

# SPATIAL STRATEGIC INTERACTION ON PUBLIC EXPENDITURES OF THE NORTHERN PORTUGUESE LOCAL GOVERNMENTS

Ana Paula Barreira\*

January 2011

## ABSTRACT

The existence of spatial strategic interaction between neighbouring local governments is often referred in literature and identified in empirical applications for several countries. This interaction can occur either in expenditures or revenues of local governments. The spatial interaction in local government expenditure finds support on three theoretical explanations: spillover effects, Tiebout competition or mimicking behaviour. Identify the adequate explanation for the local government interaction is not an easy task since the reduced form of the estimated model can generate indistinguishable pattern in spatial interactions. This paper seeks to identify between those theoretical explanations what is the underlying reason for spatial interaction in public expenditures among local governments for the case of a particular sub-area of Portugal. Using differentiated model configurations and the local government expenditures of the municipalities composing the Northern Portuguese mainland, between 1998 and 2008, the paper identifies the structural model that generates the observed spatial auto-correlation in local public expenditures. Among the various theoretical reasons, only the existence of spillovers effects finds support.

## RESUMO

A existência de interação estratégica espacial entre governos locais vizinhos é muitas vezes referida na literatura e identificada nas aplicações empíricas relativas a diversos países. Essa interação pode ocorrer tanto nas despesas ou nas receitas dos governos locais. A interação espacial na despesa pública local encontra suporte em três explicações teóricas: efeitos externos, concorrência à Tiebout ou imitação no comportamento. Identificar a explicação adequada para a interação entre governos locais não é uma tarefa fácil, já que a forma reduzida do modelo estimado pode gerar padrões indistinguíveis nas interações espaciais. Este artigo procura identificar de entre as explicações teóricas qual a razão subjacente à interação espacial nas despesas dos governos locais no caso de uma determinada subárea de Portugal. Usando diferenciadas configurações do modelo e as despesas dos governos locais dos municípios que compõem a região Norte do Continente Português, entre 1998 e 2008, o artigo identifica o modelo estrutural que gera a observada autocorrelação espacial na despesa pública local. De entre as diversas razões teóricas apontadas, apenas a existência de efeitos externos encontra sustentação.

Keywords: “local public expenditures”, “horizontal spatial interaction”, “spatial econometrics”.

JEL Classification: C33, C36, H72, H73.

---

\* Corresponding author: *E-mail:* [aprodrig@ualg.pt](mailto:aprodrig@ualg.pt); University of Algarve, Faculty of Economics and CIEO – Research Centre on Space and Organizations; Campus de Gambelas, P-8005-139 Faro, PORTUGAL; *Voice:* +351 289 800 900; *Fax:* +351 289 818 303.

## 1. INTRODUCTION

International observation often identifies governments establishing relations that can have either a vertical or horizontal nature. Understand how these relations influence the local governmental decisions is the major goal of this paper. The focus is on horizontal interactions among local governments implying that the behaviour of neighbouring governments exercise reciprocal influences. The driven idea of the paper is to contribute for the discussion on how a process of spatial strategic interaction among neighbouring jurisdictions influences local governments' decisions regarding public expenditures. The intuition behind strategic interaction is that politicians do not make their decisions in isolation, reacting often to decisions made by other politicians in the neighbouring jurisdictions. In this sense proximity plays a crucial role. The nearer are local governments from each other the higher is their reciprocal expected influence.

Public finance literature<sup>1</sup> recognizes the spatial dimension importance<sup>2</sup>. However, only recent advances in spatial data analysis have allowed an accurate consideration of space in the specification of models. The spatial dimension is usually introduced in the models by allowing a spatially lagged dependent variable or a spatially error term<sup>3</sup> which rises some econometric problems like simultaneity due the endogeneity problem of the former and the violation of the basic OLS estimation assumption of uncorrelated errors of the latter. In this paper spatially lagged models are estimated since the goal is to identify the reason why local governments interact.

There are three main theoretical approaches that explain the reasoning for spatial interaction among local governments: spillover effects, Tiebout (1956) competition or mimicking behaviour<sup>4</sup>. Briefly, the main driving forces are, respectively, the existence of unconditional grants from the central government used to support expenditures whose effects spread to neighbouring jurisdictions; an attempt to increase the tax base by attracting residents from a neighbouring jurisdiction and, an information spread about neighbouring incumbents' performance that facilitates comparisons.

Sometimes distinguish between those underlying reasons is a demanding task, especially when analysis only consider a specific year. The reasoning for that is the usually estimated reduced form of the spatial reaction function which is unable to identify the true reason for strategic interaction among local governments.<sup>5</sup> To overcome those limitations an analysis using several years is required. Although, the panel data approach is not also conventional since the estimated equation have to deal with spatial correlation.

