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government size: an application to the
Spanish case**

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Decentralization and regional government size: an application to the Spanish case

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Abstract

This paper studies the impact of decentralization on the size of regional governments in Spain controlling for economies of scale, interregional heterogeneity and institutional framework, and successfully tests some implications of the model. Firstly, it supports the classic public goods theory of a trade-off-between the economic benefits of size and the costs of heterogeneity. Secondly, it rejects the “Leviathan” hypothesis because of vertical power imbalance and lack of fiscal competition among regions. Thirdly, the paper argues that government size is mediated by financial resources obtained through intergovernmental grants, consistent with welfare economics and positive economic politics.

Keywords: Government size, Fiscal decentralization, “Leviathan” hypothesis, Vertical imbalances, Flypaper effect.

JEL Classification: H72, H77, R5.

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1. Introduction

Musgrave's classic theory of public goods (1959) can be used as a starting point to justify the distribution of competences between different tiers of government. Determining the range of responsibilities at each level, this theory is presented as a choice between two different goals: achieving scale economies and externalities, and recognizing the heterogeneity of local preferences. On the one hand, the possibility of obtaining scale economies would favour centralised public goods supply, as the average unit price decrease, production volume increases. On the other, the community's well-being will be greater the closer the public goods supply is to preferences of each citizen. Tiebout (1956) and Brennan and Buchanan (1980) sustain that fiscal autonomy leads to greater territorial competence, which limits government size and increases its efficiency as a powerful constraint on the Leviathan. Oates' decentralisation theorem (1972) links government size to attributing authority at lower tiers of government to control public finance. So, according to principle of subsidiarity, sub-national governments would be responsible for the activities that do not extend beyond the regional borders, whereas central government would manage inter-regional affairs.

The preference heterogeneity is still a controversial issue even if it represents one of the aspects of the fiscal federalism theory that has received most attention. The demand for decentralisation is based on hypothetical efficiency gains, which are far from being evident, as part of the literature shows (Ghosh, 2009), and also Carrion-i-Silvestre, Espasa and Mora (2008) and Cantarero and Perez (2009) recently proved for Spain. According to Wagner's classic law, government size tends to grow as society grows richer (Bahl and Linn, 1992; Mulligan, Gil and Sala-i-Martin, 2004; Fiva, 2006; Shelton, 2007; Yeung, 2009). We do not try to review the large classic literature on public goods and decentralization theorem. The reader is referred to the excellent recent formal literature on country formation, such as Alesina and Spolaore (1997, 2003) and Alesina and Wacziarg (1998). It also relates to the analysis of the relationship between openness and the equilibrium number and size of countries, such as Rodrik (1998), Alesina, Spolaore and Wacziarg (2000) and Alesina (2002), and the effects of income homogeneity and ethnic fragmentation on the choice of government borders, such as Alesina, Baqir and Easterly (1999) and Alesina, Baqir and Hoxby (2004). Empirically, the paper connects a recent literature on the effects of economic and political integration on the vertical government structure, such in particular Rodden (2003), Stegarescu (2004) and Thornton (2009).

The purpose of this paper is to test whether the known general results on government size applied to a specific country. Why Spanish case? The best strategy for the empirical analysis of decentralization ought to reference the experience of countries with a special federal framework, which have modified their vertical power structure in recent years (Stegarescu, 2005; Fiva, 2006). In Spain since 1978 a highly centralized state turned into a very much decentralized one, associated with the devolution of power to the regions (called AC-Autonomous Communities) and the integration in the European Economic Community (EEC) (Bosch and Suarez Pandiello, 1993; Bosch and Sole-Olle,

2003; Castells and Sole-Olle, 2005). The degree of expenditure decentralization is currently greater than in unitary European countries and similar to that of federal ones¹ (Figure 1).

The standard approach to the problem, taking into account Oates's Leviathan (1985 and 2005), consists of regressing some suitable measure of public sector size on the appropriate explanatory variables. We are particularly interested in testing to what extent regional public sector size correlates with vertical imbalance and fiscal autonomy. Literature widely accepts that in order for decentralisation to succeed it is essential that different tiers of government carry out the provision of public goods and services with their own resources (principles of autonomy and fiscal co-responsibility). Otherwise, in a context of inter-regional mobility, generous social policies may attract low income individuals and cause the exodus of high incomes ones; this is what Tiebout (1956) calls "voting with their feet".

The established results were confirmed to apply in this specific case. Our main findings can be summarized in three points. Firstly, we provide empirical evidence of a trade-off-between economic benefit of public sector size, which is a function of scale economies, and the costs of heterogeneity, resulting from large and diverse populations. Secondly, our paper highlights that government size and financial structure go hand in hand: vertical imbalance leads to more prominent public sectors, every else being equal. Thirdly, we emphasize that fiscal competition among jurisdictions is *conditio sine qua non* for regions can get benefit from decentralization. On balance, one can detect that the effect of decentralization on government size is mediated by the financial structure due to the nature of fiscal federalism.

The impact of decentralization on the size of public sector is far from settled, and relatively few economists have provided empirical studies for Spain. What distinguishes this paper from previous contributions is our emphasis on the following approaches: (1) considering two different measures of fiscal decentralization—expenditure and revenue decentralization—and their effects on aggregate public sector size; (2) disaggregating the effects at national and sub-national levels that aims to pinpoint different issues of subnational revenue autonomy; (3) controlling for socio-demographic, economic, political, etc variables in the econometric analysis; and (4) using a large and wide panel dataset spanning the years from 1985 to 2004 (20 years) with new dataset as Cantarero and Perez (2009).

The organization of the paper is as follows. Section 2 takes a closer look at the decentralisation of Spanish regions. Section 3 presents an empirical analysis related to the theoretical framework, information sources and the specification of the econometric model to be estimated. Section 4 estimates a basic model exploring the conditional effects of decentralisation in Spanish government size and carries out a sensitivity analysis. The final section concludes and points out the main implications.

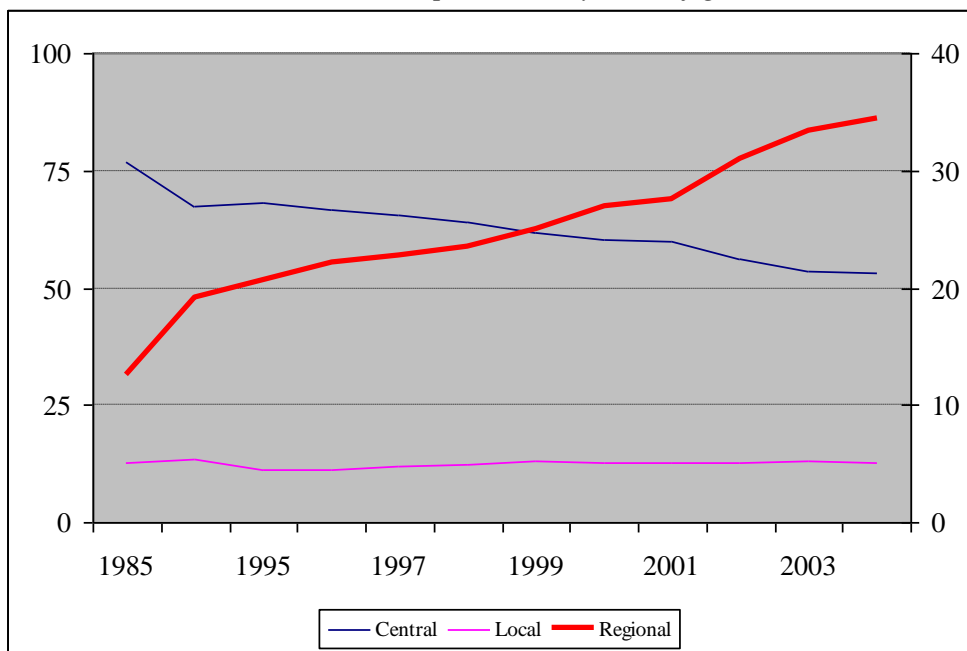
2. Fiscal decentralization in Spain

There are two milestones in the evolution of Spanish public sector: transition to democracy and accession to the EEC. Thus, the consolidation of welfare state and economic growth (increase in public expenditure and revenue) and political decentralisation (increase of the relative importance of regional and local public sector) are correlated in time.

