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What shapes the flypaper effect? The role of the political environment in the budget process

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Abstract

This study investigates the spatial heterogeneity of the flypaper effect in a sample of 2,451 Spanish municipalities over the period 2003-2015 by means of Bayesian spatial panel data econometric techniques including municipal and time-period fixed effects. In particular, we analyse how differences in the degree of political competition and the local governments' monitoring and enforcement effort in tax collection affect the size of the flypaper effect. Our results suggest that municipalities with higher tax collection efficiency and where local governments have more political strength exhibit a lower flypaper effect.

Keywords: Flypaper effect, political competition, tax collection efficiency, Spanish municipalities, Bayesian spatial econometrics.

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1 Introduction

One of the topics that has received greater attention in the literature of Fiscal Federalism is the flypaper effect (FPE). The FPE, which was first discovered by Gramlich and Galper (1973), refers to the empirical observation of a greater stimulatory effect of unconditional grants on local public spending than do comparable increases in private income. As explained by Hines and Thaler (1995) and Oates (1999), in the traditional grants-in-aid theoretical framework, this finding is puzzling given that the standard approach based on the median voter, formalised by Bradford and Oates (1971), predicts that grants to local governments are equivalent to increments of community income and, therefore, governments should display the same propensity to spend out of income or lump-sum grants.

Many attempts have been made in the literature to explain the FPE but despite these endeavours, our understanding of the effect is still somewhat limited.¹ One reason could be that many scholars do not take into account that the FPE might occur differently in different locations.

Previous theoretical and empirical studies highlight the importance of factors such as the level of political competition (Borge *et al.*, 2008; Fiva and Natvik, 2013; Gennari and Messina, 2014; Kjaergaard, 2015), ideology (Baekgaard and Kjaergaard, 2016) and the efficiency in tax collection (Aragon, 2013; Mattos *et al.*, 2011) as plausible moderators of the size of the FPE. Nonetheless, none of these analyses consider the spatial dimension of the data. In this paper we use Spanish municipal data to empirically analyse the underlying geographical dimension of the FPE and those variables that could help explaining its spatial heterogeneity. For this reason, the specification employed here consists on a spatial model that considers cross-jurisdictional interactions in the process of government spending, allowing us to investigate the role played by spatial spillovers in the determination of the FPE.

In this regard, our paper is related to a recent stream of empirical literature, starting with Acosta (2010) and followed by Bastida *et al.* (2013), Kakamua *et al.* (2014)

¹See Hines and Thaler (1995) or Inman (2008) for an overview.

and Yu *et al.* (2016), that analyses the FPE accounting for the presence of spatial interdependence and strategic interactions among local government spending decisions by means of spatial econometric modelling techniques. These studies integrate the strand of the literature analysing the FPE with that of local fiscal policy interdependence, which recognises the fact that fiscal choices made by a local government may affect the fiscal decision of the neighbouring jurisdictions due to the existence of benefit spillovers, yardstick competition and political trends, among others (Case *et al.*, 1993; Brueckner, 2003; Santolini, 2008).

The testing ground for our analysis is at the Spanish local level. We focus on Spanish municipalities because they are highly decentralised. Indeed, according to the Local Government Index developed by the Varieties of Democracy Project, Spain is among the countries with a highest level of local authority. In the same vein, the World Bank's Fiscal Decentralisation Index ranks Spain among the top twenty worldwide highly decentralised countries. In Spain, as in many other countries, local governments finance their budget mostly from two sources: local revenues (65%) and grants from upper tiers of government (35%). However, the over-reliance of municipalities on grants has several perils, as this apparent softening of local governments' budget constraints could distort local policy decisions. On the one hand, it opens the room for inefficient spending, due to either fiscal illusion or rent seeking. On the other hand, grant-based financing also highlights a potential moral-hazard problem, as it encourages municipalities to spend without necessarily considering the full fiscal consequences of such policies. In addition, the current debate on the policy reform regarding the Spanish local funding system pleads for increasing local governments' autonomy and their efficiency in spending by reducing the share of grants in local budgets and increasing revenues from local taxes. Our findings will contribute to this debate.

This paper adds to the foregoing literature in three ways. First, empirically, we explore the underlying political processes that govern the budget behaviour of local decision-makers and that could ultimately explain the spatial heterogeneity of the FPE across jurisdictions. To that aim, we use a rich local data set to calculate the effects of (i) the strength of political leadership and (ii) tax collection efficiency on

the responsiveness of local spending to grants. These variables enter the equation as interaction terms and their effects are simulated so as to explore how differences in these variables affect the estimated size of the FPE.

Second, econometrically, we extend traditional FPE modelling approaches accounting for the possibility of spatial spillovers in a spatial panel data framework. This helps us to address the arguments and concerns rose by Hines and Thaler (1995), who point out that the failure to account for spatial interdependence may induce a specification error and biased computations of the true FPE. Unlike previous studies of Acosta (2010), Bastida *et al.* (2013), Yu *et al.* (2016) or Kakamua *et al.* (2014), which are based on spatial cross-sectional data, the present analysis is based on panel data, which allows us to control for unobserved spatial and temporal heterogeneity by introducing municipal and time-period fixed effects.

Third, our spatial panel data specification is more flexible than the specifications employed in previous studies as it includes both endogenous and exogenous spatial interactions effects. This gain in flexibility is due to the estimation of a Spatial Durbin Model (SDM) by means of the Bias Corrected Maximum Likelihood (BCML) estimator developed by Lee and Yu (2010).²

The paper proceeds as follows. After this introduction, Section 2 provides a literature review on the FPE and its drivers. Section 3 discusses the econometric strategy while Section 4 presents the main empirical findings. Finally, Section 5 concludes.

²The estimation strategy for cross-section spatial models of Acosta (2010) and Bastida *et al.* (2013) is based on the IV estimator, which in the context of spatial regressions has as a main drawback the fact that the coefficient estimate of the spatial autoregressive term may fall outside its parameter space and it is usually less efficient (Elhorst and Fréret, 2009).

2 Literature Review

2.1 The Flypaper Effect

The FPE represents a major focus of theoretical and empirical work in the Fiscal Federalism literature. Despite the huge amount of empirical studies on this topic³, doubt remains about the size, and even existence, of this effect.

Many attempts have been made to explain the FPE, but no theoretical consensus has been reached so far. On the one hand, a strand of the literature considers that the anomaly of the FPE is related to the theoretical framework of the median voter and the prediction of equal reactions of spending to changes in transfers and private income. The reason is that in political and economic environments characterised by voters' irrationality (Hines and Thaler, 1995) or fiscal illusion (Oates, 1979), one should no longer expect symmetric reactions in government expenditures. From a supply side, alternative explanations suggest that the FPE may be caused by costly and/or distortionary taxation (Hamilton, 1986; Aragon, 2013; Vegh and Vuletin, 2016), as well as by inefficient political institutions (Chernick, 1979), where both self-interested budget maximising bureaucrats (Niskanen, 1971) and self-interested politicians exact rents from the uninformed citizens they serve (McGuire, 1975; Brollo *et al.*, 2013).