Being aware of such difficulties the paper proposes to answer the question of what would be the reasoning behind local government expenditures pattern which appears to be related with neighbours' behaviour. The empirical application is on the public expenditures of the Northern Portuguese local governments (municipalities). There are papers in the field that test strategic interaction among governments looking at local governments receipts. However, Portuguese municipalities have little influence on local government receipts, almost entirely defined by central government, benefiting, in contrast, from a relative freedom to set expenditures.

Using data from the 86 municipalities composing the Northern region of Portugal mainland, between 1998 and 2008, I test differentiated model configurations, using panel data estimations to answer the following questions: 1) Do the municipalities of the Northern region of Portugal establish a spatially strategic interaction? 2) If true, what is the main driven force?

The paper is organised as follows. Section 2 presents the theoretical explanations underlying the strategic interaction behaviour among local governments. Section 3 introduces the motivation for the paper. Section 4 systematises the main empirical questions and hypotheses to be tested. Empirical results are shown in Section 5. Section 6 concludes and identifies some resulting political implications.

---

<sup>1</sup> Rosen (2008) is a reference book on the subject and is widely used in undergraduate classes.

<sup>2</sup> Gérard-Vared *et al.* (1997) discuss the importance of space for fiscal federalism theory.

<sup>3</sup> For an introduction of spatial error and spatial lag models see Anselin and Hudak (1992).

<sup>4</sup> For an introduction to this kind of public finance problems see Hillman (2003).

<sup>5</sup> For an extended discussion on this issue see Revelli (2005).

## 2. THEORETICAL FRAMEWORK

Literature on spatial interaction identifies three explanations for a similar behaviour among local governments that are spatially close: spillover effects, Tiebout competition or mimicking behaviour. Reviews of the state of the art of horizontal strategic interaction can be found in Brueckner (2003) and Epple and Nechyba (2004).

The spillover effect occurs because some local government expenditures push (negative spillover) or constrain (positive spillover) the local public expenditures of the neighbours. The spillover effect can be due to a grant from central or European government to local governments that can be used to build a facility, a street for example, which crosses more than one jurisdiction. As a result, public expenditure will increase in more than one local government. In this case, providing local goods present complementary characteristics. If local goods evidence competing characteristics, however, for example the decrease in the quality of health care services, can make more attractive the services of a neighbouring jurisdiction, putting a pressure on the budget of local governments that offer better services, derived from the non-residents demand. The jurisdiction that reduced services quality, perceiving that individuals prefer the neighbouring service can decide to put the saved money with that service on other functions.

When local governments correctly explore neighbouring synergies and work together in order to use public expenditures accurately, local public intervention enhances efficiency gains. Although competition among local governments being described as an advantage of fiscal federalism, it could also cause a negative effect<sup>6</sup> in the case where competition leads to inefficient public goods provision. Local governments behaving as cooperators or as competitors depend crucially on ideology alignment among neighbouring governments. A more cooperative framework between neighbouring local governments tends to be identified when incumbency belongs to the same political party or is from the same ideology orientation.

Under Tiebout competition, local governments interact in the attempt of attracting residents from a neighbouring jurisdiction, with the goal of improving the tax base. This local government behaviour is analogous to a fiscal competition, like the Tiebout mechanism, where people look at the advantageous emerging from public goods provided in several jurisdictions and select the better nearest option. By choosing with “their feet”, individuals opt for the jurisdiction that offers the public tax-expenditure bundle most adequate to their preferences. In this case, the number of new residents is the key for interactions that occur among local governments. The attraction of households improves building houses, thus leading to an increase in the number of residences. This kind of competition can be seen as welfare competition mechanism à Wildasin (1988).

Spatial interaction can also be due to information spillover, which leads to a mimicking or copycat behaviour. The copycat behaviour is an application of the political yardstick competition hypothesis, introduced by Salmon (1987) and further developed by Besley and Case (1995), stated for tax settings, in which one jurisdiction interacts with fiscal policy in neighbouring jurisdictions. The reasoning for copying is that individuals get information about neighbouring incumbents’ performance. By comparing how local governments expend their budget, voters perceive the quality of their own local government, rewarding or punishing them in the election contest, according to the percept gap between incumbency activities. The likelihood of the local incumbents to be reappointed has also a meaning in the mimicking behaviour. A heavier copycat phenomenon faces a reasoning to exist as more fragile incumbency is. Majorities imply lower dependency from neighbours’ public budget management choices.

