	0.0260	0.113	0.272
CGInvest	238	0.0522	0.0480	-0.165	0.248
GDPgr	225	0.0055	0.0046	-0.001	0.024
POPgr	249	-0.0194	0.0354	-0.134	0.069
Surplus	249	0.0274	0.0092	0.007	0.055

Table [5]: The impact of Structural Actions on Regional Public Investment. Regions with different levels of Autonomy

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Regions with low level of competencies (art. 151)				Regions with high level of competencies (art.143)			
	F-E	F-E	GMM-AB	GMM-AB	F-E	F-E	GMM-AB	GMM-AB
PubInv (t-1)			0.5081***	0.4679***			0.6888***	0.7257***
			0.080	0.077			0.080	0.071
eusf	0.5913***	0.5981***	0.6366***	0.5858***	0.0176	0.0092	0.3573*	0.2690
	0.143	0.142	0.156	0.152	0.184	0.178	0.217	0.219
PubCons	0.0647***	0.0526**	0.0732**	0.0693***	0.0451	0.0533	0.1075	0.1102*
	0.023	0.021	0.028	0.027	0.054	0.048	0.071	0.061
PrivInv	0.0820***	0.0782***	0.0847***	0.0815***	0.0656***	0.0624***	0.0611***	0.0623***
	0.020	0.020	0.025	0.025	0.019	0.018	0.022	0.022
CGInvest	-0.0322		0.0280		-0.1112		-0.0215	
	0.066		0.074		0.124		0.131	
GDPgr	-0.0131		-0.0270*		-0.0031		-0.0121	
	0.012		0.016		0.009		0.013	
POPgr	-0.1418		-0.1138		0.0235		0.0285	
	0.120		0.140		0.113		0.112	
F test group	4.33 (.001)	7.26 (.000)			6.15 (.000)	6.78 (.000)		
R2 within	0.321	0.3092			0.152	0.1502		
Autocorr. Test	D-W = .7933 B-W = .9651	D-W = .7951 B-W = .9639	AB(1) -2.67 (.00) AB(2) 1.18 (.23)	AB(1) -2.65 (.00) AB(2) 1.38 (.16)	D-W = .6732 B-W= 1.0279	D-W = .5007 B-W= .8483	AB(1) -1.97 (.04) AB(2) 0.76 (.44)	AB(1) -1.96 (.04) AB(2) 0.17 (.86)
Sargan test			94.743	97.339			75.742	78.676
stat			0.77	0.75			0.35	0.39
Obs (groups)	140 (10)	140 (10)	130 (10)	130 (10)	98 (7)	98 (7)	91 (7)	91 (7)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
Ab(order) denotes Arellano and Bond (1991) test for autocorrelation in the error term
D-W: modified Durbin-Watson test for autocorrelated errors; B-W: Baltagi Wu LBI

Table [6]: The impact of Structural Actions on Regional Public Investment. Time-Evolution

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	1993-1999				2000-2007			
	F-E	F-E	GMM-AB	GMM-AB	F-E	F-E	GMM-AB	GMM-AB
PubInv (t-1)			0.4551***	0.3934***			0.1643	0.0831955
			0.108	0.096			0.115	0.107
eusf	0.5886***	0.5884***	0.7426***	0.4373**	0.0851	0.1854	0.0316	0.0562522
	0.165	0.161	0.237	0.222	0.220	0.215	0.236	0.244
PubCons	0.0929*	0.1021**	0.0907	0.1182*	0.0232	0.0338	0.1027**	0.0947564
	0.047	0.044	0.068	0.069	0.035	0.034	0.047	0.037
PrivInv	0.0669**	0.0705***	0.0467	0.0628*	0.0623**	0.0619**	0.1199***	0.1281358
	0.028	0.025	0.037	0.032	0.024	0.024	0.041	0.037
CGInvest	-0.0148		0.1040		-0.1555*		-0.00038	
	0.130		0.180		0.081		0.123	
GDPgr	-0.0072		-0.0349***		-0.0051		0.0166	
	0.008		0.013		0.040		0.048	
POPgr	0.0167		-0.4982		-0.1063		-0.1841	
	0.252		0.463		0.120		0.176	
F test group	3.52 (.000)	3.73 (.000)			9.79 (.000)	*14.21 (.000)*		
R2 within	0.3059	0.2973			0.142	0.0997		
Autocorr. Test	D-W = .9509 B-W = 1.350	D-W = .8448 B-W = 1.264	AB(1)-2.26 (.02) AB(2) -.065 (.94)	AB(1)-2.04 (.04) AB(2) -.491 (.62)	D-W = 1.227 B-W = 1.553	D-W = 1.175 B-W = 1.491	AB(1)-2.20 (.02) AB(2) .566 (.57)	AB(1)-2.38 (.01) AB(2) .851 (.39)
Sargan test			27.128	31.83			61.767	64.890
stat			0.98	0.74			-0.48	0.16
Obs (groups)	102 (17)	102 (17)	85 (17)	85 (17)	119 (17)	119 (17)	102 (17)	102 (17)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
Ab(order) denotes Arellano and Bond (1991) test for autocorrelation in the error term
D-W: modified Durbin-Watson test for autocorrelated errors; B-W: Baltagi Wu LBI

