Title:

Fiscal Federalism and the impact of Intergovernmental Grants. The European Regional policy in Spain

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Abstract:

We suspect that the efficiency of intergovernmental grants is related to the level of fiscal autonomy of the subsidized government. In this paper we construct and estimate a panel data model capturing the role of fiscal federalism on the effectiveness of EU Structural Actions in enhancing public expenditure in selected policy areas. We use data from the seventeen Spanish regions for the period 1993-2007. Results unambiguously support the hypothesis that the effectiveness of the ERDF decreases with larger fiscal autonomy. The role of the European Social Fund is still under analysis. These results could reflect the fact that fiscal decentralization in Spain has been focused to larger taxation autonomy without affecting regional income redistribution.

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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.

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 centered in estimating the effect of these policies on economic growth. Only very recently, some researchers have

[1] In the nomenclature of the European Union, the term "Structural Funds" usually refer to the four Funds conforming the so-called Regional Policy (European Regional Development Fund, or ERDF; European Social Fund, or ESF; Financial Instruments for Fisheries Guidance, or FIFG; and the European Agricultural Guidance and Guarantee Fund, or EAGGF which has been replaced by the European Agricultural Guarantee Fund in 2007) while the "Structural Actions" include, in addition, the Cohesion Fund. In this paper, we will use both terms indistinctively.

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 modeled 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, 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) finds, instead, that the granted governments would under-invest when tax-autonomy is restricted, particularly in rich regions. In this case, the level of matching-grants 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 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

[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.

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 presents the theoretical framework that will help to interpret the results; Section 4 presents the data and variables; Section 5 describes the methodology and the results; and Section 6 concludes.

2. FISCAL DECENTRALIZATION AND REGIONAL POLICY IN SPAIN

In this section, we introduce some figures that show how Spanish regions are a suitable illustration of the two policies under consideration (fiscal decentralization and EU cohesion policy), as they affect these regions with a relatively large degree of cross-sectional variability.

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. The Constitution states that the level of competencies assumed by each regional government

and the pace at which these competencies are assumed is not homogeneous among all regions. The constitution of the regional governments finished in 1983[4].

Figure [1] about here

Simultaneously to the 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 two 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 that the process of decentralization that Spain has experienced is not a general pattern of behavior of the countries on its economic environment.

Figure [2] about here

The Spanish Constitution discriminates between two types of regions: the so-called "historic nationalities" or regions with a high level of competencies[5] and the ten remaining regions[6] (and the two autonomous cities) that in principle assume a lower level of competencies. In practice, the regions with high levels of competencies experienced a higher level of fiscal autonomy in the beginning, but the gap between both types of regions 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, which is shown in Figure [3]:

[4] 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.
[5] Andalusia, Basque Country, Canary Islands, Catalonia, Galicia, Navarre and Comunidad Valenciana.
[6]Aragon, Asturias, Balearic Islands, Cantabria, Castile La-Mancha, Castile and Leon, Comunidad de Madrid, Extremadura, Murcia and La Rioja.

Figure [3] about here

A deeper analysis of the functional categories[7] 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"

While the level of fiscal autonomy is almost identical among the regions with low level of competencies, fiscal competencies among the regions with high level of competencies is more heterogeneous[8]. This is also reflected in the distribution of the revenue-side of the budget shown in Figure 4. In particular, two of the regions (Basque Country and Navarre) have particular privileges about the collection of taxes in their territory. Spanish regional financing scheme has gone through several revisions over time (See Lopez-Laborda, 2006; De la Fuente, 2010). For the time window analyzed in this paper, there have been three different systems into force (1991-1996; 1997-2001; and 2002-2008). These revisions have established, subsequently, a larger share of tax revenues in the budget of regional governments as well as larger leeway to decide on the level of taxation, and normative capacity to establish of abolish certain taxes. The redistributive mechanism, however, has not been modified until the revision implemented on 2009 (See Bassols et al., 2010) which is outside the period under consideration in this paper.