On the other hand, some authors base the explanation of this paradox on the validity of the methodological strategies implemented to analyse the relationship between government spending and its determinants (Bailey and Conolley, 1998). As explained by Inman (2008) the potential methodological problems posed by the literature are diverse and refer to issues of (i) model specification, (ii) omission of relevant variables, (iii) failure to distinguish matching grants from unconditional aid, (iv) failure to consider the simultaneous determination of grants and local spending and (v) measurement errors and outliers. If empirical studies suffer from these problems, their statistical inference would be invalid causing FPE estimates to be biased and misleading.

³For a comprehensive survey, see Gamkhar and Shaw (2007) or Inman (2008).

The two main variables involved in the analysis of the FPE are grants and private income. The former only includes per capita current transfers from upper tiers of government. These kinds of transfers are totally non-earmarked and are hence unconditional. Capital grants, which are earmarked grants that mainly finance capital expenditure projects proposed by local governments, have been considered separately as a control variable. Distinguishing between these two types of transfers is important because, as noted in King (1984), conditional grants have a greater stimulatory effect on spending than a lump-sum grant of the same amount. This is because, while unconditional grants only shift forward the local government budget constraint (income effect), conditional grants are also designed to stimulate local spending in subsidised public goods by reducing their relative price (substitution effect). Then, if transfers are erroneously classified as unconditional grants, the FPE will artificially arise.⁴ With respect to the income variable we use as a proxy of the median voter's gross income the average personal income tax base stated in the database on income tax returns of the Spanish Tax Administration Office.

The basic estimating equation of the FPE is:

$$E_{it} = \alpha + \delta Y_{it} + \gamma G_{it} + \epsilon_{it} \quad (1)$$

where E_{it} denotes the level of per capita spending, measured for every municipality $i = 1, \dots, N$ at a particular point in time $t = 1, \dots, T$, G_t measures per capita current grants from upper tiers of government and Y_t denotes private mean income. Following Vegh and Vuletin (2015) the FPE is defined as:

$$\frac{\partial E_{it}}{\partial G_{it}} - \frac{\partial E_{it}}{\partial Y_{it}} > 0 \quad (2)$$

and therefore it can be estimated as the difference between γ and δ in Equation (1).

As discussed in Section (1), the aim of this analysis is to investigate why the FPE may change across the geographical domain. Figure (1) depicts the estimated

⁴In the case of Spain, intergovernmental grants are mainly unconditional and account for more than a third of municipal revenues on average.

variation in the FPE across Spanish municipalities for the period 2003-2015 by means of Geographically Weighted Regression (GWR). GWR estimates of the FPE extend Equation (1) as follows:

$$\tilde{E}_i = \tilde{X}_i \beta_i + \epsilon_i \quad (3)$$

$$\beta_i = (w_{i1} \otimes I_k \dots w_{n1} \otimes I_k) \begin{pmatrix} \beta_i \\ \vdots \\ \beta_n \end{pmatrix} + u_i \quad (4)$$

where $\tilde{E}_i = W_i E$, $\tilde{X}_i = W_i X$ and β_i is a $k \times 1$ parameter vector associated with observation i . The dependent variable E is per capita spending, and the explanatory variables in X are private average income and per capita current transfers (together with a constant). Here W_i is a distance-based weight vector based on an exponential decay function such that $W_i = e^{\left(\frac{-d_i}{\theta}\right)}$ where θ denotes the bandwidth.⁵ This exploratory regression technique is helpful to investigate the heterogeneity of the estimated parameters across space and, therefore, to detect local variations in the FPE.

INSERT FIGURE (1) ABOUT HERE

As it can be seen, there exists considerable variability in the FPE estimates across jurisdictions, suggesting both a marked degree of spatial heterogeneity and the presence of hotspots in the asymmetric response of spending to changes in private income and grants. As a further check, tests on individual parameter stationarity as described in Fotheringham *et al.* (2002) are performed. The results provide evidence of spatial non-stationarity for the effects of income and transfers on the expenditures at the local level. Thus, relaxing the assumption of an homogeneous FPE over the geographical dimension seems appropriate in this context.

⁵In this setting β_i is smoothed using a combination of values in neighbouring areas. The value of θ is based on a cross-validation procedure where the score function $\theta = \operatorname{argmin} \sum_{i=1}^n \left[E_i - \hat{E}_i(\theta) \right]^2$ is minimised.

2.2 What explains the FPE Heterogeneity?

Economic theory provides different explanations as to the nature and significance of the FPE heterogeneity. According to previous empirical literature, the size of the FPE may depend on additional characteristics of the jurisdictions. This being the case, a model with interaction terms is suitable:

$$E_{it} = \alpha + \delta Y_{it} + \gamma G_{it} + \omega Z_{it} + \psi Y_{it}.Z_{it} + \zeta G_{it}.Z_{it} + \epsilon_{it} \quad (5)$$

where the Z_{it} is a moderator term with associated response parameter ω . The inclusion of interaction terms $Y_{it}.Z_{it}$ and $G_{it}.Z_{it}$ and the interaction coefficients ψ and ζ allows the researcher to capture differences in the grant or income elasticities of spending due to differences in the moderators across the sample of municipalities. In this context, the marginal impact of G_{it} and Y_{it} on E_{it} now explicitly depends on the value of Z_{it} and the estimated values of ψ and ζ are indicative of whether or not the effects of G_{it} and Y_{it} on E_{it} are systematically different over different values of Z_{it} .

We now briefly discuss the conceptual framework and key insights for the political variables that could explain the high cross-sectional variability observed in the GWR-based FPE estimates shown in Figure (1).

2.2.1 Political Strength

Political factors might matter explaining the FPE heterogeneity given that they shape the economic performance and the budget behaviour of municipalities (Santolini, 2008; Grassmueck and Shields, 2010). According to the weak government hypothesis (Roubini and Sachs, 1989a,b), a strong government has an advantage in keeping debt and deficits low because of its higher independence when making decisions, while a weak government would be more prone to bargaining and more reluctant to cut spending, as it would find it difficult to resist to pressures from local interest groups. Borge (2005), Borge *et al.* (2008), Tovmo and Falch (2002) and Volkerink and de Haan (2001) argue that the strength of political leadership is negatively related to the size of

local budgets. In scenarios with a high fragmentation of political power, and without sustainable coalitions, the bargaining process in the legislature may be complex, and the council is likely to have a relatively low bargaining power in his interaction with interest groups. As pointed out by Tovmo and Falch (2002), in such a scenario, it will most likely be hard to reduce total spending, being the result overspending, deficits, and a high propensity to use grants to finance expenditures. This situation might be reinforced when there is fiscal illusion and the perceived costs of the production of public services are below their true cost. In this context, lobbies and interest groups may push for increased spending, which can be seen as a negative fiscal externality on taxpayers. The ability of internalising such externalities is likely to depend on the strength of the political leadership. Thus, weak local governments may freeze their tax policy and let the variation in grants from upper tiers of government drive the size of the deficit and the spending levels. Overall, these arguments suggest that the propensity to increase spending via the tax-base is lower in weak governments.

To investigate the link between political competition and the size of the FPE, we measure political strength by means of the margin of majority, defined as the vote share of the largest party in the municipality i minus the 50%. So, positive values of this variable reflect scenarios of absolute majority whereas negative values point to a minority government.