Table [7]: The impact of Structural Actions on Public. 15 oldest Member States

	[1]	[2]	[3]	[4]	[5]	[6]
	F-E	F-E	F-E	GMM-AB	GMM-AB	GMM-AB
PubInv (t-1)				0.6570***	0.6282***	0.6008***
				0.059	0.062	0.064
EUSF	0.0166	0.0464	0.0665	0.0713	0.1197	0.1465
	0.121	0.120	0.118	0.129	0.128	0.126
Pubcon	-0.0051			0.00031		
	0.016			0.019		
surplus		-0.0324**	-0.0314**		-0.0376**	-0.0425***
		0.015	0.014		0.016	0.016
PrivInv	-0.0751***	-0.0511*	-0.0491*	-0.0762***	-0.0502*	-0.0361
	0.027	0.027	0.027	0.028	0.030	0.030
gdpgr	-0.0041	-0.0044		-0.0066	-0.0073	
	0.005	0.005		0.007	0.006	
popgr	0.3112*	0.3104*	0.3007*	-0.0827	-0.1363	-0.1847
	0.180	0.175	0.174	0.234	0.234	0.232
F test group	2.09 (0.0689)	3.02 (0.0122)	3.56 (0.0079)			
R2 within	0.0531	0.0750	0.0702			
Autocorr. Test	.63365568 .85706886	.7401 .9428	.7274 .9447	-2.011 (.04) 0.889 (.37)	-2.113 (.03) 1.366 (.17)	-2.039 (.04) | 1.387 (.16)
Sargan test stat				167.54 *0.495*	163.05 *0.593*	161.94 *0.617*
Obs (groups)	206 (15)	206 (15)	208 (15)	191 (15)	191 (15)	193 (15)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
Ab(order) denotes Arellano and Bond (1991) test for autocorrelation in the error term
D-W: modified Durbin-Watson test for autocorrelated errors; B-W: Baltagi Wu LBI

Table[8]: The impact of Structural Actions on Regional Public Investment. Interaction Term

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	F-E	F-E	F-E	F-E	GMM-AB	GMM-AB	GMM-AB	GMM-AB
PubInv (t-1)					0.5881***	0.5807***	0.5366***	0.5400***
					0.05	0.05	0.05	0.05
eusf	0.6482***	0.6895***	0.6477***	0.6757***	0.7860***	0.7898***	0.5452**	0.5262**
	0.19	0.18	0.19	0.18	0.22	0.20	0.22	0.21
dec	0.0189**	0.0173***	0.0164***	0.0154***	0.0222***	0.0208***	0.0169***	0.0167***
	0.004	0.00	0.00	0.00	0.00	0.00	0.00	0.00
dec*eusf	-0.5612*	-0.6267*	-0.5269	-0.5732*	-0.7154*	-0.7325**	-0.5390	-0.4977
	0.338	0.33	0.33	0.33	0.37	0.34	0.36	0.35
PrivInv	0.0462***	0.0475***	0.0444***	0.0456***	0.0492***	0.0508***	0.0594***	
	0.02	0.02	0.01	0.02	0.02	0.02	0.02	
PubCons	-0.0198		-0.0134		-0.0169		0.00073	0.0608***
	0.03		0.03		0.03		0.03	0.02
CGInvest	-0.0177	-0.0203			0.0432	0.0427		
	0.05	0.05			0.06	0.06		
GDPgr	-0.0129*	-0.0119*			-0.0263***	-0.0247***		
	0.01	0.01			0.01	0.01		
POPgr	-0.1606*	-0.1629**			-0.1253	-0.1273		
	0.08	0.08			0.09	0.09		
F test group	5.93 (.000)	5.76 (.000)	7.80 (.000)	7.54 (.000)				
R2 within	0.3014	0.297	0.2743	0.2699				
AR Test	D-W = .654 B-W = .896	D-W = .618 B-W = .860	D-W = .652 B-W = .902	D-W = .612 B-W = .866	AB(1) -3.13 (.00) AB(2) .858 (.39)	AB(1)-3.10 (.00) AB(2) .891 (.37)	AB(1)-3.05 (.00) AB(2) .526 (.59)	AB(1)-3.02 (.00) AB(2) .519 (.60)
Sargan test					173.888	174.296	168.892	169.070
stat					0.63	0.65	0.71	0.67
Obs (groups)	238 (17)	238 (17)	238 (17)	238 (17)	221 (17)	221 (17)	221 (17)	221 (17)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
Ab(order) denotes Arellano and Bond (1991) test for autocorrelation in the error term
D-W: modified Durbin-Watson test for autocorrelated errors; B-W: Baltagi Wu LBI