## 3. MOTIVATION

Portugal is known as a unitary state in which local governments have a reduced degree of freedom to set taxes. However, Portuguese municipalities benefit, in contrast, from a relative freedom to set

---

<sup>6</sup> If neighbouring local governments take competitive behaviour too seriously, a phenomenon referred to in the literature as *race to the bottom* might be found (Brueckner, 2000; Saavedra, 2000).

expenditures. The main sources of local governments' financing are property taxes or unconditional transfers from central government. Thus, the paper is concerned with the way local public expenditures decisions are influenced by neighbouring municipalities.

Although widely studied in other countries, both on receipts and expenditures sides of local government budgets, the far as I know, Portuguese strategic interaction phenomena on public expenditures was only slightly analysed for the case of the municipalities composing the Algarve region, a small region with only 16 municipalities and the Southern part of Portugal, in Barreira (2010). Using differentiated model configurations of a spatial lagged model and a transformation referred by Debarsy and Ertur (2010) for estimating a fixed effects model, the paper identifies the structural model that generates the observed spatial auto-correlation in local public expenditures. The driven force identified for the existence of spatial strategic interaction among municipalities was the existence of spillover effects generated by grants from central government. Given the small scale of the previous analysis, this paper attempts to evaluate if the reason underlying spatial interaction among municipalities of the Algarve region can be generalized to the rest of the country or if each region, facing different realities, spatially interact by different reasons.

The Northern region of Portugal is a very fractioned territory, as Table 1 shows. The region is composed of 8 sub-areas with differentiated characteristics as data indicates. Given the diversity of this region compared with the Algarve region, the paper evaluates if the predominant effect found for the Southern region of Portugal also finds support on the Northern region.

**Table 1 – Characteristics of the Northern region of Portugal**

	<b>Number of Municipalities</b>	<b>Average Area</b>	<b>Average Inhabitants</b>	<b>Municipalities &lt;10000 Inhabitants</b>	<b>Number of inhabitants in the smallest municipality</b>
Minho-Lima	10	221,8	25095	2	8 686
Cávado	6	207,7	68799	1	7 506
Ave	8	155,7	65574	0	14 077
Grande Porto	9	90,5	142605	0	29 481
Tâmega	15	174,6	37385	1	7 049
Entre Douro e Vouga	5	172,1	57680	0	21 762
Douro	19	216,2	11054	14	3 286
Alto Trás-os-Montes	14	583,7	15319	6	4 857
<b>NORTH</b>	<b>86</b>	<b>247,5</b>	<b>43552</b>	<b>24</b>	

Source: Portuguese National Statistics (I.N.E.) and own calculus.

The spatial interaction estimation implies the definition of a neighbouring relationship which is represented by a matrix that measures connectivity among municipalities through a weighting attribution. Barreira (2010) considered a symmetric weighting matrix, implying a fixed number of neighbouring municipalities. When a differentiated number of neighbours are considered for each municipality, the estimation approach has to be reconsidered. The existence of a great interference of central government through unconditional transfers to local governments that generates a spillover effect was the main reason identified for the Southern part of the country to engage into spatial interaction. The question here is to evaluate if considering the referred differences for the North, the main reason for a spatial strategic interaction remains. Under these circumstances a different estimation procedure, namely an instrumental variable estimation, should be applied which can lead to different results regarding the reason underlying spatial strategic interaction. The estimations presented in section 5 answers to these questions.

As international examples of the spatial strategic interaction study on local public expenditures, can be mentioned Case *et al.* (1993), Figlio *et al.* (1999) and Fredriksson and Millimet (2002) for U.S.; Schaltegger and Kuttel (2002) for Swiss; Solé-Ollé (2006) for Spain; Borck *et al.* (2007) for German;

Foucault *et al.* (2008) and Elhorst and Fréret (2009) for France; and St'astná (2009) for Czech Republic.

Tiebout competition finds support in local governments from Germany and from the Czech Republic. In the former case, the financing of the local governments is sustained, in a relevant proportion, by mobile taxes, relying namely on enterprise activity. In this sense, more public expenditures means more public goods provided, making a jurisdiction more attractive for enterprises, since local governments offer them better conditions for their economic activity. In the latter case, Tiebout competition is found in the environmental expenditures with the goal of increasing the number of residents and consequently the tax base. Figlio *et al.* (1999), regarding the U.S. states, find that decentralized welfare benefit setting exacerbates inter-state competition that might induce states to respond to changes in their neighbour' policies asymmetrically.