2.2.2 Tax Collection Efficiency

Similarly, the responsiveness of local spending to grants might depend on the local governments' monitoring and enforcement effort. Hamilton (1986) suggests that the FPE may be due to differences in the marginal cost of funds. In his model, local taxes are costlier than grants due to distortionary costs, which motivates governments to increase spending out of transfers rather than through their tax-base. According to Aragon (2013), this argument extends naturally to other factors increasing the relative cost of local taxes, such as tax collection costs (i.e, compliance and administrative costs). Compliance costs reflect the value of the time spent by the taxpayer filling tax returns as well as any expenditure on goods and services for the same purpose whereas

administrative costs refer to the resources used by the local tax authority to operate the tax system including the cost of processing tax returns, monitoring tax evasion and the required legal proceeds. Aragon (2013) argues that these costs are not negligible and in some cases may be as important as the distortionary costs of taxation. He theoretically shows that, in scenarios of costly taxation, local governments find more beneficial to use grants from central governments as they lower the marginal cost of public spending.⁶

Costly tax collection is proxied here with an index of tax collection efficiency since an efficient tax administration reduces tax collection costs which, in turn, reduces the relative costs of local taxes and the need of local governments to rely on grant money to finance their expenditures (Aragon, 2013). We follow Mattos *et al.* (2011), who suggests ranking tax collection efficiency by comparing the fiscal performance of each municipality with a tax frontier (fiscal potential). To that end, Data Envelopment Analysis (DEA) methodology developed by Charnes *et al.* (1978), which generalises Farrell's definition for multi-output contexts to calculate efficiency scores, is employed. Formally, efficiency can be calculated as the solution to the following maximisation problem:

$$\begin{aligned}
 & \text{Max } \phi_0 \\
 & \text{st :} \\
 & x_{ji0} - \sum_{i=1}^n x_{ji} \lambda_i \geq 0, j = 1, \dots, m \\
 & - \phi_0 y_{ri0} + \sum_{i=1}^n y_{ri} \lambda_i \geq 0, r = 1, \dots, k \\
 & \sum_{i=1}^n \lambda_i = 1, i = 1, \dots, n \\
 & \lambda_i \geq 0, \forall i
 \end{aligned} \tag{6}$$

where y denote the outputs, x the inputs and λ_i are the weights on the n municipalities,

⁶Using data on Peruvian municipalities, he finds that municipalities facing higher tax collection costs are more responsive to additional grants, which should increase the size of the FPE.

which allow the construction of the composite efficiency index $1/\mathcal{O}_0$ where $\mathcal{O}_0 = y\lambda$.

The performance of each municipality is measured relative to an envelopment surface composed of other municipalities from the sample representing current technology. Those that are enveloped by the surface are classed as efficient; while those outside it are classed as inefficient. The closer the municipality is to the border or frontier, the greater its efficiency. We use the per capita total amount of local revenues from local taxes as our output variable. As inputs, we first consider whether the local council has an updated cadaster. In particular, we compute (i) the number of years since the cadaster (Property Assessment Office) was last updated. As noted in Aragon (2013), the rationale for using this proxy is that the cadaster is recognised as an effective tool in implementing and operating property tax systems. In addition, we take into account that the municipalities' responsibility for tax collection varies depending on their population. We use (ii) a dummy to capture the fact that a number of small municipalities are not responsible for collecting local revenues and rather delegate this responsibility to the provincial government. Finally, we also use (iii) the elevation range and (iv) the distance in kilometres of each municipality to the closest tax management office. Tax collection is expected to be more costly and less efficient in high elevation and remote locations, especially when taxpayers need to commute to the Provincial Council to comply with their local taxation obligations. We normalise each of these three measures for each municipality and each period by means of the negative max-min formula so that they become positive inputs in the DEA analysis.

3 Econometric Strategy

3.1 Data

Our sample consists of 2,451 Spanish municipalities over the period 2003-2015. The data sample is restricted to almost all municipalities above 1,000 inhabitants due to the lack of complete time-series data for those localities below this threshold. Note that the Spanish municipal sector is characterised by a high degree of fragmentation,

with an extremely large number of municipalities with very small populations. In particular, 60% of the approximately 8,100 existing municipalities have fewer than 1,000 inhabitants and represent just 3.6% of the total population. Thus, we believe the final sample to be reasonably representative of the whole population, at least for the municipalities with more than 1,000 residents.

In the Spanish institutional framework, the subnational sector comprises two levels of government: regions (so-called Autonomous Communities) and municipalities. According to the Spanish Constitution, the former are mainly responsible for the provision of education and health services, whereas the latter are mainly involved in the provision of refuse collection, water supply, sewer system and street lighting, among others.

In addition to their own sources of taxation, notably the property tax, municipalities rely heavily on unconditional transfers from the central government to meet their residents' demand for public goods and services. Contrary to conditional grants, which are determined on a project-by-project basis, unconditional grants are allocated according to population-based formulas that leave little room for electoral politics. In the case of Spain, intergovernmental grants are mainly unconditional and account for more than a third of municipal revenues on average.

3.2 The Model

As mentioned in the introduction, earlier studies on the FPE use a spatial cross-sectional approach (Acosta, 2010; Bastida *et al.*, 2013; Kakamua *et al.*, 2014; Yu *et al.*, 2016). The reason to adopt a spatial approach is that if local governments interact with each other, a change in the income of a particular municipality i may stimulate not only its own level of spending but also the spending level in neighbouring municipalities $j \neq i$ which, in turn, may generate additional effects going back to the municipality of origin i . Figure (2) suggests the existence of a positive link between own spending and the average of neighbouring municipalities. Nevertheless, whether or not these cross-jurisdictional government interactions amplify or decrease the size of

non-spatial FPE estimates is an empirical question and depends on the complementary or substitutive relationships in the provision of public goods.

INSERT FIGURE (2) ABOUT HERE

The nature of the data set allows us to employ panel data techniques in this context, thus extending modelling possibilities as compared to the single equation cross-sectional setting employed so far. The empirical analysis begins with the following Spatial Durbin Model (SDM) including municipal and time-period fixed effects. The model is written in vector form for a cross-section of observations at time t :

$$E_t = \mu + \iota_N \alpha_t + \rho W E_t + X_t \beta + W X_t \theta + \epsilon_t \quad (7)$$

where E_t is a $N \times 1$ vector consisting of observations for the local government spending measured for every municipality $i = 1, \dots, N$ at a particular point in time $t = 1, \dots, T$, and \mathbf{X}_t is an $N \times K$ matrix of exogenous aggregate covariates with associated response parameters β contained in a $K \times 1$ vector that are assumed to influence local government spending. $\epsilon_t = (\epsilon_{1t}, \dots, \epsilon_{Nt})'$ is a $N \times 1$ vector that represents the corresponding disturbance term which is assumed to be i.i.d with zero mean and finite variance σ^2 . W is a $N \times N$ matrix of known constants describing the spatial arrangement of the municipalities in the sample. The variable $W E_t$ denotes contemporaneous endogenous interaction effects among the dependent variable, with ρ being the spatial auto-regressive coefficient. $W X_t$ is the matrix of exogenous regressors of neighbouring municipalities with its corresponding $K \times 1$ vector of parameters θ . $\mu = (\mu_1, \dots, \mu_N)'$ is a vector of municipal fixed effects, $\alpha_t = (\alpha_1, \dots, \alpha_T)'$ denote time specific effects and ι_N is a $N \times 1$ vector of ones. Municipal fixed effects control for all municipal-specific time invariant variables whose omission could bias the estimates, while time-period fixed effects control for all time-specific, space invariant variables whose omission could bias the estimates in a typical time series (Elhorst, 2014).⁷

⁷The use of political variables has forced us to restrict the panel data to the electoral years (i.e. 2003, 2007, 2011 and 2015). Therefore, our $T = 4$. This limited time dimension precludes us to employ a dynamic specification given that by construction we would lose one period leaving us with $T = 3$, and such a short panel could yield very noisy estimates of both the temporal and the space-time diffusion parameters.