[Figure 4 about here]

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

[7] See González-Alegre (2010)
[8] See Molero (2001)

autonomy or between regions with low level of autonomy other than their political status. In both groups of regions there are objective 1 regions (which are eligible for most of the Structural Funds) and regions with per capita income larger than the national and European averages. Figure [5] has the purpose of showing that there is no systematic difference in the amount of Structural Funds from the EU that both groups of regions receive.

Figure [5] about here

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 the 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.

Figure [6] about here

3. MODELLING FISCAL DECENTRALIZATION

This section shows how theoretical predictions about the impact of intergovernmental grants on public administrations gaining fiscal autonomy within a federation, depend largely on the assumptions used to model fiscal autonomy. As mentioned before, the existence of theoretical models that combine fiscal decentralization and intergovernmental grants is relatively limited.

Nevertheless, the literature about the conditions that make fiscal decentralization desirable is extremely prolific[9]. Arguments in favour of fiscal decentralization rely largely on preference heterogeneity for public goods provision among regions (Besley and Coate, 2003; Brueckner, 2005; Rubinchick-Pessach, 2005) and its impact on multifactor productivity (Martínez-Vazquez and McNab, 2006) while arguments against are usually based on internalization of spillover effects among regions (Chu and Yang, 2012) , strategic behaviour towards redistribution (Oates, 2005) or fiscal competition (Leite-Monteiro and Sato, 2003; Hatfiel and Padro, 2008).

For the sake of this paper, however, it is important to distinguish between fiscal autonomy based on the capacity to decide on the distribution of the public budget –both in the expenditures and the revenues side of the budget- and fiscal autonomy affecting the mechanisms of regional redistribution of income. Based on one of the sub-games[10] included in Volden (2007), let us assume a sub-national government which acts as a representative agent of its constituents and that benefits from providing an investment good and keeping taxes low, so that:

$$Us = (yi)fc,s - (ts + tn)\, f\, b,s - |d - xs|$$

The utility of the sub-national government depends positively on income, which is related to the public investment good according to the production function $yi=\rho iqi$. The function fc,s represents the fraction of credit that the sub-national government obtains from the provision of the public investment good; ts and tn represent taxes issued by the sub-national and national governments respectively, and fb,s represents the fraction of *blame* that the sub-national government obtains from taxation. Finally, the last term captures the disutility associated from taking a policy direction which deviates, in a one dimensional line, from the optimal direction preferred by the representative agents.

[9] Being Oates (1972) considered as the blast-off that stimulated most subsequent research. An intuitive review of the evolution of the literature may be found in Weingast (2009)

[10] Introducing two main innovations to the model: the consideration of a public investment good instead of a consumption good an the introduction of a redistributive mechanism among sub-national governments.

Taxation is determined in order to balance the budget, taking into account the presence of an intergovernmental transfer (G) and a redistribution policy represented by the parameter b, so that:

$ts = [ms\ yi - G - b(Y - yi)] / \alpha s;$

For the sake of simplicity, we assume that the national government does not provide any amount of the public investment good ($yi = ys$). The national government also equilibrates its budget, so that $ts = G / \alpha n$.

The term ms captures the cost for the sub-national government of providing the investment good while αs (αn) $\in [0,1]$ captures the efficiency at which the sub-national (national) government is able to raise taxes. The marginal cost and tax efficiency parameters represent, respectively, the level of fiscal autonomy on the expenditure and revenue sides of the budget of the sub-national government. Implicitly, ms decreases as the sub-national government gets larger autonomy to decide on the policy areas and functional themes of the expenditure projects. In parallel, αs captures limitations in the tax capacity of the government and increases as government gains leeway to decide on the distribution and range of its own taxation scheme.

Finally, there is a third dimension of fiscal decentralization represented by the redistribution parameter $b \in [0,1]$, since there is a zero-sum redistribution mechanism among regions whose income deviate from average income Y. For b=1, regional income is identical among all regions due to redistribution while for b=0 there is no redistribution at all.