The behaviour underlying municipal governments in France, in contrast, is imitation. France is usually considered a unitary country, meaning that decentralization processes are related to lower number of competencies attached to lower government levels, compared with Germany for example. In the case of Swiss cantons, mimicking effects in public expenditures is also found. The mimicking behaviour is also identified on part of US states by Fredriksson and Milimet (2002) in environmental policymaking.

Spillover effects are found in Spanish local governments, meaning that local interactions elapse from an upper-level orientation: regional government. The same reasoning is identified by Case *et al.* (1993) for the U.S. case, in which expenditures on local public services potentially can cause beneficial or detrimental effects on nearby jurisdictions.

## 4. EMPIRICAL QUESTIONS

### 4.1. Empirical framework

The empirical application tests the existence of strategic interaction among local governments of Northern region of Portugal and intends to identify among the alternative theoretical explanations what is the underlying reason for that behaviour. The analyses consider the 86 municipalities composing the region and an observation period comprehended between 1998 and 2008. The spatial lag models estimated consider, as such, panel data. According to Hsiao (1986) and Baltagi (2005), panel data give more informative data, more variability, less collinearity among the variables, more degrees of freedom, and more efficiency. Panel data also allows the specification of more complicated behavioural hypothesis, including effects that cannot be addressed using pure cross-sectional or time-series data. In the spatial models allow to identify the underlying reason behind spatial strategic interaction, which would be not possible under a cross-section framework.

For the weighting matrix definition all municipalities bordering each municipality were considered, implying an asymmetric matrix which allows a differentiated number of neighbours. In fact, the region has municipalities comprehending from 2 to 9 neighbouring municipalities. According to Anselin *et al.* (2006) weights choice is typically driven by geographic criteria, such as contiguity or distance, including nearest neighbour distance. The weighting matrix is row-normalized, meaning that sums one.

The cost of ignoring spatial dependence in the dependent variable is relatively high since the econometrics literature has pointed out that if one or more relevant explanatory variables are omitted from a regression equation, the estimator of the coefficients for the remaining variables is biased and inconsistent (Greene, 2005). In contrast, ignoring spatial dependence in the disturbances, if present, which leads to spatial error model estimation, approach discarded here, will only cause a loss of efficiency.

Spatial models rely on the asymptotics in the cross-sectional dimension to obtain consistency and asymptotic normality of estimators. Models with controls for fixed effects utilize the time-series component of the data, whereas models without controls for spatial fixed effects utilize the cross-sectional component of the data. Some studies argue that models that control for spatial fixed effects

tend to give short-term estimates and models without controls for spatial fixed effects tend to give long-term estimates (Baltagi, 2005, Paltridge, 2005).

Consistent estimation of the individual fixed effects is not possible when  $N$  tends to infinity, due to the incidental parameter problem (Anselin, 2001). The incidental parameters problem is independent of the extension to spatial error autocorrelation or to the inclusion of a spatially lagged dependent variable since it also occurs without these two extensions. The spatial fixed effects can only be estimated consistently when  $T$  is sufficient large (Elhorst, 2010a). Nevertheless, it has been argued that when the interest is primarily in obtaining consistent estimates for the coefficient of the dependent variables, the use of demeaned spatial regression models may be appropriate using the standard maximum likelihood (ML) estimation approach (Elhorst, 2003).

As an alternative to reliance on an often unrealistic assumption of normality and to avoid some of the computational problems associated with the Jacobian term in ML estimation, Instrumental Variables (IV) and General Method Moments (GMM) methods has been suggested for single cross-section spatial regression models (Anselin, 1988 and 1990, Kelejian and Prucha, 1998 and 1999). According to Anselin *et al.* (2006) these results can be extended to the panel data setting. The endogeneity of the spatially lagged dependent variable suggests a straightforward instrumental variables strategy in which the spatially lagged (exogenous) explanatory variables are used as instruments (Kelejian and Prucha, 1998 and Lee, 2003).

Under the presence of spatially lagged dependent variable, the pool OLS (POLS) estimated parameters lose its property of unbiasedness and consistency. The seemingly unrelated regression (SUR) is applicable when  $T$  is large and  $N$  is small, which is not the case here. As an alternative, Elhorst (2001) suggests the IV estimation by Two Stage Least Squares (2SLS), but this method does not take account of the restrictions on the coefficients within the coefficients matrices. The advantage of this method is that they do not rely on the assumption of normality of the disturbances and ignores the Jacobian term (Elhorst, 2010b). The author also states that the IV estimation assumes that the disturbances terms are independently and identically distributed for all  $i$  and  $t$  with zero mean and variance  $\sigma^2$  (Elhorst, 2010a). Moreover, IV estimation has the benefit of proving consistent estimates of the parameters even in the presence of spatially correlated error terms (Saavedra, 2000). One disadvantage of IV estimators is the possibility of ending up with a coefficient estimate of the spatial lag coefficient outside its parameter space by the fact of ignoring the Jacobian term.