Following the literature, the covariates that fill out matrix \mathbf{X}_t include private mean income (Y_t) and per capita unconditional current grants (G_t), as well as a set of controls (C_t) that include several demographic and socio-economic variables (population, dependency rate -old and young population-, migrants, education, unemployment rate, capital transfers) and three political factors (ideology, regional and national alignment) that might be relevant in shaping local budgeting decisions. Variables' labels, data sources, definitions and summary statistics are reported in Table (1).

INSERT TABLE (1) ABOUT HERE

3.3 Inference, Interpretation and Bayesian Spatial Model Selection

Notice that the presence of spatial lags of the dependent and explanatory variables complicates the interpretation of the parameters in Equation (7). Therefore, some caution is required when interpreting the estimated coefficients in the SDM. As it is common in modern spatial econometrics analysis, inference is based on a partial derivative interpretation and the computation of *direct*, *indirect* and *total effects* (LeSage and Pace, 2009; LeSage, 2014). The matrix of partial derivatives with respect to a change in a regressor X_k is given by:

$$\frac{\partial E_t}{\partial X_t^k} = \left[(I - \rho W)^{-1} \right] \left[\beta^{(k)} + \theta^{(k)} W \right] \quad (8)$$

In this type of spatial models a change in a particular explanatory variable in municipality i has a *direct effect* on the dependent variable in that municipality, but also an *indirect effect* on the remaining municipalities. Thus, *direct effects* (diagonal terms in Equation (8)) capture the effect on local government spending in i caused by a unit change in an exogenous variable X_k in i . *Indirect effects* (off-diagonal terms) can be interpreted as the effect of a change in X_k in all other municipalities $j \neq i$ on the spending in i or, alternatively, as the impact of changing an explanatory variable in a particular municipality on spending in the remaining municipalities. Finally, the *total effect* is the sum of the direct and indirect effects.

The specification in Equation (7) is particularly useful in this context, since the SDM can be contrasted against alternative spatial panel data model specifications widely employed in the spatial econometrics literature such as the *Spatial Lag Model* (SLM), the *Spatial Error Model* (DSEM) and the *Spatial Durbin Error Model* (SDEM) in Equations (9), (10) and (11) respectively.

$$E_t = \mu + \iota_N \alpha_t + \rho W Y_t + X_t \beta + \epsilon_t \quad (9)$$

$$\begin{aligned} E_t &= \mu + \iota_N \alpha_t + X_t \beta + v_t \\ v_t &= \lambda W v_t + \epsilon_t \end{aligned} \quad (10)$$

$$\begin{aligned} E_t &= \mu + \iota_N \alpha_t + X_t \beta + W X_t \theta + v_t \\ v_t &= \lambda W v_t + \epsilon_t \end{aligned} \quad (11)$$

Another relevant source of model uncertainty in spatial econometrics is the spatial weights matrix. Given that this is a relevant issue in spatial econometric modelling, a broad range of alternative specifications of W are considered.⁸ As it is common practice in applied research, all the matrices are row-standardised, so that it is their relative, and not absolute, distance that matters.

In order to choose between different potential specifications of the spatial weight matrix W , as well as to choose between SDM, SLM, SDEM and SEM specifications a Bayesian model comparison approach is applied following LeSage (2014) and Rios *et al.* (2017). This approach determines the posterior model probabilities (PMP) of the alternative specifications given a particular W , as well as the PMP of different spatial weight matrices given a particular model specification. Proceeding in this way, we find

⁸The first spatial weights matrix is based on the concept of first order contiguity, according to which $w_{ij} = 1$ if jurisdictions i and j are physical neighbours and 0 otherwise. The definition of neighbouring regions used here is based on physical contiguity. To ensure that every region has at least one neighbour, we employ the Delaunay triangulation by constructing Voronoi polygons from the centroids of the sample municipalities using the Matlab function `xy2cont.m` developed by LeSage. See LeSage and Pace (2009, p. 118) for further details. Secondly, several matrices based on inverse distance with cut-offs at different thresholds of distance in kilometres are introduced. In addition, power distance and exponential decay matrices with cut-offs at the first and second quartile are employed. Finally, k-nearest neighbours computed from the great circle distance between the centroids of the various jurisdictions are also considered.

that the SDM appears to be the preferred spatial model specification, as its average probability over all W is 62.9% whereas the SDEM has a 37.1% and the SLM/SEM displays a 0% probability.⁹ Conditional to the SDM specification, the spatial weight matrix displaying the highest probability is the exponential decay of the 5% with cut-off at the second quartile of distances. Thus, the investigation of the FPE presented in the next section relies on this specification.

4 Results

4.1 Baseline results

Before starting with the discussion of the results, it is worth mentioning that our empirical analysis might suffer from some of the methodological issues listed in Section 2 and raised by Inman (2008). As noted above, these econometric problems could invalidate statistical inference, hence causing FPE estimates to be biased and/or misleading. The methodology implemented here is able to address some of these issues, while others might persist, affecting the quality of the estimates. First, a strong point of the spatial approach is that it accounts for spatial dependence and neighbouring effects, whose omission could lead to biased and inconsistent estimates (LeSage and Pace, 2009). Second, the use of a panel data framework with fixed effects along with a large set of control variables and the inclusion of political interaction terms allow us to minimise the omitted variables problem (unobserved heterogeneity). Third, the availability of data allows us to clearly distinguish between the unconditional transfers and other type of grants, which are captured with two different variables. Fourth, the investigation of the potential bias induced by measurement errors is addressed by robustness checks on the definition of income and government spending. Nonetheless, our methodology does not correct for the potential negative effect of endogeneity caused by reverse causal relationships and, therefore, the results obtained here should be treated with caution.

⁹The results are shown in Table A1 in the Appendix.

The first column of Table (2) presents the results obtained when a two-way fixed-effects model is estimated by OLS, whereas Column (2) reports the own-municipality coefficient estimates and those of the neighbours of the SDM specification. As it can be observed in Column (1), the estimated coefficients of per capita income and grants are both positive and statistically significant at the 1% level and suggest the existence of a FPE, as the later is larger than the former.

Nevertheless, the results of the non-spatial regression should be treated with caution. In particular, it is important to recall that spatial effects play an important role in explaining government spending patterns in the Spanish setting, which may cause estimates in Column (1) to become biased, inconsistent and/or inefficient. Indeed, the positive and significant estimated spatial autoregressive parameter of per capita spending in Column (2) reveals a strong spatial dependence in municipal spending. In other words, spending in a given municipality is positively affected by spending in neighbouring municipalities. This result is in line with the information provided by Figure (2) and previous empirical findings (e.g. Bastida *et al.*, 2013; Rios *et al.*, 2017), and highlights the need to take into account spatial effects when modelling local spending patterns in Spain.