The optimal choice of public investment good provision solves the maximization problem of the utility function of the sub-national government subject to its budget constraint. Assuming that the functions fc,s and f b,s, take the form, respectively, (msys – G / ms ys) and (tn / ts+tn), we obtain:

$$Ys = [G + bY + \alpha/2([\rho s\alpha s/(ms+b\rho s)]-G/\alpha n)] / [ms+b\rho s]$$

The amount of public investment provided because of the implementation of the intergovernmental grant, (ys,grant – ys,nograant) is, therefore:

$$[G – (\alpha s\ G)/2\alpha n)] / [ms+b\rho s]$$

This relation summarizes the main implications about the relationship between fiscal autonomy and intergovernmental grants in the model:

Proposition: The effectiveness of a public grant to investment in enhancing public investment depends on the level of fiscal autonomy of the subsidized government. In particular, greater fiscal autonomy in the expenditure side of the budget or in redistribution policies increase the effectiveness of the grant while greater taxation autonomy leads to lower effectiveness of the grants.

We show that the effectiveness of intergovernmental transfers is affected by fiscal decentralization. As long as larger fiscal autonomy is based on reducing the importance of redistributive mechanisms among regions or on enlarging the expenditure capacities of subsidized governments, decentralization will make intergovernmental grants more effective. However, when fiscal decentralization in based on a larger autonomy on the taxation capacities of subsidized government, which seems to be the case of the Spanish regions, the effectiveness of intergovernmental transfers is negatively related to decentralization.

4. 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 on EU transfers from previous years. 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 data-source 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".

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

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 transfers 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 (2003) 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. 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[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]

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.

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. Private Investment is a key determinant of Public Investment according to De Haan et al. (1996) and Sturm (2001). Changes

[11] Zang and Zou, 1998; Martinez-Vazquez and McNab, 2005; Iimi, 2005; Jin et al., 2005
[12] De Haan et al., 1996; Diaz-Cayero et al., 2003
[13] See González-Alegre (2008)
[14] Defined as public current expenditures.

in population could be a determinant of the necessities of public capital relative to publicly provided consumption goods, in fact, Population has been included as an approximation of labour force supply in many studies that examine the productivity of public capital (Ramirez, 1998; Everaert and Heylen, 2001).

The rate of production growth is traditionally included as a determinant of public expenditure[15] since 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. 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 data-sources: 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. In our case, however, since we work with regional-level data and the leeway of Spanish regional governments to incur into deficit in the period under consideration was extremely limited, we have decided to omit 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 [7].

There have been several studies trying to link political variables to the tendency to alter patterns of public spending. 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 et al. (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.

[15]See for example Miller and Russek (1997), Kneller et al. (1999) Bose et al. (2007).

[Table 2: Summary Statistics]

5. 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. To our knowledge, there are no empirical studies trying to link the Structural Actions, or more generally the effectiveness of intergovernmental grants, with the level of fiscal autonomy of the granted administration. Both issues have been analyzed separately, and usually focusing the attention to their relation with economic growth. Therefore, none of the studies presented in table A1 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: they analyze the impact of fiscal decentralization or the Regional Policy of the EU using data from the Spanish economy.

In order to assess 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.

<u>Sample-Breaking</u>

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 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:

$$\text{PubInv}_{i,t} = \delta\ \text{eusf}_{i,t} + \beta\ \text{x}_{i,t} + \alpha_i + \varepsilon_{i,t} \qquad (1)$$

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[16] "Historic Nationalities", and a second group of the remaining ten regions[17], for which the Constitutions recognized a lower level of Autonomy.

And secondly, as a robustness check, we have also considered the time-dimension of the series in order to identify two alternative subgroups with remarkable differences in their level of fiscal autonomy. We have selected the year 2000 as the break point, which will leave us two subsamples of similar length.

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

The evolution of fiscal autonomy across time in both subsamples is quite stable in both groups of regions[18] although with a remarkable gap between regions with low and high level of competencies.