Fingleton and Le Gallo (2007, 2008) show that IV estimators are extremely useful in those cases where linear spatial dependence models contain one or more endogenous explanatory variables that need to be instrumented. Models including a spatial lag and additional endogenous variables can be straightforwardly estimated by 2SLS. Franzese and Hays (2004) states that spatial 2SLS-IV, which instruments for spatial lags of dependent variables with spatial lags of independent variables, yields unbiased and reasonably efficient estimates of both common-stimuli and diffusion effects, when its conditions hold: large samples and fully exogenous instruments. If the instruments are indeed perfectly exogenous, their covariances with errors is exactly zero, then IV estimators will be consistent and asymptotic efficient (Franzese and Hays, 2007).

Given that the cross-section dimension largely exceeds the time dimension and in order to avoid the incidental problem refereed above, spatial lagged models without controls for spatial fixed effects are estimated. Estimations rely on the 2SLS using as instruments the lagged common dependent variables.

## 4.2. Empirical hypothesis

The dependent variable is per capita public expenditure (*pubexp*). The independent variables are, beside neighbouring per capita public expenditures (*Wpubexp*) – the spatial lagged variable, two economic variables, namely, the percentage of property taxes on receipts (*proptax*) and medium value for residence (*valueres*).

The observations are converted into natural logarithmic, allowing the reading of the ro-coefficient, associated to the neighbour effects, as elasticity. Seeking for simplicity, I dropped the indices  $i$  for each of the 86 municipalities and  $t$  for each of 11 years included in the panel data estimations.

The basic model follows a spatial lag specification and can be defined as:

$$pub\ exp = c + \rho(Wpub\ exp) + \beta X + \varepsilon$$

The identification of the reason underlying a statistical significant ro-coefficient, the spatial autoregressive coefficient, implies the configuration of three hypotheses to be tested related to each one of the possible explanation for strategic interaction among local governments typified above.

**H1: Strategic interaction is a spillover effect overcome**

If the hypothesis is correct when central government grants as well as ideology alignment with neighbouring local governments are considered, the statistical significance of ro-coefficient should decrease.

The basic model is extended to check this hypothesis including two more independent variables: grants from central government (*transfac*) and ideology alignment with neighbouring jurisdictions (*ideolalig*).

$$pub\ exp = c + \rho_1(Wpub\ exp) + \beta X + \delta Z + \varepsilon$$

**H2: Strategic interaction is a result of Tiebout competition**

Under this hypothesis the relevant variable that explains why local governments are tempted to get into strategic interaction is the number of residences available in each jurisdiction, being the goal of each local government to increase houses, thus attracting tax contributors to own jurisdiction. The inclusion of a variable that captures this effect should produce a decrease on the statistical significance of the ro-coefficient.

In this case the basic model is changed to accomplish one more independent variable – number of houses for residence (*house*) and becomes as:

$$pub\ exp = c + \rho_2(Wpub\ exp) + \beta X + \phi Y + \varepsilon$$

**H3: Mimicking behaviour is the reasoning for strategic competition**

Political circumstances play a crucial role when this hypothesis is tested. In fact copycat behaviour is more heavily expected by local governments facing reappointment problems. As such, an electoral year is determinant for this behaviour because comparisons between local incumbents can become with a cost: electoral defeat. Moreover, making public expenditure choices under majority or minority political frameworks determine the temptation for mimicking. If local governments have majorities are less constrained by neighbours' public expenditures choices.

In order to accommodate this explanation the basic model is extended with three dummy variables: Chamber Majority (*chambmaj*), Municipal Assembly Majority (*assebmaj*) and election year (*electiony*), which occurred in 2001 and 2005. The resulting estimated model is defined as:

$$pub\ exp = c + \rho_3(Wpub\ exp) + \beta X + \psi Q + \varepsilon$$

Table 2 summarises the main statistics for the independent variable, the lagged independent variable, the dependent variables and the lagged dependent variables used as instruments.

**5. EMPIRICAL RESULTS**

I started with a non-spatial linear regression model and then tested whether or not the model needs to be extended with spatial interaction effects, as suggested by Elhorst (2010b). The POLS estimates accuracy improves significantly with the inclusion of the spatially lagged variable. Since under the presence of spatially lagged dependent variable, the pool OLS (POLS) estimated parameters lose its

property of unbiasedness and consistency, I consider the estimation of 2SLS models using as instruments the lagged dependent variables common to all estimates. I also confirmed that the covariances between lagged dependent variables considered as instruments and the errors of the estimations are approximately equal to zero.