Table[9]: The impact of Structural Actions on Regional Public Investment. Centered Interaction Term

	[1] F-E	[2] F-E	[3] F-E	[4] F-E	[5] GMM-AB	[6] GMM-AB	[7] GMM-AB	[8] GMM-AB
PubInv (t-1)					0.5796***	0.5775***	0.5401***	0.5424***
					0.05	0.05	0.05	0.05
eusf	0.6482***	0.6894***	0.6477***	0.6757***	0.7500***	0.7746***	0.5433**	0.5446**
	0.19	0.18	0.19	0.18	0.22	0.20	0.22	0.22
dec	0.0189***	0.0173***	0.0164***	0.0154***	0.0218***	0.0208***	0.0169***	0.0172***
	0.004	0.003	0.004	0.003	0.004	0.004	0.004	0.004
dec*eusf	-0.5612*	-0.6266*	-0.5269	-0.5731*	-0.6856*	-0.7210**	-0.5279	-0.5359
	0.34	0.33	0.33	0.33	0.37	0.34	0.36	0.35
PrivInv	0.0462***	0.0475***	0.0444***	0.0456***	0.0484***	0.0497***	0.0556***	0.0559***
	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02
PubCons	-0.0198		-0.0134		-0.0143		0.0018	
	0.03		0.03		0.03		0.03	
CGInvest	-0.0177	-0.0203			0.0426	0.0424		
	0.05	0.05			0.06	0.06		
GDPgr	-0.0129*	-0.0119*			-0.0246**	-0.0239**		
	0.01	0.01			0.01	0.01		
POPgr	-0.1605*	-0.1629**			-0.1249	-0.1279		
	0.08	0.08			0.09	0.09		
F test group	4.86 (.000)	4.63 (.000)	6.06 (.000)	5.76 (.000)				
R2 within	0.30	0.297	0.2743	0.2699				
					AB(1) -3.11			
	D-W = .654	D-W = .618	D-W = .652	D-W = .612	(0.00)	AB(1) -3.10 (.00)	AB(1) -3.10 (.00)	AB(1) -3.04 (.00)
AR Test	B-W = .896	B-W = .860	B-W = .902	B-W = .866	AB(2) .846 (.39)	AB(2) .891 (.37)	AB(2) .876 (.38)	AB(2) .541 (.58)
Sargan test					173.921	174.45	171.060	170.784
stat					0.63	0.64	0.67	0.64
Obs (groups)	238 (17)	238 (17)	238 (17)	238 (17)	221 (17)	221 (17)	221 (17)	221 (17)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
Ab(order) denotes Arellano and Bond (1991) test for autocorrelation in the error term
D-W: modified Durbin-Watson test for autocorrelated errors; B-W: Baltagi Wu LBI

Table [10]: Regional Public Investment and EU Structural Funds. Simultaneous Equations. “Endogeous” error term

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	PubInv				eusf			
	EC 2SLS	FE 2SLS	EC 2SLS	FE 2SLS	EC 2SLS	FE 2SLS	EC 2SLS	FE 2SLS
eusf	1.4957***	1.3570	1.4913***	0.0176				
	0.481	0.987	0.335	0.815				
PubInv					0.2040***	0.1104***	0.1737***	0.1042***
					0.027	0.032	0.028	0.032
dec	0.0099**	0.0094**	0.0168***	0.0157***	-0.0043***	-0.00074	-0.0032***	-0.00184**
	0.004	0.004	0.002	0.002	0.001	0.001	0.001	0.001
PubCons	0.0481**	0.0494**			0.0035	-0.0105		
	0.020	0.022			0.008	0.008		
PrivInv	0.0353**	0.0341*	0.0276*	0.0130				
	0.016	0.019	0.015	0.017				
GDPgr	-0.0237*	-0.0225*						
	0.013	0.014						
POPgr	-0.2170***	-0.2050**	-0.2530***	-0.1906**				
	0.075	0.081	0.072	0.078				
CGInvest					-0.0053	-0.0479*	-0.0194	-0.0486*
					0.023	0.025	0.024	0.025
RMSE	0.1712	0.1774	0.2208	0.2287	0.1981	0.2052	0.2277	0.2359
Obs (groups)	255 (17)	255 (17)	255 (17)	255 (17)	255 (17)	255 (17)	255 (17)	255 (17)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
RMSE: Root Mean Square Errors