The use of two alternative criteria to divide the sample will let us overcome some of the shortcomings which are attached to each criterion. 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 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]. Initially, we also assume strict exogeneity of the explanatory variables ($E[x_{i,s}, \varepsilon_{i,t}] = 0$; *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 could 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

[18] See González-Alegre (2008)
[19] Despite the fact that there are no remarkable differences in the level of economic development among both groups of regions. Neither there are 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.
[21] Knight, 2002; Becker, 1996; Besley and Case, 2000.

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 subtracting the autocorrelation term attached to the original errors:

$$PubInv_{i,t} = \delta\ eusf_{i,t} + \beta\ x_{i,t} + \alpha_{i+}\varepsilon_{i,t} \qquad \text{where } e_{i,t} = \rho e_{i,t}-1+u_{i,t}$$

$$PubInv_{i,t} = \rho * PubInv_{i,t} + \delta\ eusf_{i,t} - \rho\delta\ eusf_{i,t} + \beta\ x_{i,t} - \rho\beta\ x_{i,t} + (1-\rho)\alpha_{i+}u_{i,t} \quad (2)$$

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

Estimation Results. Table 3 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 while

[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*

columns [5] to [8] include the estimations for the remaining seven regions with a larger level of fiscal autonomy. 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 positive 0 and smaller than one. However, for the regions with a high level of competencies, the coefficients estimated are smaller and generally insignificantly different from zero.

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 [3], we can see how the level of fiscal autonomy of both groups of regions has increased over time. By splitting the sample around year 2000, the level of fiscal autonomy remains relatively stable for both groups of regions across time[25], keeping a significant difference among them. The results of the equivalent estimations are shown in Table [4]. We have estimated an impact of the

[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.
[25] See González-Alegre (2010)

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 behavior of the other control variables remains stable.

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 5 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 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 followed similar guidelines as tables 3-4.

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 multiplied by the value of 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.

Cross-product 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 6)

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 consists of two structural equations, one in which the dependent variable is Public Investment, while in the other the capital transfers allocated through the Structural Funds. 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]:

$$\text{PubInv}_{i,t} = \delta_{(1)}\ \text{eusf}_{i,t} + \beta_{(1)}\ \text{x}_{(1)i,t} + \alpha_{(1)i} + \varepsilon_{(1)i,t} \qquad (4)$$

$$\text{eusf}_{i,t} = \delta_{(2)}\text{PubInv}_{i,t} + \beta_{(2)}\ \text{x}_{(2)i,t} + \alpha_{(2)i} + \varepsilon_{(2)i,t} \qquad (5)$$

Where $\text{x}_{(1)}$ and $\text{x}_{(2)}$ 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

[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, 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.

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 8.

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 (6) and (7), $z_{(1)}$ and $z_{(2)}$ respectively, which are two vectors of time-invariant explanatories, including both endogenous and exogenous variables:

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

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

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 7 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[30]. Results upon the assumption that the endogenous variables are correlated with the unit-specific term are shown in table 9.

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

Both, tables 8 and 9, 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 9) 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[31] 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)). 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.

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.

[3131] 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.

Tables 10 and 11 replicate the SEM estimation after splitting the sample into the group of regions with *low level of competencies* and the regions with *high level of competencies*. Table 10 presents the results assuming that the source of the endogeneity is the correlation of the variables with the unit-specific effect, while table 11 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 is a bit limited. In general, the coefficients estimated for the regions with low level of autonomy are larger in absolute value and level of significance for the variables of our interest which is in line with our previous results. 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. 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, confirms our previous suspicious that by gaining fiscal autonomy regions find it more difficult to be eligible for additional grants.

6. 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 Structural Actions designed to enhance Public Investment in key areas for growth.

Spain has 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 these regions 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 variables. 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. The coefficients estimated for EUSF in the sub-groups with lower level of fiscal autonomy were larger and with stronger levels of significance. The effectiveness of these intergovernmental grants might be negatively affected by the level of fiscal autonomy of the granted government.

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 variables. 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 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. 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.