As regards the estimated coefficients of the SDM, both per capita income and grants are positive and statistically significant at the 5% level. In addition, the point estimate for grants is significantly larger than the coefficient of income (with a difference of 0.9), providing evidence of a positive FPE. This finding confirms the results obtained in earlier empirical work on Spanish municipalities (Lago-Peñas, 2008; Bastida *et al.*, 2013), reflecting a large stickiness of grant revenues in the public budget.

However, as explained in Section (3.3), inference in spatial econometric models containing endogenous interactions should not be based on implicit form coefficients (LeSage and Pace, 2009). Thus, Columns (3) to (5) report the *direct*, *indirect* and *total effects*, respectively, calculated from the SDM with the full set of controls. We find that the *direct effects* are significant for both private income and grants whereas the *indirect effects* are only significant for income. Focusing on the main aim of the paper, the *total effects* reveal that the response of local governments to changes in

private income is lower than to changes in grants, providing compelling evidence in favour of the FPE. The difference between the *total effects* is 1.035 (euros). The *direct effects* indicate that the 1 euro increase in private income and grants registered by a specific municipality leads to a FPE of 0.9 euros. In turn, the *indirect effect* shows that changes in private income and grants in the neighbouring municipalities contribute to amplify the FPE by an additional amount of 0.131 euros. Therefore, *indirect effects* account for the 12.6% of the overall FPE, thus corroborating the empirical relevance of spatial spillovers in this context. In addition, we find that the employment of a non-spatial econometric approach would under-estimate the size of the FPE by 10%. However, what seems to be more relevant for the correct estimation of the FPE is the inclusion of municipal fixed effects, as they reduce the bias with respect to the pooled SDM (i.e, with an homogeneous intercept) to 17% (see Table A2 in the Appendix).

INSERT TABLE (2) ABOUT HERE

With respect to the various control variables included in our baseline model, Table (2) shows that capital transfers are positively associated with local spending. This finding can be explained by the fact that capital grants are usually conditional transfers related to the provision of specific public goods and services. Both the share of dependent population and population size exert a negative effect on local spending. This seems to indicate that municipalities with a relatively important presence of young and old population spend less, which may be related to the lower revenues implied by a population with less active members. On the other hand, the negative effect of population size is consistent with the presence of scale economies in the provision of public goods as observed in Solé-Ollé (2006) and Rios *et al.* (2017). Finally, the impact of unemployment, migrants, education, ideology and regional and national alignment is not statistically significant.

We test the sensitivity of our estimates in a number of different ways. First, we investigate if the results hold with alternative measures of private income and spending. Second, we perform an additional estimation using a log-log functional form. The results reported in Tables A3, A4 and A5 in the Appendix always support

the existence of a FPE, giving us confidence on the robustness of our main findings.

Finally, a strand of the literature also investigates whether the response to changes in intergovernmental grants is not only related to the magnitude (FPE) but to the *sign* of the variation in transfers (cuts versus increases). In other words, the governments tend to treat increases and decreases in aid differently. According to this asymmetrical response hypothesis, local governments can compensate cuts in transfers by either raising additional taxes so as to preserve expenditure levels or magnify the spending response to cuts in grants by lowering own revenues as well. The former response gives rise to the *fiscal replacement* effect observed in Gramlich (1987) and Heyndels (2001), whereas the latter relates to the *fiscal restraint* or so-called *super FPE* obtained in Gamkhar and Oates (1996), Stine (1994) or Levaggi and Zanola (2003), among others. In the *fiscal replacement* case expenditures are more responsive to increases than to cuts in grants, while the opposite occurs in the *fiscal restraint* case. To investigate whether asymmetries are present in the case of changes in unconditional grants, we follow Kjaergaard (2015) and extend our baseline model with (i) a dummy variable A_t that equals 1 when grants are decreasing in municipality i at time t and 0 otherwise, and (ii) its interaction with grants ($A_t G_t$):

$$\begin{aligned} E_t = & \mu + \iota_N \alpha_t + \delta Y_t + \gamma G_t + \eta A_t + \pi A_t G_t + C_t \beta_1 + \rho W E_t \\ & + W Y_t \theta_1 + W G_t \theta_2 + W A_t G_t \theta_3 + W C_t \theta_4 + \epsilon_t \end{aligned} \quad (12)$$

In this model specification the estimated total effect of grants ($\tilde{\gamma} = \left[(I - \rho W)^{-1} \right] [\gamma + \theta_2 W]$) is the expenditure response to an increase in grants, while $\tilde{\gamma} + \tilde{\pi} = \left[(I - \rho W)^{-1} \right] [\gamma + \pi + \theta_2 W + \theta_3 W]$ captures the effect on declining grants. In the context of decreasing grants, a negative value of π means that we are in presence of a *fiscal replacement* type of asymmetry while a positive one reveals a *super FPE*.

As reported in Table (3), clear evidence is found of asymmetrical reactions of spending depending on the direction of the change experienced in grants. In particular, our estimates reveal a *fiscal restraint* or *super FPE* form of asymmetry: spending is more sensitive to cuts than to increases in grants, so that municipalities react to declining grants by decreasing expenditures and own revenues, suggesting a negative

replacement of lost funds. This result is in line with previous empirical work (e.g., Stine, 1994). The estimation results for income, grants and the other control variables hold.¹⁰

INSERT TABLE (3) ABOUT HERE

4.2 The role of moderators shaping the FPE

We now investigate how the political and institutional characteristics of the jurisdictions - proxied by the set of moderators described in Section (2.2) - affect the size of the FPE. To that end, we combine Equations (5) and (12) to obtain the following spatial specification:

$$\begin{aligned} E_t = & \mu + \iota_N \alpha_t + \delta Y_t + \gamma G_{it} + \omega Z_t + \psi Y_t Z_t + \zeta G_t Z_t + \eta A_t + \pi A_t G_t + \phi A_t G_t Z_t + C_t \beta \\ & + \rho W E_t + W Y_t \theta_1 + W G_t \theta_2 + W Z_t \theta_3 + W Y_t Z_t \theta_4 + W G_t Z_t \theta_5 + W A_t \theta_6 + W A_t G_t \theta_7 \\ & + W A_t G_t Z_t \theta_8 + W C_t \theta_9 + \epsilon_t \end{aligned} \quad (13)$$

Let $\tilde{\delta}$, $\tilde{\gamma}$, $\tilde{\omega}$, $\tilde{\psi}$, $\tilde{\zeta}$, $\tilde{\eta}$, $\tilde{\pi}$ and $\tilde{\phi}$ denote the corresponding average total effects on government spending caused by a change in Y_t , G_t , Z_t , $Y_t Z_t$, $G_t Z_t$, A_t , $A_t G_t$ and $A_t G_t Z_t$, obtained using Equation (8). Then, the expected FPE conditional on Z_t when grants decrease $\Delta G_t < 0$, can be obtained as:¹¹

$$\frac{\partial E_t}{\partial G_t} - \frac{\partial E_t}{\partial Y_t} = (\tilde{\gamma} + \tilde{\pi} - \tilde{\delta}) + (\tilde{\zeta} + \tilde{\phi} - \tilde{\psi}) Z_t \quad (14)$$

Note that when grants increase $\Delta G_t > 0$, $A_{it} = 0$ and the previous expression reduces to:

$$\frac{\partial E_t}{\partial G_t} - \frac{\partial E_t}{\partial Y_t} = (\tilde{\gamma} - \tilde{\delta}) + (\tilde{\zeta} - \tilde{\psi}) Z_t \quad (15)$$

¹⁰In order to save space, the results are not shown here but available upon request to the authors.