Our analysis is carried out within the complex process of such major trends, since it starts with Spain's accession to the EEC. Unlike classical federations, in Spain an intermediate tier of government, i.e. regional government was created *ex novo* between the two pre-existing ones, i.e. municipalities and provinces, and central government with the Spanish Constitution (SC), to solve the problem of regionalism that had existed for centuries. Therefore, the Spanish territorial division is similar to the structure of almost all federal countries, in particular those with three tiers of government: Central (federal state), Regional (AC or states) and Local (provinces and municipalities).

Figure 1 illustrates how a major decentralisation process of public sector has occurred over a relatively short period of time according to Stegarescu (2005). Table 1 shows that decentralization is already above "unitary" European countries (France, Holland, Ireland, Italy, Luxembourg and United Kingdom) and comparable to fiscal federalism countries (Germany, Australia, Austria, Canada, United States and Switzerland), according to the *Forum of Federations* and *OECD Fiscal Federalism Network*. Since the 80's and especially in the last decade, a process has taken place in the public sector, coinciding with another process of European integration and globalisation (sandwich hypothesis). Expenditure managed by central administration has undergone a notable decrease in relative terms, from 76.6% in 1985 to 53% in 2004, benefiting Territorial Administrations, whose relative weight has grown by up to 33.4% at regional level and by 12.6% at local level. Providing public goods and services in a redistributive way is now the responsibility of subnational governments, although fiscal federalism literature had traditionally considered it to be a function of central government. So, there is an increase in the chance for innovation, since all sub-national governments work as a laboratory of ideas within a fiscal federalism system (Oates, 1999), that is the so-called "hypothesis of the discoveries"².

Figure 1
Public sector expenditure by tiers of government (%)



Note. Central and local governments left scale, and regional government right scale.

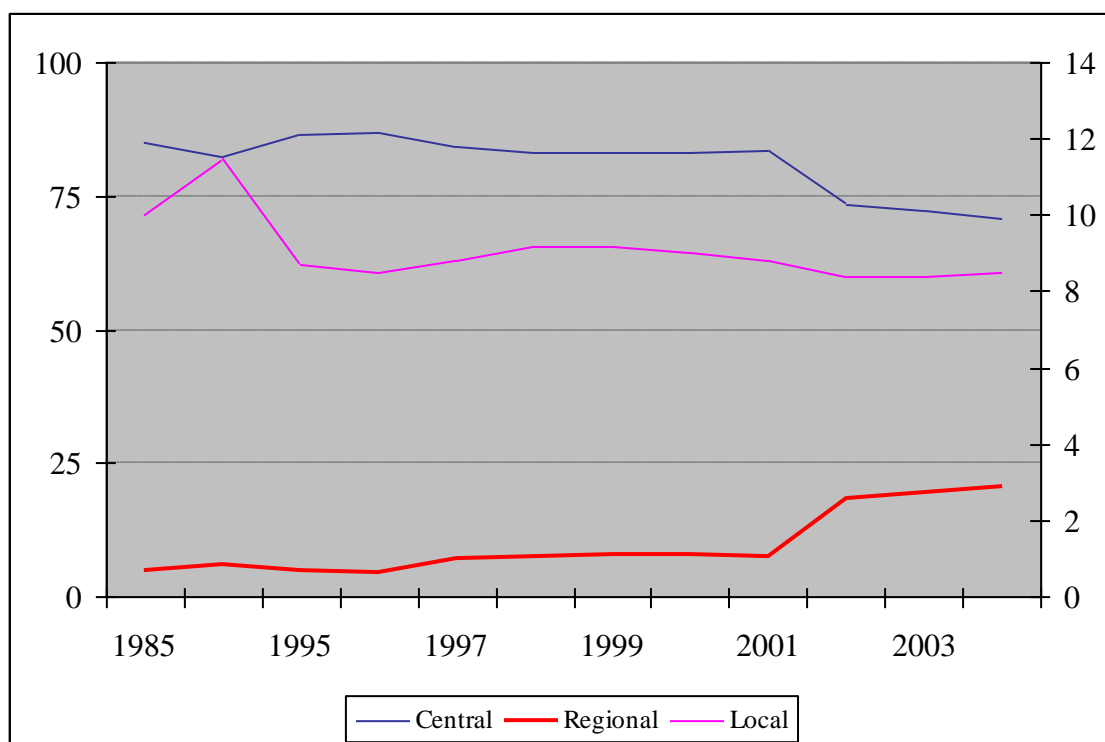
Table 1*Public sector by tiers of government in compared experience (2002)*

Tiers of government	Germany	Austria	Australia	Canada	USA	Switzerland	Federal countries	France	Spain	Netherlands	Ireland	Italy	Luxembourg	United Kingdom	Unitary countries
	(% of consolidated expenditures)														
Federal	70.2	80.2	68.0	54.7	68.8	65.8	67.9	89.6	59.9	97.0	98.0	88.3	93.8	96.0	91.9
Regional	21.9	9.3	28.0	36.3	19.2	19.5	21.2	0	27.6	0	0.	0	0	0.2	1.3
Local	7.8	10.2	4.0	9.0	12.0	14.7	10.8	10.4	12.9	3.0	2.0	11.7	6.2	3.8	6.8
	(% of consolidated revenues)														
Federal	72.7	81.2	68.0	54.7	68.8	65.8	74.6	90.0	73.3	96.3	97.7	84.0	93.8	95.6	94.0
Regional	21.6	7.2	28.0	36.3	19.2	19.5	17.3	0	18.3	0	0	0.8	0	0	0.2
Local	6.7	11.0	4.0	9.0	12.0	14.7	7.5	9.5	8.4	3.7	2.3	15.2	6.2	4.4	6.8

Source: Government Finance Statistics Yearbook, International Monetary Fund.

It is useful to note that public expenditure decentralisation in Spain has not been accompanied by a similar process in the funding system (see Figure 2). The current Spanish regional funding system shares with other federal countries –either in the English-speaking world (Canada, United States, Australia) or in Europe (Germany, Switzerland, Austria)– a high decentralisation of public expenditure and revenue, although remarkable discrepancies in fiscal co-responsibility exist among countries. In 2004, AC revenues (20.7% on the global revenues) still depended excessively on subsidies by the central government that largely controlled (70.8%) the management of public resources. Unlike other federal states, the Spanish funding system does not ensure equal distribution of revenues among different AC to meet their transferred responsibilities. There seems to be a trend to amplify inter-territorial inequalities, which have accompanied the Spanish decentralisation process and its different funding models, especially between special (foral regions like Basque country and Navarra) and common regions.