**Table 2 – Descriptive statistics of the dependent variable, independent variables and instruments**

	Mean	Standard deviation	Maximum	Minimum
pubexp	650	359	2668	70
Wpubexp	543	265	1630	105
valueres	36.961	27.109	218.776	3.876
proptax	11,34	9,21	51,04	0,00
transfac	48,79	16,49	86,94	3,69
ideolalig	0,44	0,28	1,00	0,00
house	346	604	5903	3
chambmaj	0,95	0,22	1,00	0,00
assebmaj	0,70	0,46	1,00	0,00
electy	0,18	0,39	1,00	0,00
wproptax	13,20	8,93	79,85	1,19
wvalueres	35.945	23.127	149.500	4.213

Source: Portuguese National Statistics (I.N.E.) and own calculus.

Table 3 shows the main empirical results. The basic model identifies the presence of strategic interaction among neighbouring municipalities, since ro-coefficient is statistical significant. When the model is extended to accommodate the three hypotheses tested, only the hypothesis 1 is relevant.

For the Northern region of Portugal, spatial strategic interaction among neighbouring municipalities emerges as a result of spillover effects. For this effect the relevant variable is the alignment of ideology among neighbouring municipalities. In fact, neighbouring municipalities that share the same ideology tend to spend more, meaning that bordering municipalities with incumbency of the same party are more prone to engage into cooperation that leads to an increase on public expenditures. The example of a street that crosses more than one municipality can be seen as a good example. In this case, a rehabilitation intervention by one municipality of inter-jurisdictional street forces to a rehabilitation of the part located in the neighbouring municipalities and this effect is improved when incumbencies share the same ideology.

The existence of central government grants to local governments, although forcing an increase on public expenditures, has a smaller relevance than the ideology alignment among neighbouring municipalities. This result is somehow unexpected since the former study for the southern part of Portugal identified as the major reason for spillover effects the existence of such transfers.

The second hypothesis does not find support. Although the variable number of new houses is statistically relevant has a negative sign, contrarily to the initial expectation. This could be explained by the fact that in the Northern region there is 24 very small municipalities with less than 10 000 inhabitants. Moreover, 42 municipalities (almost fifty percent of the considered municipalities) are facing shrinking phenomena during the last decade, thus do not being economically attractive municipalities. As consequence, the number of new houses built has been decreasing when public expenditure per capita increases due the reduction of inhabitants.

**Table 3: Estimation 2SLS of public expenditures with intercept and common lagged dependent variables as instruments**

	Basic Model	t-stat		Model testing H1	t-stat		Model testing H2	t-stat		Model testing H3	t-stat		Extended Model	t-stat		
wpubexp	0.509958	13,871230	*	0.479971	12,651230	*	0.464798	12,695850	*	0.511668	13,637170	*	0.432379	11,165980	*	
valueres	0.223745	5,939986	*	0.248952	6,549076	*	0.237017	6,457521	*	0.216729	5,621920	*	0.248220	6,521214	*	
proptax	-0.475474	-13,293600	*	-0.468731	-12,211350	*	-0.369991	-9,401485	*	-0.460944	-12,638730	*	-0.346168	-8,126450	*	
transfac				0.074428	1,500497	***							0.063970	1,317392	***	
ideolalig				0.184747	3,345563	*							0.166179	3,031219	*	
house							-0.095997	-5,729445	*				-0.098597	-5,850474	*	
chambmaj										0.079310	1,001022		0.088255	1,141604		
assembmaj										0.057699	1,517742	***	0.046941	1,259011		
electy										-0.021657	-0,21807		0.058286	0,600609		
Robustness Tests		p-value		p-value			p-value			p-value			p-value			
Wald test ( $\rho=0$ )		192,411	0.0000	*	160,054	0.0000	*	161,185	0.0000	*	185,973	0.0000	*	124,679	0.0000	*

T-values: \*1% statistical significant; \*\*5% statistical significant; \*\*\*10% statistical significant. Intercept value is not reported.

Moreover, it seems that local governments increase per capita public expenditures in an attempt to refrain the abandon of the municipalities. In these circumstances, spatial strategic interaction is not an outcome of a Tiebout competition phenomenon.