¹¹We use the tilde notation to distinguish them from the parameter estimates in Equations (5) and (12), given that to simulate the FPE conditional on Z_t we use the total effects implied by the Monte Carlo simulation of the partial derivative of the reduced form of the SDM in Equation (8).

In order to conduct inference on the FPE conditional on Z_t , we need to know if the estimated response given by Equation (14) is statistically distinguishable from zero. For that, we also need an estimate of the variance and the covariance of the total effects of the relevant terms implied in the calculation of the FPE. Thus, to simulate the distribution of the FPE conditional on Z_t we perform a Monte Carlo analysis of the distribution of the total effects by computing their covariance. Using the laws of the variance, the variance of the FPE conditional on Z_t is given by:

$$\begin{aligned}
Var \left[\frac{\partial E_t}{\partial G_t} - \frac{\partial E_t}{\partial Y_t} \right] &= Var(\tilde{\gamma}) + Var(\tilde{\delta}) - 2Cov(\tilde{\delta}, \tilde{\gamma}) \\
&+ Z_t^2 \left(Var(\tilde{\zeta}) + Var(\tilde{\psi}) - 2Cov(\tilde{\zeta}, \tilde{\psi}) \right) \\
&+ 2Z_t \left(Cov(\tilde{\gamma}, \tilde{\zeta}) + Cov(\tilde{\delta}, \tilde{\psi}) - Cov(\tilde{\gamma}, \tilde{\psi}) - Cov(\tilde{\delta}, \tilde{\zeta}) \right)
\end{aligned} \tag{16}$$

Figure (3) reports the estimated FPE conditional to each of the moderators discussed in Section (2.2) when they are introduced at a time in Z_t . Panels on the left display the mean effects and the 95% confidence intervals, while panels on the right present the t-statistic of the estimated impacts for the intervals in which the moderators Z_t are defined, information needed to make inference on the significance of the FPE.

Figures 3(a) and 3(c) depict the evolution of the FPE as the tax collection efficiency index increases when grants increase and decrease, respectively. As observed, municipalities with inefficient tax collection that incur in relatively higher costs to obtain a given level of revenues display higher values of the FPE. The negative slope of the mean effect of tax collection efficiency supports previous results of Aragon (2013). Therefore, we confirm our expectation that grants would have a smaller stimulatory effect in municipalities facing higher local tax collection efficiency. It is important to note that the negative link between tax collection efficiency and the FPE is significant at the 5% level up to a threshold of our composite index of 0.5, which covers approximately the 98.5% of our sample of municipalities.¹² In addition, the results indicate

¹²A concern might arise as to whether our measure of tax collection efficiency may simply reflect higher per capita income of the local taxpayers, thus affecting the interpretation of the previous result.

that the estimated FPE conditional to the tax collection efficiency index is greater when grants decrease.

Figures 3(e) and 3(g) show the response of the FPE to changes in the margin of majority, which is the variable that captures political strength increases, in the case of increasing and decreasing grants, respectively. As expected, there is a negative link between political strength and the size of the FPE and, once again, it becomes larger in the case of decreasing grants. The effect is statistically significant at the 5% level for the range $[-0.35, 0.225]$, thus covering the 97.5% of the municipalities. In our sample of study, the local council was a minority government in 55.1% of the cases, which always corresponds to a size of the FPE above 1. This finding also supports previous analysis of Tovmo and Falch (2002) and Borge *et al.* (2008), who find that in weak governments the FPE is higher because of the lower bargaining power in the interaction with interest groups and the lower support that local politicians enjoy to implement higher taxes in such circumstances.

INSERT FIGURE (3) ABOUT HERE

5 Conclusions and Policy Implications

This paper seeks to complement previous studies on the FPE and contributes to our understanding of the factors that shape the asymmetric reaction of local public spending to private income and grants over space. To that end, we employ spatial panel data econometric techniques. Our estimates suggest that the average size of the FPE is of 1.035 euros when grants increase and 1.96 euros when grants decrease, which implies that an equivalent 1-euro increase in transfers and income generates a considerably asymmetrical response of local spending. The finding of a FPE is robust to different model specification checks. We also find that the omission of the spatial interactions would under-estimate the FPE by 10% whereas the omission of municipal fixed effects would imply a bias of the 17%, suggesting the need to control

Nevertheless, this is not the case in our sample of municipalities as there is a negative but relatively weak correlation between these two variables (-0.31 with p-value 0.00).

for unobserved spatial heterogeneity.

In a second step, we analyse how differences in the political characteristics of the municipalities may affect the size of the FPE. We find that in those municipalities where political strength and tax collection efficiency are high, the size of the FPE is lower. In other words, municipalities where local incumbents either enjoy a greater margin of manoeuvre for budget decision-making or make a stronger monitoring and enforcement effort in tax collection are less responsive to additional grants, which in turn decreases the size of the FPE.

These findings pose some policy implications. In particular, local government authorities should increase administrative efficiency of tax collection, whilst also increase incentives for taxpayers' compliance. On the one hand, improvements in administrative efficiency of tax collection can be achieved adopting measures such as automation of billing, computerised payment systems or new IT systems designed to reduce the scope for avoidance (Collier *et al.*, 2018). In the case of Spain, these measures would specially benefit taxpayers located in remote areas, reducing their need to commute to the Provincial Council.

On the other hand, a taxpayer's decision to comply is a function of the perceived probability of an audit, the extent of penalties, and her risk aversion (Cummings *et al.*, 2009). Thus, stronger detection and an effective administration of realistic sanctions for late and non-payment are crucial to inducing compliance. In addition, simplifying the property tax design and related reporting requirements, providing access to support and advice or simple methods for making tax payments (including online, at banks and via SMS) would also facilitate compliance. As noted in Prichard *et al.* (2019), efforts should also be made to increase taxpayers' trust in the tax system: whenever they think that taxes are fair or that they will translate into specific public benefits, their willingness to pay will increase.

An interesting line for future research in studies focusing on the analysis of local spending spillovers without relying on spatial econometric methods is the identification of these spillover effects by means of quasi-experimental settings and the employment

of exogenous sources of variation as in Isen (2014) and Fossen *et al.*, (2017). On the other hand, an avenue to further refine FPE estimates using spatial econometrics could consist in the estimation of dynamic spatial panel data models with unobserved common factors as in Shi and Lee (2017).