Figure 2
Public sector revenues by tiers of government (%)

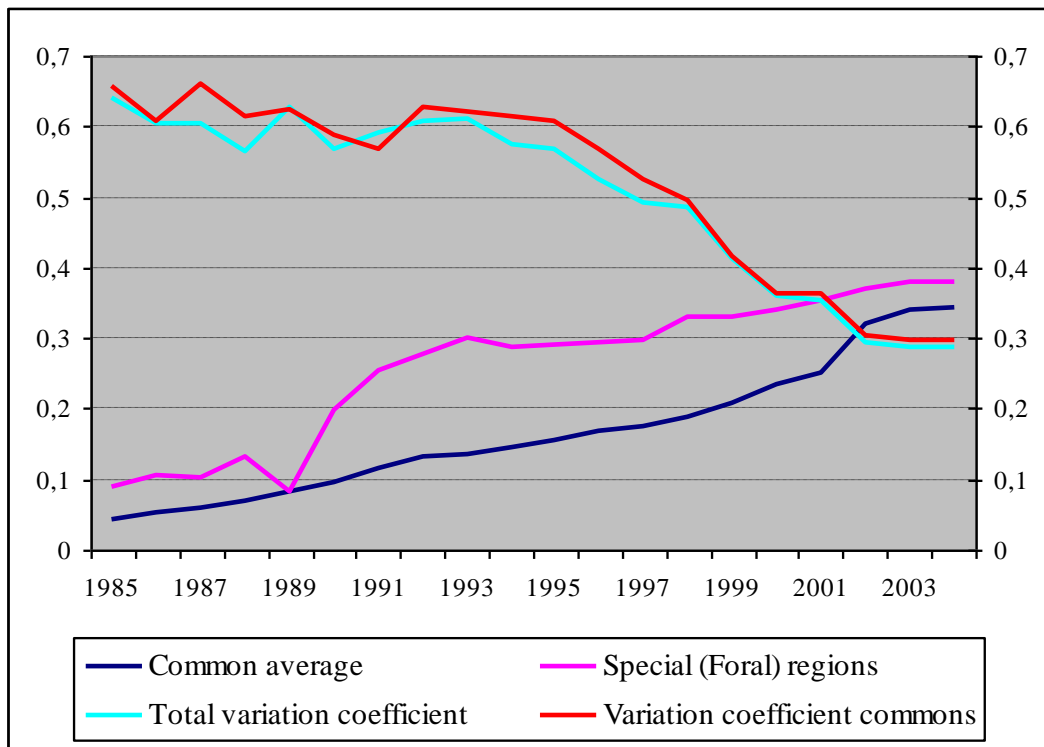


Note. Central and local governments left scale, and regional government right scale.

When we disentangle the Spanish public sector dynamics, it is important to bear in mind the differences between the common regime AC. Figure 3 shows that the increase of autonomy expenditure/GDP is sustained in these AC and more irregular in the foral regions in the period studied. The largest difference in the average of both sub-samples occurred at the beginning of 90's, with values of 0.14 and 0.30 for the AC of common and special regime, respectively, in 1993. Afterwards, they converge at the higher level, especially from 2002, due to the larger growth in regional public sector of common regime AC. Thus, differences with special regimes scarcely amounted to 4 percentage-points in 2004

and the increase in average values of the two sub-samples is compatible, since 1994, with a reduction in standard deviations. Consequently, the dynamics of both statistics (average and standard-deviation) gives as a result the process of last decade, with a fast reduction of inequality between regions. Figure 3 illustrates, on the one hand, how variation coefficients decrease by more than 50% in the second part of the sample period and, on the other hand, that as of 1998 the dispersion of the sub-sample on common regime regions has overlapped that of the whole sample. Hereafter we will further explore some reasons for this.

Figure 3
Regional public sector (average and deviations)



3. Empirical analysis

We first consider some theoretical and empirical aspects of practical interest. Then, an aggregate of relevant variables is examined with the aim to explain the demand for decentralisation, and the regression equations are specified. For this purpose we follow Stegarescu (2004) which considers a federation of fixed population N , equally divided into two regions, $i=1, 2$, whose inhabitants consumed a national and a local public good. Local public good g^L is supplied in equal quantity to the two regions, yet of different type, in accordance with local preferences. Public good g^C provided by the central government is uniform and located in the middle of an ideological spectrum of regional preferences. It is assumed that these are of different signs and equal magnitude in the two regions: $\delta_1 = -\delta_2 = \delta$ and $\delta \in [0, 1]$. Defining the amount of public good as $g = g^L + g^C$, it obtains $g^L = \theta g$ and $g^C = (1 - \theta)g$, where θ is the degree of decentralisation. To maximise social well-being, the planner maximises the utility of an individual in region i as:

$$U_i = \alpha \ln \theta g + \beta(1-\delta) \ln[(1-\theta)g] + \ln A_i + \varpi \ln \theta g - \frac{g(1+\theta)}{N}, \quad (1)$$

where α and β ($0 < \alpha, \beta \leq 1$) are the parameters that denote local and national preference; $\omega \in [0, 1]$ is the degree of integration of the federation in the world economy, and A_i represents technology. The intuition is simple, though a reference to previous contributions is in the Appendix. The first two terms of the utility function can clearly be derived by embedding the public goods story of previous paragraph in a Cobb-Douglas utility function. While the $(1-\delta)$ is not a standard trick, it seems a reasonable way to incorporate preferences over the type of the public good. With regard to the last terms of equation (1), it does seem to be easily motivated within the context of equations (A1)–(A4). Decentralisation costs increase with the degree of decentralisation and decrease with the federation size.

The variable to be explained is the public sector decentralisation, which is determined by the amount and variety of goods provided by subnational governments³. Literature on fiscal federalism has identified several factors that explain decentralisation: social diversity, inter-jurisdictional competence, vertical structure of power, fiscal autonomy, geographic and demographic characteristics, and economic factors. This classification superimposes another, which distinguishes basic variables (preference heterogeneity, economies of scale and economic integration); variables of interest (fiscal autonomy, vertical power structure and inter-jurisdictional competence); and, finally, some variables that allow control for economic cycle, social structure and financial structure. Table A.1 of the Appendix shows a synthesis of both classifications and Table A.2 defines the variables and their sources.

Empirical analysis is performed from a panel dataset by which inferences can be made from variations between units and/or within them. However, there are practical reasons to favour the second. In the first place, to control for specific factors that do not vary in time, such as geographic area, institutions and inter-regional traditions or diversities, which are not picked up by the variables included in the estimates. Inferences based on variations within each unit are less likely to be subject to bias of omitted variables. Secondly, due to decentralisation is better measured through time than through the sample units, especially if it responds to long-term institutional agreements, as stated by Gil and López-Laborda (2007). Hsiao (2003) points out that the implementing of specific regional effects is not only an optional tool for obtaining greater information about the sample, but it is also an econometric need to control for correlation between independent variables due to contemporaneous shocks (regional or in time), which could provide inconsistent or senseless estimates.