Municipalities also can spatially interact as a Tiebout competition mechanism not for inhabitants directly but for economic activity – enterprises. However, when the number of enterprises is considered instead of number of new houses, the effect is reinforced.<sup>7</sup> In fact, the decreasing number of enterprises in a municipality forces local government to engage into more spending, trying probably to avoid the abandon of inhabitants. Consequently, local governments act replacing the place taken by enterprises, namely substituting them as a major employer. In this framework, it seems that equity concerns overcome the efficiency questions.

The third hypothesis tested of a mimicking behaviour underlying strategic interaction among municipalities did not also find support. The fair of being compared with neighbouring municipalities performance prior elections seems not explain incumbents engaging in spatially strategic interaction. This result is confirmed when specific public expenditure categories are considered, namely environmental management and protection or cultural and sportive expenditures.<sup>8</sup> Although mimicking behaviour would be more easily observed, according to the literature, when particular public expenditures are considered, the estimates do not sustain this prior expected result.

When spending on environmental management and protection is considered as independent variable the spatially strategic interaction becomes less intense. Spatially strategic interaction in this kind of public expenditure result also from a spillover effect which emerges by neighbouring local governments engage into a cooperative behaviour when incumbency have the same ideology orientation. The increasing dependency from central government grants reveals influence negatively public expenditures on environmental management and protection, which is in contrast with the expectations. Tiebout competition also does not find support when this category of public expenditure is taken as independent variable. Although not shown, municipalities with few enterprises tend to spend more on environment.

Similar results are found when the analysis considers cultural and sportive expenditures. The major difference relies on Tiebout competition which sums to the spillover effect. In this case, the increasing of new residences influences positively this kind of public expenditures, reinforcing the spatially strategic interaction. This result means that local governments use this category of public expenditures to attract new residents to their municipalities. The economic activity seems do not play a relevant role for the decision of this type of expenditures.

The estimates indicate that per capita public expenditure increases with the value of houses, meaning that differences in fiscal attractiveness tend to be capitalised into house prices, and decrease with the proportion of property taxes on public budget, as theory predicts since the higher the voters contributions the more accountable the incumbents become. These results are irrespective of being considered as independent variable particular categories or overall public expenditures.

## **6. CONCLUSIONS AND POLICY IMPLICATIONS**

Using differentiated model configurations and the local government expenditures of the municipalities composing the Northern region of Portugal, between 1998 and 2008, the paper identifies the structural model that generates the observed spatial auto-correlation in local public expenditures. Strategic interaction among municipalities is an outcome of spillover effects stimulated by neighbouring local governments with similar political orientation. The confirmed spillover effect hypothesis reinforces the idea that public expenditure in a municipality induces more expenditure in neighbouring municipalities. For this part of the country is not reasonable to state that public expenditure increase by a copycat incentive or as a strategy to competitively attract more residents, increasing, as such, tax base.

---

<sup>7</sup> The estimative considering the number of enterprises are not shown here but are available upon request.

<sup>8</sup> The Appendix presents the descriptive statistics relative to these variables as well as the estimations outputs when they are considered as dependent variables.

In Portugal, municipalities have a large spectrum of competences irrespectively of their dimension. Given the delegation by central government of too many public functions to be fulfilled, municipalities tend to replicate the same local public goods in each municipality, thus do not exploiting scale economies and leading to a replication of public goods or an overwhelming provision. This public expenditure increase due spillover effects is not an outcome of a copycat behaviour but a result of the same range of competences delegation to all municipalities, irrespectively of their budgetary capacity. Good examples are roads intervention or education investment on better schools to improve educational quality.

These results deserve some reflexion. Being local governments influenced by central government, incumbents are pushed to offer to own population a wide set of public goods, covering a huge number of economic and social functions. Moreover, the reliance on intergovernmental grants for financing local governments' activity has a pervasive effect, since it destroys the right incentive for responsible local decisions and compromises autonomy, thereby allowing the intrusion, although indirectly, of the central government into local decisions.

Given the necessity of accomplishing the competences attached to municipalities, public provision tend to be homogenous making irrelevant the "vote with the feet" mechanism promoted by Tiebout. Similarly, if all municipalities offer the same public goods set the inter-jurisdictional comparison of the incumbency performance loses its reasoning. If we sum also the fact that local governments have a very slight margin to set taxes, constrained to a small gap for defining the tax rate of local taxes, no mechanism enhancing efficiency gains that would limit public expenditure can be found.

Since local governments are not free to chose what set of competences should be fulfilled, municipalities are not allowed to specialize on certain public functions or exploit scale agglomeration gains. As such, local governments are not compelled to give voice to their constituents, meaning that specific local preferences for public goods are not fully considered, leading, by one hand, to market imperfections and, by the other hand, to an inefficient public provision with implications on local and regional development.