These results are not surprising, if we make use of a simple theoretical model constructed from the few theoretical studies that link fiscal decentralization and intergovernmental grants. According to our model, fiscal decentralization makes intergovernmental grants more effective as long as decentralization is related to larger fiscal autonomy to decide on the expenditure side of the budget or to lower importance of inter-regional redistribution of income. However, when fiscal decentralization is based on larger autonomy over taxation, intergovernmental grants become less effective. This is precisely the case of Spanish regions. In the period under consideration, inter-regional redistribution of income has remained relatively stable, while most of the gains of fiscal autonomy have been related to larger leeway to decide on taxation policies.

The results in this paper support the argument that the optimal design of the Structural Actions should internalize the extremely heterogeneous levels of fiscal federalism that we observe across 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 across levels of the public administration. The Structural Actions are not 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.

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Appendix.

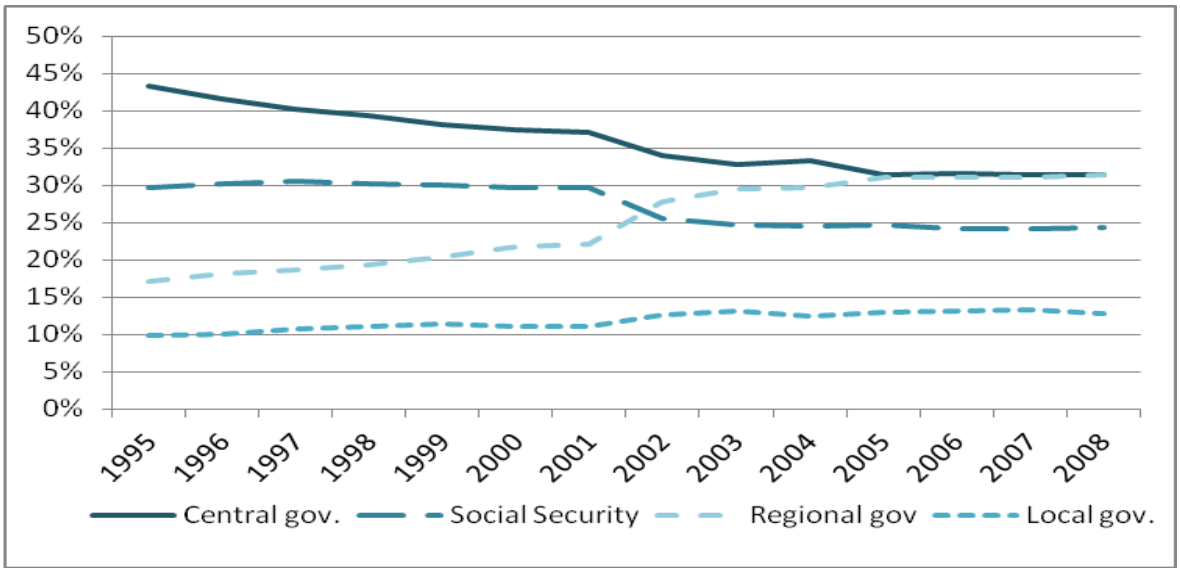
Table A1. Fiscal Decentralization and European Cohesion Policy: Previous Empirical Studies with Spanish regional data.

Autor/s (year)	Main Issue	Data coverage	Methodology	Main Results
Alvárez et al. (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-	Contribution of	Spanish	Panel Data model	For the regions with higher level of

Silvestre, Espasa and Mora (2008)	fiscal **decentralization** to economic growth	Regional Data, 1964-2000	estimated by GMM	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.
González-Alegre (2012)	Effectiveness of **EU Structural Actions**; 1993-2005	EU15 and Spanish regional data	Panel Data model estimated by GMM	Public investment in the member countries makes up around 60% of the increase in EU funds.