Some of the explanatory variables are available as annual observations, meaning they can be related with the endogenous variable in the panel data. Others, in contrast, are only available from an observation in the sample period, either because they are unchangeable in time as represent inherent physical characteristics of regions, or because they only vary improbably due to deep institutional reforms or population is regrouping or, finally, although being themselves changeable in time only certain observations are available. The inclusion of these variables in the regression

would cause a problem of perfect multicollineality with dummies of regional effects. To solve it, a two-stage procedure is used. First, the coefficients are estimated by approximating fixed effects using variables with annual observations as regressors. Subsequently, the region-effects obtained in the previous step are regressed on the invariable factors.

For Levine and Renelt (1992), the literature attempting to identify the impact of economic policies suffers from a lack of robustness under alternative specifications and the following model was therefore proposed:

$$y_{it} = \alpha_i + \beta'_x \mathbf{x}_{it} + \beta'_m \mathbf{m}_{it} + \beta'_z \mathbf{z}_{it} + \lambda_t + \eta_{it}, \quad (2)$$

where y denotes the relative size of sub-national public sector, α refers to a scalar (1x1) of unobserved individual effects, β is the vector (1xk) of coefficients of explanatory variables, x is the sub-group of basic variables always included in the regression, m are the variables of interest, z is a sub-group of control variables, λ is a vector of temporal dummies, η is a random disturbance iid $(0, \sigma_u^2)$, i and t index region and time. The empirical procedure considers a regression that includes basic variables and those of interest. Afterwards, the robustness of estimators is checked regarding the inclusion of additional control variables, modifying z to find the widest range of β_m that is significant at customary confidence levels. Then, we specify the fixed effects α_i as:

$$\hat{\alpha}_i = \gamma' \mathbf{w}_i + u_i, \quad (3)$$

where matrix w denotes the group of temporal unchanging factors that determine the idiosyncratic characteristics of regions and u is the disturbance term that is assumed to be orthogonal to the explanatory variables. So as to adequately evaluate the effect of short and long-term dynamics, Rodden (2003) proposed the error correction model (ECM):

$$\Delta y_{it} = \alpha_i + \beta_1 y_{it-1} + \beta_2 \Delta \mathbf{x}_{it} + \beta_3 \mathbf{x}_{it-1} + \beta_4 \Delta \mathbf{m}_{it} + \beta_5 \mathbf{m}_{it-1} + \beta_6 \mathbf{z}_{it} + \lambda_t + \mu_{it}, \quad (4)$$

which distinguishes between transitory and long-term effects moving equilibrium levels. Using lagged levels of the dependent variable and first differences of the strictly exogenous variables, it is possible to distinguish between short-term and long-term effects at the equilibrium levels. The coefficients of interest are β_3 and β_5 , which estimate long-term effects.

4. Regression results

In this section we study the determinants of regional decentralisation in Spain during the period 1985-2004. Firstly, variables and data sources are examined before presenting our results obtained from regressing the endogenous variable on some annually observed explanatory variables. An analysis of the idiosyncratic characteristics of variables between regions but invariable in time is then carried out. Finally, the long-term role of financing is considered. We use a panel dataset of 20 years and 17 regions, i.e. 340 observations. The sample is unbalanced and we prefer not to make lineal approximations of unavailable observations. Table A.3 of Appendix presents summary statistics for the variables and Table 2 provides the simple correlations matrix, which are significant in many cases at usual confidence levels.

Table 2
Correlation matrix

	<i>size</i>	<i>log(n)</i>	<i>log(y)</i>	<i>x</i>	τ	θ_e	θ_r	g_y	<i>u</i>	<i>borrowing</i>	g_h	<i>currgra</i>
<i>log(n)</i>	0.12**											
<i>log(y)</i>	0.20***	-0.07										
<i>x</i>	0.36***	0.16***	0.58***									
τ	0.42***	0.00	0.55***	0.32***								
θ_e	0.37***	0.11**	0.20***	0.33***	0.14***							
θ_r	0.09	-0.24***	0.34***	0.32***	0.06	0.56***						
g_y	-0.22***	-0.03	-0.19***	0.01	-0.25***	-0.01	0.03					
<i>u</i>	-0.17**	0.23***	-0.70***	-0.40***	-0.42***	-0.10*	-0.15***	0.13**				
<i>borrowing</i>	0.50***	0.20***	0.06	0.38***	0.30***	0.21***	0.01	-0.08	0.10*			
g_h	0.24***	0.03	0.01	-0.01	0.13**	0.03	-0.09*	-0.05	-0.09*	0.08		
<i>currgra</i>	0.67***	0.10*	0.20***	0.34***	0.34***	0.19***	0.04	-0.15***	-0.20***	0.32***	0.23***	
<i>c</i>	0.27***	0.21***	-0.04	0.01	0.17***	0.61***	-0.03	0.00	0.02	0.21***	0.10*	0.15***

Note. ***, ** and * denote statistical significance at the 1, 5 and 10% levels respectively.

4.1. Basic estimates

The theoretical model suggests a direct relationship between regional government size and a set of variables (basic and of interest). We reject the null hypothesis of no-correlation at a significance level of 1% using Wooldridge test (2002). We also reject the homoscedasticity hypothesis in panel data at the same significance level using the likelihood ratio (LR) test. Based on these results, we re-specify (2) as a model with a structure of first order heteroscedastic and autoregressive errors (common to all the panels). Subsequently, we examine which estimator is most appropriate. Using Hausman test, we reject the null hypothesis that regressors and effects are uncorrelated. As that result suggests that the estimator for random effects is inconsistent, we used the fixed effects estimator to estimate the relation between the regional public sector size and the conditioning factors. The estimation was carried out by Feasible Generalised Least Squares (FGLS), as the repeated use of GLS with heteroscedasticity produces maximum-likelihood credible parameter estimates. The fixed effects are controlled by including dummy variables.

The results of basic estimations are shown in Table 3. The variable to be explained is the public sector size in Spanish regions (*size*), as the ratio of government expenditure to GDP. Column 1 shows the impact of the basic variables of the model: economies of scale ($\log(n)$), heterogeneity ($\log(y)$) and integration (x). The estimation provides positive coefficients (statistically significant at the 1% level) of the first two variables in accordance with theoretical predictions and no different to zero in the latter. The coefficient of $\log(n)$ indicates that it is more efficient to supply the market locally as it increases in size, due to the possibilities of achieving scale economies. The estimations also reflect the effect of per capita income on regional governments, in line with previous studies such as Stegarescu (2004) and Shelton (2007). The coefficients obtained suggest that one-standard deviation increase in $\log(y)$ would rise regional public sector by 1.5 percentage points. According to Wagner's Law, the increase in citizens' average standard of living is associated with preference heterogeneity in the short-run, since decentralisation is a superior good with positive income elasticity.