Table [11]: Regional Public Investment and EU Structural Funds. Simultaneous Equations. “Endogeous” individual effects

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	PubInv				eusf			
	HT 2SLS	FE-	HT 2SLS	FE-	HT 2SLS	FE-	HT 2SLS	FE-
eusf	0.5933***	0.5648***	0.5433***	0.5313***				
	0.137	0.136	0.137	0.137				
PubInv					0.1055***	0.1053***	0.1002***	0.1002***
					0.030	0.029	0.029	0.029
dec	0.00993***	0.0099***	0.0162***	0.0160***	-0.000691	-0.00068	-0.00178**	-0.0017**
	0.004	0.004	0.002	0.002	0.001	0.001	0.001	0.001
PubCons	0.04267**	0.0425**			-0.0104	-0.0102		
	0.019	0.019			0.008	0.008		
PrivInv	0.02823*	0.0258*	0.0178**	0.0176				
	0.015	0.015	0.015	0.015				
GDPgr	-0.01847	-0.0181						
	0.012	0.012						
POPgr	-0.1957***	-0.1847**	-0.2108*	-0.2058***				
	0.073	0.072	0.072	0.072				
CGInvest					-0.0476**	-0.0483*	-0.0489*	-0.0489**
					0.024	0.025	0.025	0.025
RMSE	0.1729	0.1769	0.2230	0.2282	0.2000	0.2047	0.2300	0.2353
Obs (groups)	255 (17)	255 (17)	255 (17)	255 (17)	255 (17)	255 (17)	255 (17)	255 (17)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
RMSE: Root Mean Square Errors

Table [12]: Public Investment and EUSF. Simultaneous Equations. “Endogeous” error term. Regions by level of autonomy

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Regions 151				Regions 143			
Dependent var.	PubInv		eusf		PubInv		eusf	
	EC 2SLS	FE 2SLS	EC 2SLS	FE 2SLS	EC 2SLS	FE 2SLS	EC 2SLS	FE 2SLS
eusf	1.7222***	3.1396**			0.8766	-2.399*		
	0.196	1.263			0.616	1.241		
PubInv			0.2801***	0.2008***			0.0659*	-0.0213
			0.038	0.046			0.036	0.041
dec	0.0164***	0.0174***	-0.0052***	-0.0037***	0.0102**	0.0074	-0.0027**	-0.0014
	0.003	0.006	0.001	0.001	0.005	0.005	0.001	0.001
PrivInv	0.0541**	0.0791**			0.0102	-0.0021		
	0.022	0.034			0.023	0.026		
POPgr	-0.2521***	-0.3949*			-0.2485**	-0.3638***		
	0.080	0.206			0.115	0.134		
CGInvest			-0.0114	-0.0317			0.0331	-0.0438
			0.030	0.031			0.048	0.049
RMSE	0.2008	0.2081	0.2012	0.2084	0.2506	0.2598	0.2639	0.2736
Obs (groups)	150 (10)	150 (10)	150 (10)	150 (10)	105 (7)	105 (7)	105 (7)	105 (7)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
RMSE: Root Mean Square Errors

Table [13]: Public Investment and EUSF. Simultaneous Equations. “Endogeous” individual effects. Regions by level of autonomy

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Regions 151				Regions 143			
	HT 2SLS	FE-	HT 2SLS	FE-	HT 2SLS	FE-	HT 2SLS	FE-
Dependent var.	PubInv		eusf		PubInv		eusf	
	HT	FE	HT	FE	HT	FE	HT	FE
eusf	0.7318***	0.7328***			-0.4670*	-0.4514		
	0.149	0.147			0.272	0.275		
PubInv			0.1820***	0.1820***			-0.0381	-0.0381
			0.044	0.043			0.037	0.037
dec	0.0127***	0.0127***	-0.0034***	-0.0034***	0.0083**	0.0071	-0.0014	-0.0014
	0.003	0.003	0.001	0.001	0.004	0.004	0.001	0.001
PrivInv	0.0628***	0.0630***			0.0036	0.0072		
	0.020	0.019			0.019	0.021		
POPgr	-0.1473	-0.1479			-0.2854***	-0.2675***		
	0.096	0.094			0.090	0.098		
CGInvest			-0.0345	-0.0345			-0.0412	-0.0412
			0.031	0.031			0.048	0.049
RMSE	0.2043	0.21021811	0.2047	0.2077	0.2571	0.2585	0.2707	0.2721
Obs (groups)	150 (10)	150 (10)	150 (10)	150 (10)	105 (7)	105 (7)	105 (7)	105 (7)

*,**,*** denote significance levels at the 10%, 5% and 1% respectively
RMSE: Root Mean Square Errors