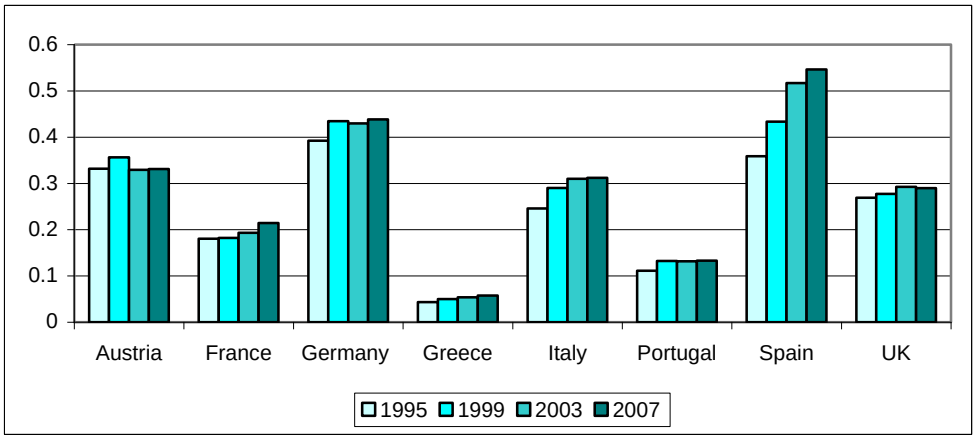
Figures

FIGURE 1: Shares of Public Expenditure by level of administration



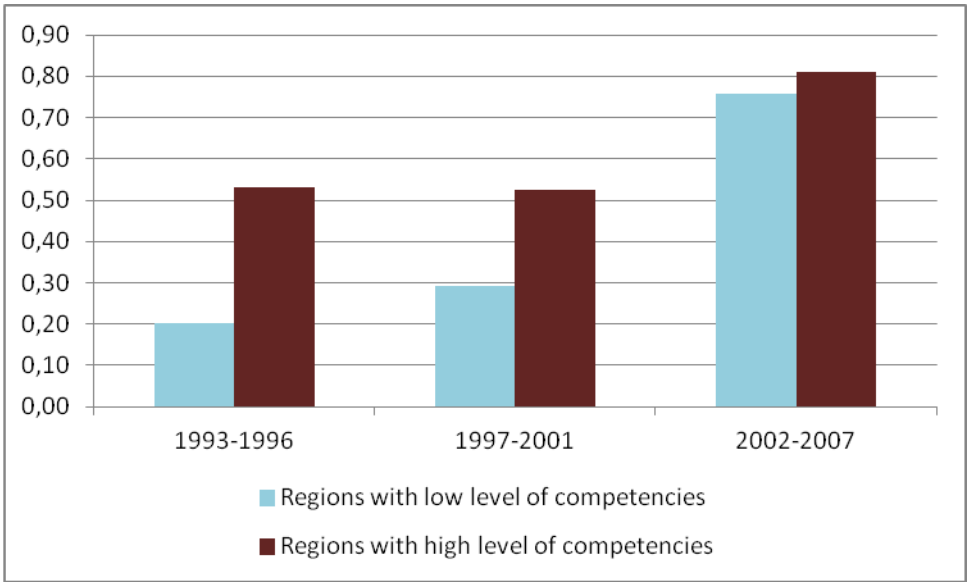
Source: Eurostat, Government Finance Statistics

FIGURE 2: Ratio of state and local public expenditure to general government expenditure. 1995 2007.



Source: Eurostat, Government Finance Statistics.

FIGURE 3: 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"