Table 3
Regional public sector size
 Dependent Variable: Public expenditure / GDP
 Estimation Method: Feasible Generalised Least Squares ^a

Variables	[1]	[2]	[3]	[4]	[5]	[6]
<i>log(n)</i>	0.54*** (8.31)	0.40*** (6.52)	0.32*** (5.01)	0.27*** (4.11)	0.25*** (3.71)	0.28*** (4.72)
<i>log(y)</i>	0.36*** (9.13)	0.40*** (10.11)	0.53*** (11.74)	0.54*** (11.17)	0.52*** (10.50)	0.42*** (12.84)
<i>x</i>	0.01 (0.27)	0.02 (0.54)	-0.03 (0.78)	-0.03 (0.75)	-0.03 (0.66)
τ		0.22* (1.88)	0.34*** (2.99)	0.34*** (2.88)	0.31*** (2.73)	0.16* (1.68)
θ_e		0.10*** (2.61)	0.12*** (3.03)	0.11** (2.10)	0.12** (2.16)	0.15*** (3.23)
θ_r		-0.19*** (4.73)	-0.18*** (4.93)	-0.18*** (4.59)	-0.17*** (4.37)	-0.16*** (5.60)
<i>g_y</i>			-0.37*** (5.46)	-0.39*** (5.74)	-0.39*** (5.54)	-0.29** (4.22)
<i>u</i>			0.36*** (4.84)	0.35*** (4.68)	0.33*** (4.32)	0.21*** (3.08)
<i>g_h</i>				0.16* (1.83)	0.17* (1.92)	0.21** (2.40)
<i>c</i>				0.03 (0.61)	0.03 (0.50)	-0.01 (0.24)
<i>borrowing</i>					0.02 (0.12)	0.07 (0.38)
<i>b_{cf}</i>					0.00 (0.39)	0.00 (0.45)
<i>currgra</i>					0.07*** (2.57)	0.09*** (3.23)
Constant	-6.20*** (14.97)	-5.74*** (13.77)	-6.54*** (12.60)	-6.39*** (11.61)	-6.44*** (8.93)	-5.84*** (9.87)
R ²	0.71	0.79	0.80	0.80	0.82	0.85
LR $\chi^2_{(16)}$	99.81	76.14	90.93	83.44	79.79	78.27
<i>p</i> -value	0.00	0.00	0.00	0.00	0.00	0.00
AR(1)	0.82	0.69	0.68	0.65	0.65	0.63
Hausman test						
<i>p</i> -value	0.00	0.00	0.00	0.00	0.00	0.00
Observations	289	289	289	289	289	323

Notes: ^a Corrected from heteroscedasticity and autocorrelation. ***, **, and * denote statistical significance at the 1, 5 and 10% levels respectively. *t* values of robust estimators, reported in parentheses. Under the null hypothesis, Hausman's statistic test follows a χ^2 with *k*-1 freedom degrees. Statistic of Wald's *F*-test is significant at the 1% level in all the cases. Estimates have been made with Stata 8.0.

How do interest variables run? Our empirical results do not support the restraint hypothesis of "Leviathan".

Fiscal autonomy seems to increase government size, instead of decreasing it as part of the literature has suggested. The positive and significant sign of τ (tax autonomy) is difficult to interpret by fiscal federalism theory. Table 3 suggests

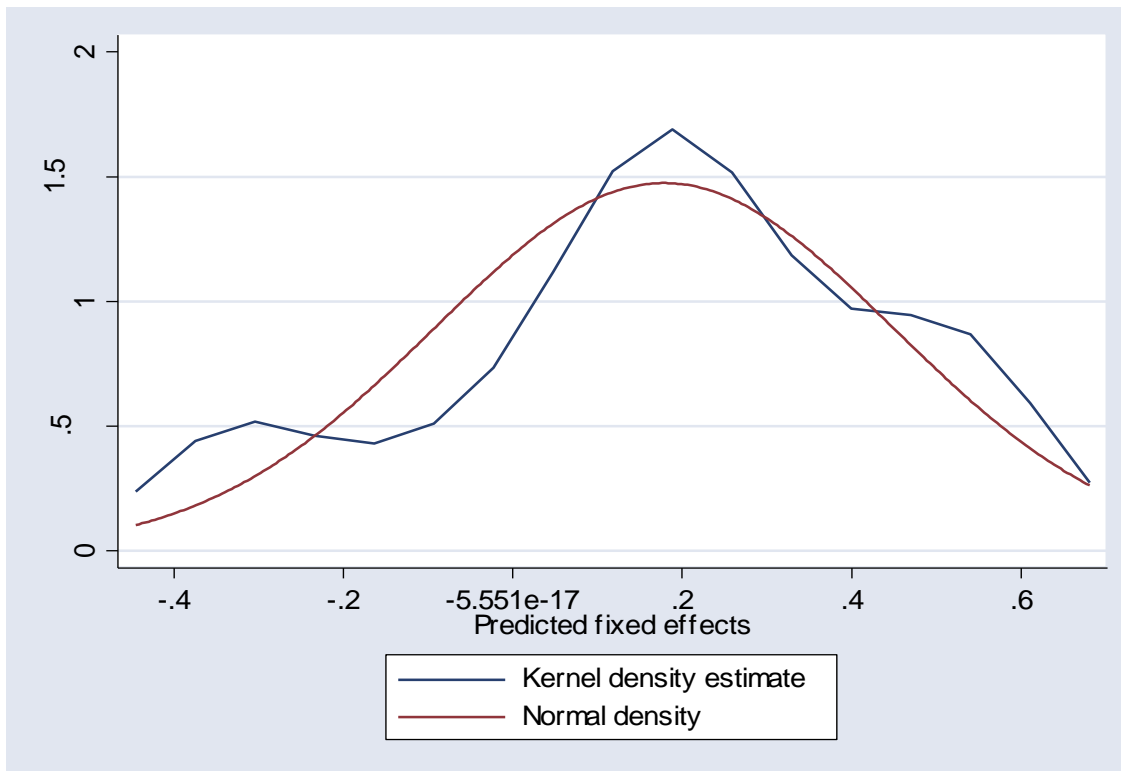
that it could be the result of financing system, since fiscal autonomy correlates with other sources of (revenue and expenditure) decentralisation. In opposition to Oates (1985), it does import to use fiscal expenditure (θ_e) or revenue (θ_r) decentralisation as a proxy, since the former is linked to a larger public sector and the latter to a smaller one. Specifically, an increase of 10% in fiscal expenditure (revenue) decentralisation translates into the increase (reduction) of approximately one percentage point (two points) in the relative size of regional public sector. The estimates of θ_e and θ_r are significant at the 1% level and robust to the inclusion of other variables. The asymmetry observed in the effects is tightly linked to vertical imbalance, and consistent with Stein (1999), Jin and Zou (2002) and Rodden (2003). Political negotiation allows the more disadvantaged regions to escape fiscal competition, transferring to central government a large part of tax collecting as fiscal illusion.

We now focus upon the effect of control variables on previous estimates. Estimated coefficients in column 3 support the hypothesis about an expenditure policy of counter-cyclical type. Thus, economic deceleration scenarios are favourable conditions for the regional governments to demand the transfer of responsibilities in social policy and vice versa. Both the rate of per capita GDP growth (g_y) and the unemployment rate (u) bear positive coefficients (significant at the 1% level). Our results of column 4 do not reject that public expenditure is geared largely towards financing transferred competences. Thus, there is a positive and significant correlation at the 10% level between government size and education growth (g_h)⁴. In contrast, current expenditure (c) is not significant and neither does the holding of elections to regional parliaments. Moreover, our findings support the common pool hypothesis, as current grants (*currgra*) have the expected positive sign, significant at the 1% level (see column 5). By contrast, we reject the flypaper effect, since the *borrowing* coefficient is not significantly different to zero. These outcomes show that fiscal autonomy is complementary to financing via current grants from central government. The R^2 is up to 0.85.