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7 Figures

Figure 1: GWR Flypaper Effects in Spanish Jurisdictions

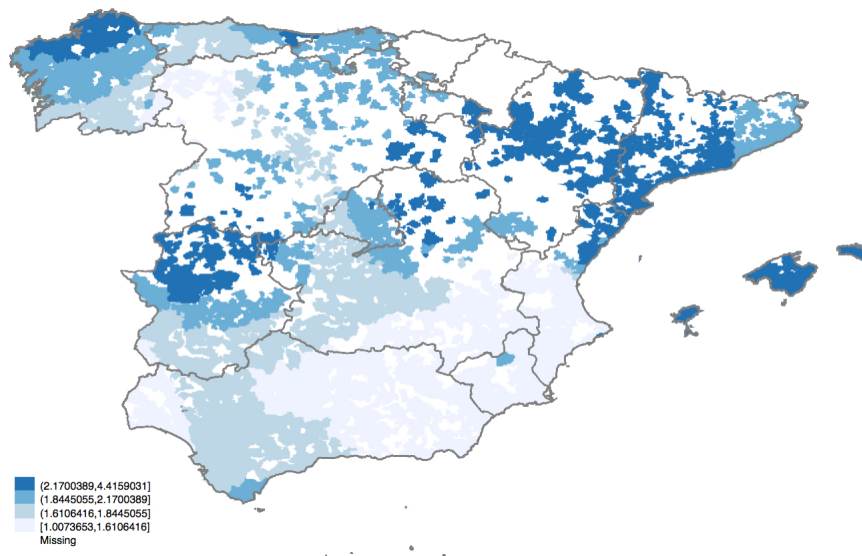


Figure 2: Local Spending in Spain (2003-2015): Do neighbouring jurisdictions matter?

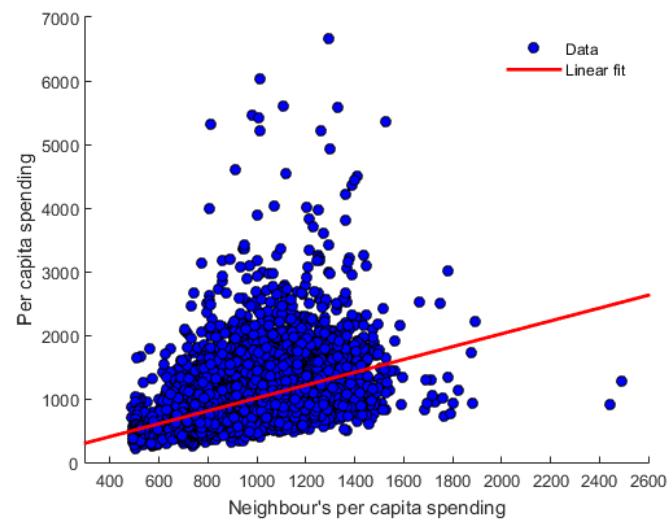
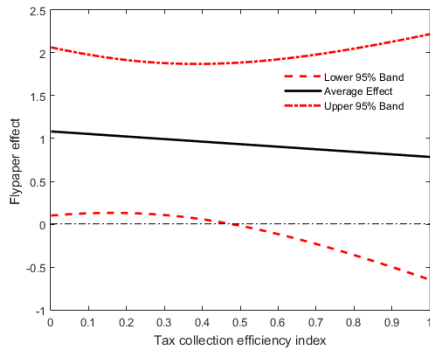
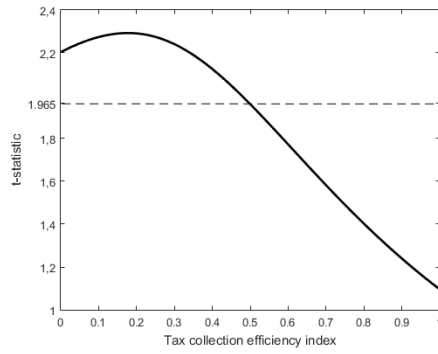


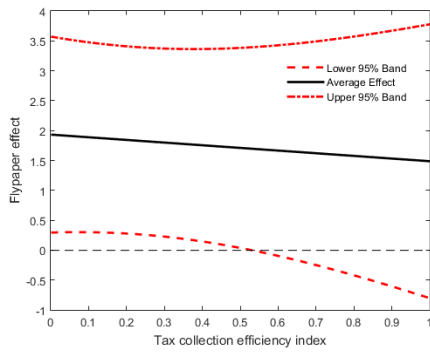
Figure 3: Heterogeneous Flypaper Effect Estimates



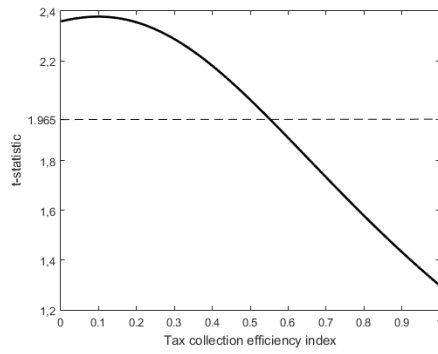
(a) Tax Collection Efficiency (with increasing grants)



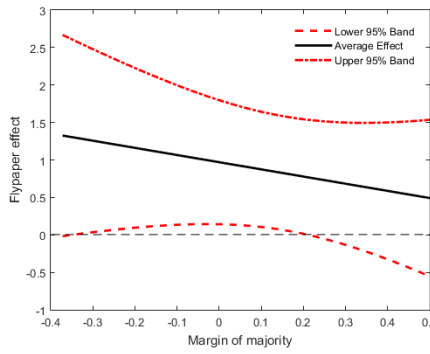
(b) t-statistic Tax Collection Efficiency (with increasing grants)



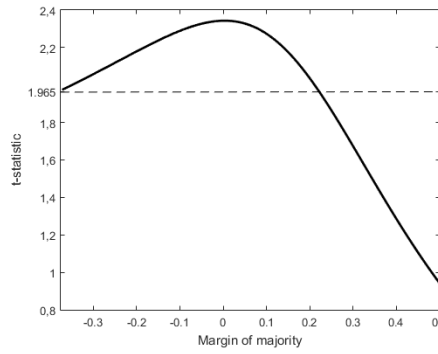
(c) Tax Collection Efficiency (with decreasing grants)



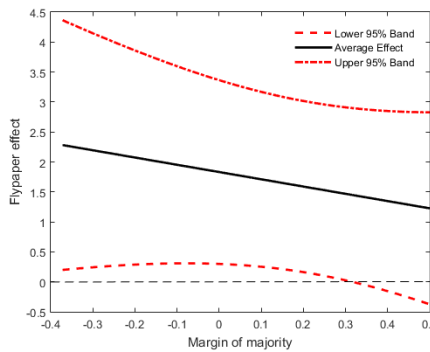
(d) t-statistic Tax Collection Efficiency (with decreasing grants)



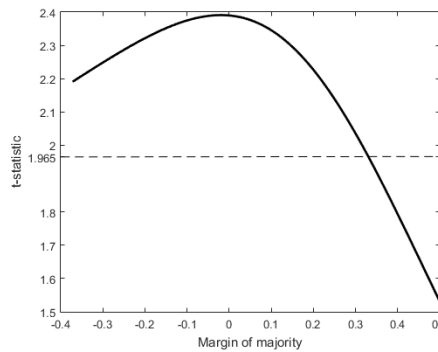
(e) Margin of majority (with increasing grants)



(f) t-statistic Margin of majority (with increasing grants)



(g) Margin of majority (with decreasing grants)



(h) t-statistic Margin of majority (with decreasing grants)