FIGURE 4: Sources of Revenues as percentage of GDP

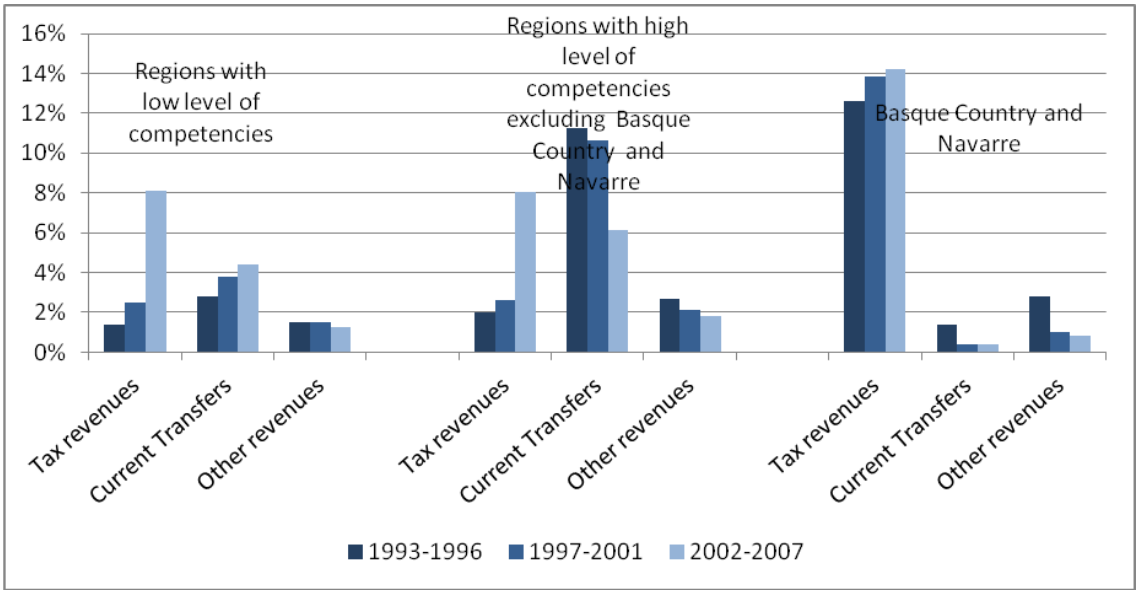
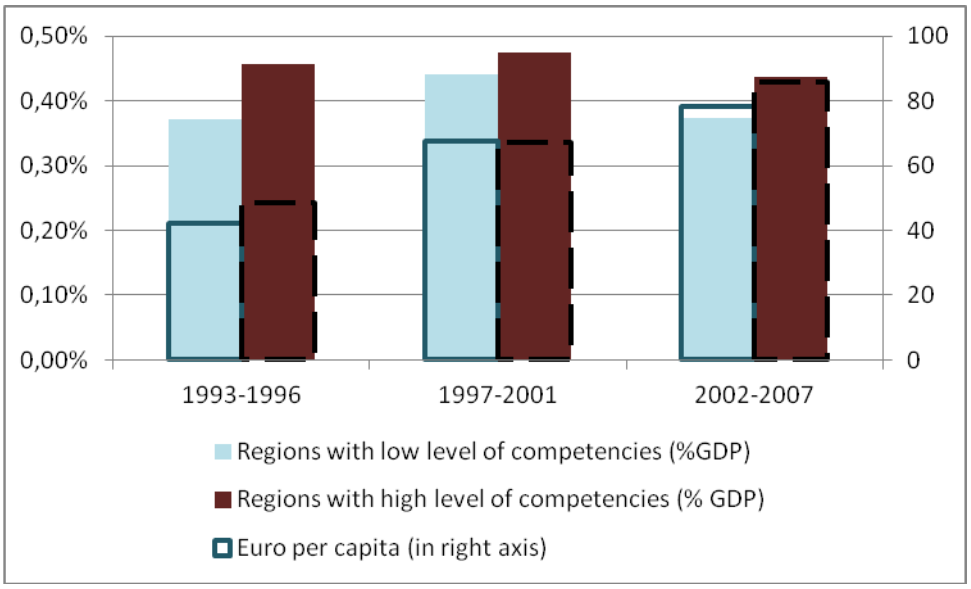
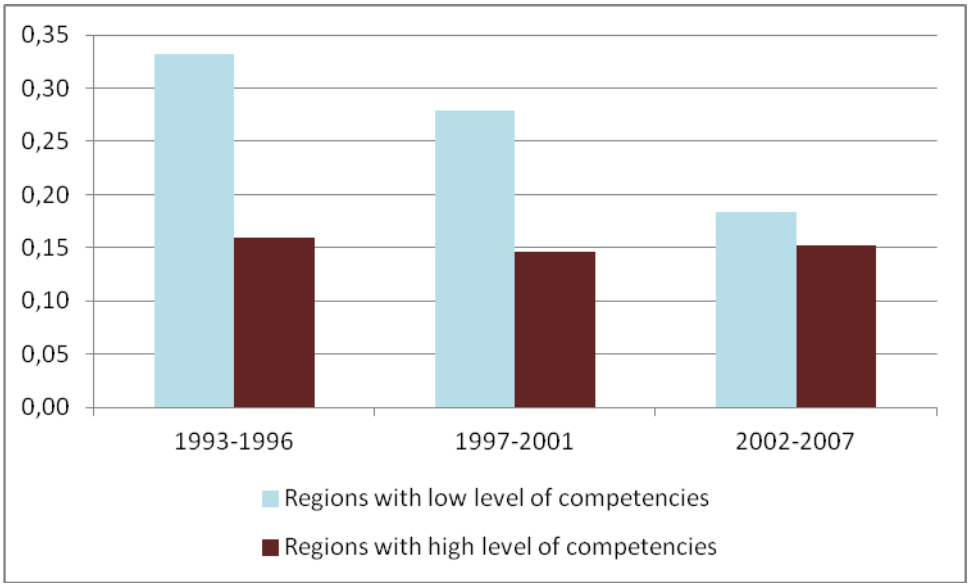