4.2. Further results

Figure 4 plots the estimator of the kernel density function of region-effects and the normal function. The similarity between both indicates that region-effects are quasi-normally distributed. To test whether decentralization scores for the two AC types are the same, the two-sample T -test can be carried out. Since the associated probability (p -value=0.99) is greater than 0.05 the null is not rejected. We suppose idiosyncratic characteristics are related to variables whose magnitude do not change in time, or does so very slowly. Table 4 presents the results of estimating equation (3) by robust Ordinary Least Squares (OLS), the Huber-White sandwich estimator of variances being imposed. As expected, it supports the classic theory of public goods in terms of scale economies and preference heterogeneity.

Figure 4
Estimates of kernel density for fixed effects



Up to what point are the idiosyncratic variables decisive in explaining differences between regions' public sectors? In our paper, we have found evidence that the provision of public services to dispersed populations creates diseconomies of scale. The rural population term appears with significant coefficient and of the predicted sign. It suggests that a standard-deviation increase in the ratio of ruralisation is associated with up to a 33% augment in region-effects. Moreover, it is a robust estimator whose impact is not affected when controlled for other variables. Similarly, the over-65 population has the expected positive sign, although it is not significant. This fact can be seen as a consequence of social services received by the elderly, and especially those of pension costs, being paid by central government (due to Social Security "single cashbox"). To the extent that these people mostly live in rural areas, its non-significance can also be due to likely multicollinearity (correlation coefficient between both variables equal to 0.61). In addition, homogeneity in personal distribution of income measured by Gini's index seems to exert significant influence, in line with Feld, Kirchgässner and Schaltegger (2005).

Our results do not support Wallis' hypothesis (quoted in Oates 1989) that development of competences leads to larger subnational governments. The *dpower* coefficient does not differ significantly from zero, thus the influence on regional public expenditure would be indirect, such as fiscal autonomy. On the contrary it seems that the estimates are consistent with Alesina, Baqir and Easterly (1999) and support the part of literature that considers fragmentation as a determinant in the size of regional government. The negative coefficient of *fractional* (linguistic fractionalization),

significant at the 1% level, indicates that the utility of an ethnic group is reduced when it is made to share public goods with other groups.

Table 4
Regional public sector size and regional effects
Dependent Variable: Fixed Effects
Estimation Method: Robust Ordinary Least Squares

Variables	[1]	[2]	[3]	[4]	[5]
$\log(\text{Km}^2)$	-0.01 (0.09)	-0.05 (0.84)	-0.05 (0.77)	-0.04 (0.67)	-0.06 (1.52)
Municipalities (thousands)	-0.14 (1.01)	-0.24* (2.09)	-0.25* (1.91)	-0.24** (2.22)	-0.23** (2.93)
Rural population		1.29*** (4.02)	1.28*** (3.43)	1.29*** (3.68)	1.09*** (3.83)
Population > 65		0.85 (0.45)	1.17 (0.53)	0.21 (0.09)	2.21 (1.33)
Gini_1990			0.55 (0.20)
Dpower (Art. 151)				-0.07 (0.60)	0.09 (0.77)
Fractional					-0.13*** (3.20)
Constant	0.32 (0.40)	0.23 (0.45)	-0.01 (0.01)	0.29 (0.48)	0.21 (0.45)
R^2	0.09	0.68	0.68	0.69	0.77
F -test	1.39	7.03	3.98	5.60	14.72
p -value	0.28	0.00	0.03	0.01	0.00

Notes: ***, **, and * denote statistical significance at the 1, 5 and 10% levels, respectively. t values of robust estimators, reported in parentheses.

We now turn our attention to the role that AC's financing play. The literature on fiscal federalism argues that the increase of grants and the co-participation in public revenue schemes are associated with an increase of expenditure by sub-national governments, since their effect is equivalent to a tax reduction for the individual taxpayer (flypaper effect). To check it, the ECM (4) is used as our interest lies in analysing the long term equilibrium model. Moreover a logarithmic transformation of variables is performed, as it improves the adjustment and simplifies interpreting the results. The dependent variable is the growth rate of regional public sector and the exogenous variables of interest are the lagged values of fiscal autonomy, fiscal decentralisation, indebtedness and current grants.

Table 5 summarizes the estimates, which are consistent with those obtained by FGLS and basically support theoretical expectations. Firstly, the common pool hypothesis cannot be rejected. Numerically, the results suggest that the effect of one-standard deviation increase in grants will rise regional public expenditure by a 0.6%. We hypothesize that citizens underestimate the cost of public expenditure, which would lead them to demand a greater quantity of

services, since they consider all of benefits but only the part of taxes that pay (the so-called fiscal illusion). Secondly, the decentralisation theorem cannot be rejected either. The effect of a 10% increase in the revenue decentralisation ranges (all other things being equal) from 0.4 to 0.6 percentage points, depending on the specification. Thirdly, the model rejects the Leviathan hypothesis, as more AC' own revenue does not mean less public expenditure. Just the opposite: a 10% increase in the fiscal autonomy adds up 3.5% in the long-run the growth rate of regional public sector. Our results support those of Monasterio, Sánchez and Blanco (1999) and Lago-Peñas (2002) also for Spain.

Table 5
Estimations of changes in regional public sector size
Dependent Variable: growth rate of public sector
Estimation Method: Error Correction Model with fixed effects

Variables	[1]	[2]	[3]	[4]	[5]
$\text{Log}(\text{size}_{t-1})$	-0.43 ^{***} (9.40)	-0.50 ^{***} (10.57)	-0.66 ^{***} (13.25)	-0.66 ^{***} (13.23)	-0.78 ^{***} (14.26)
$\Delta \text{Log}(\tau)$	0.11 ^{**} (2.11)	0.16 ^{***} (3.13)	0.37 ^{***} (3.64)	0.34 ^{***} (3.36)	0.18 [*] (1.76)
$\text{Log}(\tau_{t-1})$	0.11 ^{***} (3.60)	0.18 ^{***} (5.79)	0.72 ^{***} (8.65)	0.69 ^{***} (8.31)	0.50 ^{***} (5.87)
$\Delta \text{Log}(\theta_e)$		-0.49 ^{***} (4.79)	-0.28 ^{**} (2.52)	-0.34 ^{***} (2.95)	-0.21 [*] (1.89)
$\text{Log}(\theta_{e,t-1})$		-0.46 ^{***} (5.18)	-0.12 (1.30)	-0.23 ^{**} (2.17)	-0.10 (0.95)
$\Delta \text{Log}(\theta_r)$			-0.30 ^{***} (2.58)	-0.26 ^{**} (2.23)	-0.13 (1.17)
$\text{Log}(\theta_{r,t-1})$			-0.63 ^{***} (6.89)	-0.58 ^{***} (6.12)	-0.43 ^{***} (4.58)
$\Delta \text{Log}(\text{borrowing})$				-0.05 (0.45)	-0.01 (0.06)
$\text{Log}(\text{borrowing}_{t-1})$				-0.10 ^{**} (2.31)	-0.10 ^{**} (2.32)
$\Delta \text{Log}(\text{currgra})$					0.18 ^{***} (5.34)
$\text{Log}(\text{currgra}_{t-1})$					0.17 ^{***} (5.09)
g_y	-1.97 ^{***} (2.91)	-2.70 ^{***} (4.09)	-1.51 ^{**} (2.29)	-1.68 ^{**} (2.44)	-1.78 ^{***} (2.74)
$\text{Log}(y_{t-1})$	-0.73 ^{**} (2.20)	-2.00 ^{***} (5.06)	-0.48 (1.12)	-1.02 ^{**} (2.05)	-0.79 [*] (1.69)
Δu	3.37 ^{***} (4.89)	6.05 ^{***} (7.07)	2.98 ^{***} (2.78)	3.46 ^{***} (3.10)	2.33 ^{**} (2.18)
u_{t-1}	2.77 ^{***} (5.29)	6.37 ^{***} (7.51)	2.51 ^{***} (2.60)	3.58 ^{***} (3.34)	2.81 ^{***} (2.75)
g_h	1.20 (1.38)	0.62 (0.75)	1.36 [*] (1.73)	1.20 (1.53)	0.39 (0.51)
h_{t-1}	1.16 [*] (1.69)	-0.10 (0.14)	0.81 (1.24)	1.07 (1.61)	1.23 [*] (1.95)
Constant	4.50 [*] (1.68)	15.25 ^{***} (5.20)	2.22 (0.61)	6.17 [*] (1.52)	4.59 (1.19)
R ²	0.29	0.36	0.45	0.46	0.53
Observations	323	323	323	323	323