8 Tables

Table 1: Descriptive Statistics and data sources of the variables

Variable	Mean	Standard Deviation	Definition	Source
<i>Dependent variable</i>				
Total spending	943.184	440.46	Per capita spending (euros/inhab.). Corresponds to total expenses	SMPF
Current spending	679.039	283.113	Per capita current spending (euros/inhab.). Corresponds to operating expenses as defined by Sections I to IV of the economic classification of local budgets	SMPF
<i>Explanatory variables</i>				
Income	15,093.81	5,072.68	Average income (euros)	STAO
Grants	294.265	127.374	Per capita current transfers from the central government (euros/inhab.)	SMPF
Asymmetry	0.268	0.443	Asymmetry in grants, defined as a dummy variable that equals 1 if grants are decreasing and 0 otherwise (euros/inhab)	SMPF
Population	15,619.82	80,888.56	Total resident population	INE
Unemployment rate	10.025	5.739	Share of active population unemployed (%)	INE
Education	53.499	12.831	Share of population with secondary and/or tertiary education (%)	INE
Migrants	7.926	8.431	Share of immigrants in the resident population (%)	INE
Capital transfers	123.921	158.646	Per capita capital spending (euros/inhab.). Corresponds to expenses as defined by Sections VI and VII of the economic classification of local budgets	SMPF
Ideology	5.713	1.957	Index that ranges between 0 (left) to 10 (right)	Deusto Polls
Regional Alignment	0.410	0.492	Dummy variable. 1 if regional and local governments are aligned, 0 otherwise	SMI and own calculations
National alignment	0.393	0.489	Dummy variable. 1 if national and local governments are aligned, 0 otherwise	SMI and own calculations
<i>Moderators of the FPE</i>				
Political strength	-0.010	0.116	Share of votes received by the leading local party - 50%	SMI and own calculations
Tax collection efficiency	0.157	0.846	Index that ranges between 0 (less efficient) to 1 (more efficient)	SPAO, and own calculations using GIS techniques and DEA

Notes: SMPF denotes the Spanish Ministry of Public Finance, SMI refers to the Spanish Ministry of Internal Affairs, INE is the National Statistics Institute, SPAO is the Spanish Property Assessment Office, GIS is Geographical Information Systems and DEA is Data Envelopment Analysis.

Table 2: Main Results and Effect Decomposition

<i>Variables</i>	Non Spatial Model	Spatial Durbin Model			
	Coefficient (1)	Coefficient (2)	Direct Effects (3)	Indirect Effects (4)	Total Effects (5)
Income	0.010*** (7.11)	0.004** (2.48)	0.004*** (2.78)	0.063*** (7.27)	0.067*** (7.88)
Grants	0.943*** (29.86)	0.908*** (23.85)	0.909*** (23.91)	0.194 (1.13)	1.102*** (6.53)
Implied FPE	0.933	0.904	0.904	0.131	1.035
<i>Controls:</i>					
Unemployment	-2.857*** (-2.86)	1.160 (0.75)	1.094 (0.70)	-1.421 (-0.37)	-0.327 (-0.10)
Capital Transfers	0.925*** (55.10)	0.918*** (47.91)	0.918*** (47.39)	0.043 (0.29)	0.961*** (6.50)
Education	-0.959* (-1.86)	-0.502 (-0.82)	-0.470 (-0.74)	1.992 (0.64)	1.522 (0.50)
Dependency	-11.541*** (-12.45)	-6.999*** (-5.78)	-7.122*** (-5.79)	-19.266*** (-4.79)	-26.389*** (-6.75)
Migration	-3.381*** (-3.70)	-5.721*** (-4.26)	-5.694*** (-4.33)	9.006** (2.50)	3.312 (1.00)
Population	-0.006*** (-6.51)	-0.003** (-2.49)	-0.003*** (-2.69)	-0.029*** (-4.27)	-0.032*** (-4.78)
Ideology	0.741 (0.68)	0.026 (0.02)	-0.022 (-0.02)	1.571 (0.31)	1.549 (0.31)
Alignment (regional)	-10.658*** (-2.32)	-7.940 (-1.45)	-8.297 (-1.47)	-25.306 (-1.01)	-33.603 (-1.37)
Alignment (national)	-11.258* (-1.65)	-13.455* (-1.73)	-13.259* (-1.75)	6.603 (0.12)	-6.656 (-0.12)
Neighbours' Income		0.039*** (6.61)			
Neighbours' Grants		-0.203* (-1.74)			
Neighbours' Unemployment		-1.430 (-0.49)			
Neighbours' Capital Transfers		-0.312*** (-3.15)			
Neighbours' Education		1.492 (0.71)			
Neighbours' Dependency		-9.734*** (-3.29)			
Neighbours' Migration		7.888*** (3.10)			
Neighbours' Population		-0.017*** (-3.98)			
Neighbours' Ideology		1.008 (0.30)			
Neighbours' Alignment (regional)		-13.066 (-0.82)			
Neighbours' Alignment (national)		8.594 (0.23)			
Neighbours' Spending		0.364*** (11.00)			
R-squared	0.810	0.819			
Log-Likelihood	-67851.9	-67635.2			

Notes: The dependent variable is per capita spending. The non-spatial model is a two-way fixed and time-period fixed effects model specification. The SDM includes time period and municipal fixed effects. ns denotes not significant, * significant at 10% level, ** significant at 5% level, *** significant at 1% level. t-statistics are shown in parentheses. Inferences regarding the statistical significance of the spatial direct, indirect and total effects are based on the variation of 1,000 simulated parameter combinations drawn from the variance-covariance matrix implied by the BCML estimates. The results are obtained using an exponential decay spatial weights matrix of the 5% with cut-off at the second quartile of distances.

Table 3: Effect Decomposition with the Asymmetry Variable

Variable	Estimated Coefficient (1)	Direct Effects (2)	Indirect Effects (3)	Total Effects (4)
Income (Y_t)	0.004** (2.48)	0.004*** (2.75)	0.058*** (7.19)	0.062*** (7.81)
Grants (G_t)	0.920*** (22.82)	0.920*** (23.25)	0.141 (0.717)	1.061*** (5.46)
Asymmetry (A_t)	-79.873*** (-5.02)	-80.278*** (-4.94)	-137.485* (-1.92)	-217.763*** (-2.99)
Interaction Asymmetry * Grants ($A_t G_t$)	0.327*** (6.41)	0.330*** (6.33)	0.631*** (2.84)	0.961*** (4.23)
Implied FPE with increasing grants	0.916	0.915	0.083	0.999
Implied FPE with decreasing grants	1.243	1.254	0.7114	1.960
Controls	Yes	Yes	Yes	Yes

Notes: Estimation results for the SDM with time period and municipal fixed effects. The dependent variable is per capita spending. A_t is a dummy variable that equals 1 when grants are decreasing in municipality i at time t and 0 otherwise. ns denotes not significant, * significant at 10% level, ** significant at 5% level, *** significant at 1% level. t-statistics are shown in parentheses. Inferences regarding the statistical significance of the spatial direct, indirect and total effects are based on the variation of 1,000 simulated parameter combinations drawn from the variance-covariance matrix implied by the BCML estimates. The results are obtained using an exponential decay spatial weights matrix of the 5% with cut-off at the second quartile of distances.