FIGURE 5: Capital transfers from the EU to the Spanish regional governments. (% GDP and Euro per capita)



Source: "Liquidación del presupuesto de las CCAA"

FIGURE 6: Ratio Capital to Total Expenditure



Source: "Liquidación del presupuesto de las CCAA"

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: 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		
			AB(1) -2.67				AB(1) -1.97	
Autocorr. Test	D-W = .7933	D-W = .7951	(.00)	AB(1) -2.65 (.00)	D-W = .6732	D-W = .5007	(.04)	AB(1) -1.96 (.04)
	B-W = .9651	B-W = .9639	AB(2) 1.18 (.23)	AB(2) 1.38 (.16)	B-W= 1.0279	B-W= .8483	AB(2) 0.76 (.44)	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 4: 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	D-W = .8448	AB(1)-2.26 (.02)	AB(1)-2.04 (.04)	D-W = 1.227	D-W = 1.175	AB(1)-2.20 (.02)	AB(1)-2.38 (.01)
	B-W = 1.350	B-W = 1.264	AB(2) -.065 (.94)	AB(2) -.491 (.62)	B-W = 1.553	B-W = 1.491	AB(2) .566 (.57)	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 5: The impact of Structural Actions on Regional Public Investment. 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)					0.5881***	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	D-W = .618	D-W = .652	D-W = .612	AB(1) -3.13 (.00)	AB(1)-3.10 (.00)	AB(1)-3.05 (.00)	AB(1)-3.02 (.00)
	B-W = .896	B-W = .860	B-W = .902	B-W = .866	AB(2) .858 (.39)	AB(2) .891 (.37)	AB(2) .526 (.59)	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 6: 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	AB(1) -3.10	AB(1) -3.10	AB(1) -3.04
	D-W = .654	D-W = .618	D-W = .652	D-W = .612	(0.00)	(.00)	(.00)	(.00)
					AB(2) .846	AB(2) .891	AB(2) .876	AB(2) .541
AR Test	B-W = .896	B-W = .860	B-W = .902	B-W = .866	(.39)	(.37)	(.38)	(.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 7: 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 8: 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 9: 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 10: Public Investment and EUSF. Simultaneous Equations. "Endogeous" error term. Regions by level of autonomy

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Regions with low level of competencies				Regions with high level of competencies			
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 11: Public Investment and EUSF. Simultaneous Equations. "Endogeous" individual effects. Regions by level of autonomy

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Regions with low level of competencies				Regions with high level of competencies			
Dependent var.	HT 2SLS PubInv	FE-PubInv	HT 2SLS eusf	FE-eusf	HT 2SLS PubInv	FE-PubInv	HT 2SLS eusf	FE-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