Notes: ^{***}, ^{**} and ^{*} denote statistical significance at 1, 5 and 10% levels, respectively. *t* values of robust estimators, reported in parentheses

5. Concluding remarks

This paper is a step toward applying empirical analysis to the study of regional decentralization in Spain and its effect on government size. In addition, it includes economic, fiscal, institutional, social, etc. control variables, which the literature has proved to be relevant. We find that the degree of expenditure decentralization is compatible since 1994 with a fast decrease of inequality between regions. However, this process has not been accompanied by a similar one in the financing system, which still depends excessively on grants from central government. While the paper has emphasized the link from decentralization to voter preferences and to economic efficiency, one may argue that other channel may be operative; namely increases of regional public sector respond also to fiscal imbalances. The two channels are not mutually exclusive.

The AC governments tend to assume responsibilities previously in central government, exerting pressure on expenditure decentralisation. However, the resistance to progress in fiscal co-responsibility by means of revenue decentralisation leads to increases in current grants as a way to finance its responsibilities. Some fiscal cessions in the current financing model even act as unconditional grants, as they do not come with greater regulation capacity. Even though AC may establish extra charges on central administration's taxes in practice, they do not do so, not even in sufficient measure for there to be fiscal competition between jurisdictions. This trend appears frequently interspersed by the differential linguistic fact, but this is not in itself synonymous with decentralisation, rather a precondition for the development of competences.

If the process of fiscal decentralization continues as up to now, AC have interest in increasing its responsibilities, thus reinforcing the movement toward vertical imbalances that may have influenced their demand for decentralization in the first place. The size of the lower levels of government will increase in accordance with the greater the amount of financing that they obtain through grants, as a function of Leviathan hypothesis and flypaper effect. The expenditure decentralisation without the adequate revenue decentralisation dilutes fiscal competence and moral responsibility, since budgetary imbalance increases inconsistency between those that benefit from the programmes and those who end up financing and paying for them. Later advances in the decentralisation process must be compatible with the goal of reducing fiscal imbalances that emanate from vertical structure of fiscal power. This could be achieved by assigning to the lower tiers of government the tax bases of fiscal revenue that they can manage efficiently, as well as limiting indebtedness level and discretionarily in grants. Taking into account other experiences, the Spanish process should be completed more equitably with a second decentralisation, from intermediate to local level.

Footnotes

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(1) Local administration is therefore excluded from this study because its relative weight has been hardly altered over the last years

(2) However, it should be necessary analyze whether some sub-national jurisdictions, especially at local level, could be below the optimum size for efficiently providing public goods, in terms of cost. This is especially relevant in the case of health or education, due to there is economies of scale and externalities.

(3) For Stegarescu (2005), the concept has two dimensions: the first one affects the functional division of responsibilities so that the relative importance of revenue and expenditure of sub-national governments determines the scope of autonomy. The second one, and most important, decentralisation dimension concerns vertical structure of fiscal power, i.e. the extent to which decision making in public finances is effectively decentralised. It is measured as the relation of sub-national government expenditure (revenue) to consolidated expenditure (revenue) in accordance with the degree of fiscal autonomy. Budgetary approach is the most used in the literature, although it has certain limitations that should be taken into account. Firstly, due to the difficulty in calculating to what extent decentralisation is the result of attributing new responsibilities and resources to the lower tiers of government or whether it simply reflects the relative size of its activities. On the other hand, due to fiscal statistics do not adequately reflect vertical structure in decision-making. Ebel and Yilmaz (2003), Rodden (2004) and Stegarescu (2005) can be consulted for a discussion on the limitations of these indicators.

(4) It can be thought that the same could be the case of health responsibilities, although, having been transferred from the old Spanish National Health Institute after the sample period, it is not included in regressions.

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Appendix

Alesina and Spolaore (1997) focus on a trade-off between the benefits of large countries and the costs of heterogeneity in large populations. In order to keep the model tractable, they consider only one nonrival public good. The world population has mass 1, and it is assumed a continuum of individuals with ideal points distributed uniformly on the segment $[0,1]$. Individual's utility is decreasing with the distance to their government from their ideal point. The world needs at least one government and thus $N \geq 1$, where N is the number of countries in the world. Every individual has the same, exogenous income y , and pays tax t_i . Thus, the utility function of individual i is

$$U_i = g(1 - al_i) + y - t_i, \quad (A1)$$

where g and a are positive parameters and l_i is the preference distance from individual i to his government. The parameter g measures the government service and parameter a captures the reduction in marginal utility of government services when the government is located at a distance l_i from the individual's preferred type. Individuals who are close to each other in terms of preferences would like to form a country together. It is assumed the geographical and the preference dimensions coincide and therefore l_i in equation (A1) captures both dimensions.

Following Rebelo (1991) by assuming constant returns to scale to a broad concept of capital, and assuming household producers, the production function can be written as

$$y = Ak, \quad (A2)$$

where y is output per capita, $A > 0$ is the constant net marginal product of capital, and k corresponds to the per capita amount of aggregate capital that is viewed broadly to encompass both human and nonhuman capital. According to the literature in the tradition of Barro (1990), one assumes regional output per capita y_i is linked to the per capita quantity of local government purchasing of goods and services, which is assumed to generate output

$$y_i = f(A_i, g^L, \varpi) \quad (A3)$$

The general idea of including g^L as a separate argument of the production function is that local government purchasing is not a close substitute for central government purchasing. Aschauer (1989) argues that the services from government infrastructure are particularly important in this context. Furthermore, the relation between marginal output per capita and integration ϖ is based on the extent of the market hypothesis. When and how does the size of a country matter for the economic prosperity of its inhabitants? The relationship between country size and market size depends on the trade regime. The empirical evidence gathered by Alesina, Spolaore and Wacziarg (2000) is consistent with the hypothesis that free trade makes borders more open but crossing national borders still has a cost in terms of trade flows. Alesina (2002) points out that the trade off between the benefits of size, like economies of scale, versus the costs of heterogeneity of preferences in large populations offers a useful perspective to think about political borders. The model considers tax schedules in which individuals far from the government pay less

$$t_i = \frac{g}{s} + \gamma q^2 + q(\bar{l} - l_i), \quad (\text{A4})$$

where g denotes government costs, s is country size, q is a nonnegative parameter, and \bar{l} defines the average distance from government. For any positive γ , the social planner would choose the efficient number of countries of equal size, and $q=0$.

Stegarescu (2004) makes substantial departures from earlier contributions and chooses (1) entirely to deliver a closed-form solution. Resolving for θ and g , the conditions for maximizing the utility function, it obtains the optimal solution for

$$\theta^* = \frac{\alpha + \varpi}{\alpha + \varpi + 2\beta(1 - \delta)}, \quad (\text{A5})$$

and

$$g^* = \frac{N}{2} [\alpha + \varpi + 2\beta(1 - \delta)]. \quad (\text{A6})$$

From the equations (A5) and (A6) one can deduce some interesting conclusions. Firstly, the optimal degree of decentralisation is invariably positive and growing with preference heterogeneity, as public local goods always provide direct utility. Secondly, as national public goods create some type of benefits, remaining in the federation is preferable to seceding (as $\beta > 0$ and $\delta < 1$); we are not supposing that there is a direct cost for belonging to federation (Le Breton and Weber, 2003). Thirdly, public goods grow with population size, due to the possibility of obtaining scale economies and reducing per capita cost. Fourthly, the effect of economic integration on the degree of decentralisation is ambiguous.

Table A.1
Explanatory variables

	BASICS			OF INTEREST		CONTROL	
Scale economics	Heterogeneity	Economic integration	Fiscal autonomy	Vertical fiscal power framework	Fiscal power jurisdiction	Economic and politics cycles	Social framework
Total population	Per capita income	Trade openness	Regional fiscal pressure	Borrowing	Education	Per capita income growth	Population age
Regional surface	Fiscal power evolution		Expenditure decentralization	Budget consolidation		Unemployment rate	Rural population urban population
Fragment	Linguistic fractionalization		Revenue decentralization	Current grants		Regional elections	Per capita income distribution

Table A.2

Data source

Variable	Definition	Source
DEPENDENT VARIABLE		
<i>size</i> : Total public expenditure as % of real GDP, 1986 prices. BADESPE (IEF) and Fundación BBVA (1999, 2000) for 1985-1999 and Alcaide and Alcaide (2007) for 2000-2004.		
INDEPENDENT VARIABLE		
Geographic and demographic		
<i>s</i> : Surface in Km ² . Dirección General del Instituto Geográfico Nacional		
<i>Rural</i> : Proportion of people in rural jurisdictions < 10.000 inhabitants. INE.		
<i>n</i> : Population. Renovation of Padrón municipal de habitantes a 1 de mayo de 1996. National Data, by AC and provincias. INE.		
<i>under15</i> : Population under 15 years old. Renovation of Padrón municipal de habitantes a 1 de mayo de 1996. National Data, by AC and provincias. INE.		
<i>over65</i> : Population over 65 years old. Renovation of Padrón municipal de habitantes a 1 de mayo de 1996. National Data, by AC and provincias INE		
Social Heterogeneity		
<i>local</i> : Thousands of municipalities by CCAA. Dirección General del Instituto Geográfico Nacional.		
<i>fractional</i> : Dummy = 1 if linguistic fractionalization (own language that includes Galicia, Catalonia, Basque Country); 0 otherwise.		
<i>Gini</i> Index. Measure of income inequality calculated by Ayala <i>et al.</i> (2006).		
Fiscal Autonomy		
<i>τ</i> : Fiscal autonomy or Tax as % of GDP. BADESPE (IEF) and Ministerio de Economía y Hacienda.		
<i>θ_e</i> : Fiscal decentralization: Sub-national share of government expenditure. BADESPE (IEF) and Ministerio de Economía y Hacienda.		
<i>θ_r</i> : Fiscal decentralization: Sub-national share of own source revenue as % of total government revenue. BADESPE (IEF) and Ministerio de Economía y Hacienda.		
<i>borrowing</i> : Regional borrowing as % of GDP. Bank of Spain.		
<i>bcf</i> : Budget Consolidation Framework (deficit and borrowing constraints in 1992,1995 and 1998) by Autonomous Communities. Banco de España.		
<i>currgra</i> : Current grants as % of real GDP, 1986 prices. BADESPE (IEF).		
Economics		
<i>GDP_{cp}</i> : GDP in millions of constant euros of 1986. Fundación BBVA (1999, 2000) and Alcaide and Alcaide (2007).		
<i>y</i> : Real GDP per capita, 1986 prices. Fundación BBVA (1999, 2000) and Alcaide and Alcaide (2007).		
<i>g_y</i> : Variation Rate of per cápita GDP. Fundación BBVA (1999, 2000) and Alcaide and Alcaide (2007).		
<i>x</i> : trade openness rate = (X + M) / GDP. Aduanas and Impuestos Especiales, Ministerio de Economía y Hacienda.		
<i>π</i> : Implicit Deflator of GDP. Fundación BBVA (1999, 2000) and Alcaide and Alcaide (2007).		
<i>u</i> : Unemployment rate (annual average). Boletín of Coyuntura Regional, Ministerio de Economía y Hacienda.		
Political		
<i>elections</i> : Regional elections. Ministerio de Administraciones Públicas.		

<i>Dpower</i> : Dummy of fiscal power (1 if CCAA is from article 151 of Spanish Constitution “advanced” fiscal power and 0 if not).
Control Variables
<i>c</i> : current expenditures as % of own regional expenditures. BADESPE (IEF) and Ministerio de Economía y Hacienda.
<i>h</i> : Human capital (average years of schooling of employed population). De la Fuente and Doménech (2006).
<i>g_h</i> : Variation rate of human capital (average years of schooling of employed population). De la Fuente and Doménech (2006).
<i>consumption</i> : Government consumption (staff expenditures + current expenditures + capital allowance) as percentage of real GDP, 1986 prices. Regional Governments.

Table A.3
Summary statistics

Variable	Number of observations	Average	Standard-deviation	Minimum	Maximum
Annual Variables					
Public sector size	340	0.177	0.122	0.014	0.568
Log(<i>n</i>)	340	7.388	0.895	5.568	8.958
Log(GDP per capita)	340	8.825	0.256	8.074	9.270
Trade openness rate	289	0.305	0.167	0.022	0.817
Fiscal autonomy	340	0.125	0.038	0.001	0.245
Expenditure Decentralization	340	0.310	0.109	0.108	0.696
Revenue decentralization	340	0.240	0.204	0.003	0.938
Growth rate GDPpc	340	0.028	0.023	-0.029	0.084
Unemployment rate	340	0.165	0.062	0.044	0.346
Growth of human capital	340	0.019	0.014	-0.017	0.082
Borrowing	340	0.046	0.021	0.013	0.106
Current grants	340	0.056	0.068	0.001	0.972
Fix Variables					
Fixed effects	17	0.168	0.145	-0.072	0.441
Log(surface, in km ²)	17	9.795	1.048	8.516	1.145
Thousands of municipalities	17	5.621	1.106	3.807	7.718
% Population capital provinces	17	0.342	0.119	0.184	0.571
% Population < 10.000 inhabitants	17	0.290	0.164	0.054	0.577
% Population < 15 years old	17	0.156	0.023	0.123	0.194
% Population > 65 years old	17	0.164	0.027	0.104	0.204
Gini Index 1990	17	0.303	0.022	0.257	0.339