Given the small dimension of too many municipalities in the Northern region of Portugal, the number of municipalities should be evaluated, as it was recently in other countries like Finland or Greece, leading to the possibility of merging municipalities, thus avoiding unnecessary public expenditures, exploiting the gains from agglomeration and reducing the cost of facilities replication.

## REFERENCES

- Anselin, L. (1988). *Spatial Econometrics: Methods and Models*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Anselin, L. (1990). Some robust approaches to testing and estimation in spatial econometrics. *Regional Science and Urban Economics* 20, 141–163.
- Anselin, L. (2001). Spatial econometrics. In Baltagi, B. (ed.), *A Companion to Theoretical Econometrics*: 310–330. Blackwell, Oxford.
- Anselin, L., LeGallo, J., Jayet, H. (2006). Spatial panel econometrics. In Matyas L., Sevestre, P. (eds), *The econometrics of panel data, fundamentals and recent development in theory and practice*: 901-969. 3<sup>rd</sup> Edition, Kluwer, Dordrecht.
- Anselin, L., Hudak, S. (1992). Spatial econometrics in practice: A review of software options. *Regional Science and Urban Economics*. 22: 509–536.
- Baltagi, B.H. (2005). *Econometric analysis of panel data*. 3<sup>rd</sup> ed., Wiley, Chichester, England.
- Barreira, A.P. (2010). Spatial strategic interaction of Portuguese local government expenditures as a factor for regional development: The case of Algarve municipalities. *Mimeo*.
- Besley, T., Case, A. (1995). Incumbent behaviour: vote seeking, tax setting and yardstick competition. *American Economic Review*. 85(1): 25–45.

- Borck, R., Caliendo, M., Steiner, V. (2007). Fiscal competition and the composition of public spending: Theory and evidence. *FinanzArchiv: Public Finance Analysis*. 63(2): 264–277.
- Brueckner, J.K. (2000). Welfare Reform and the Race to the Bottom: Theory and Evidence. *Southern Economic Journal*. 66(3): 505–525.
- Brueckner, J.K. (2003). Strategic interaction among governments: An overview of empirical studies. *International Regional Science Review*. 26: 175–188.
- Case, A.C., Rosen, H.S., Hines, J.C. (1993). Budget spillovers and fiscal policy interdependence: Evidence from the States. *Journal of Public Economics*. 52: 285–307.
- Debary, N., Ertur, C. (2010). Testing for spatial autocorrelation in a fixed effects panel data model. *Regional Science and Urban Economics*. 40: 453–470.
- Elhorst, J.P. (2001). Panel data models extended to spatial error autocorrelation or a spatially lagged dependent variable. Faculty of Economics, University of Groningen, Research School of Systems, Organization and Management, *Research Report 01C25*.
- Elhorst, J.P. (2003). Specification and estimation of spatial panel data models. *International Regional Science Review*. 26(3): 223–243.
- Elhorst, J.P. (2010a). Spatial panel data models. In Fischer M.M., Getis A. (eds.), *Handbook of Applied Spatial Analysis*: 377–407. Springer, Berlin Heidelberg New York.
- Elhorst, J.P. (2010b). Applied spatial econometrics: Raising the bar. *Spatial Economic Analysis*. 5(1): 9–28.
- Elhorst, J.P., Fréret, S. (2009). Evidence of political yardstick competition in France using a two-regime spatial Durbin model with fixed effects. *Journal of Regional Science*. 49(5): 931–951.
- Epple, D., Nechyba, T. (2004). Fiscal decentralization. In Henderson, V., Thisse, J.F. (eds.), *Handbook of Regional and Urban Economics*, Vol.4: 2423–2480. North-Holland, Elsevier.
- Figlio, D.N., Kolpin, V.W., Reid, W.E. (1999). Do states play welfare games? *Journal of Urban Economics*. 46: 437–454.
- Fingleton, B., LeGallo, J. (2007). Finite sample properties of estimators of spatial models with autoregressive, or moving average disturbances and system feedback. *Annales d'économie et de statistique*. 87/88: 39–62.
- Fingleton, B., LeGallo, J. (2008). Estimating spatial models with endogenous variables, a spatial lag and spatially dependent disturbances: finite sample properties. *Papers in Regional Science*. 87: 319–339.
- Foucault, M., Madiès, T., Paty, S. (2008). Public spending interactions and local politics: Empirical evidence from French municipalities. *Public Choice*. 137(1): 57–80.
- Franzese, Jr., Hays, J.C. (2004). Empirical modeling strategies for spatial interdependence: Omitted-variable vs. Simultaneity biases. *Summer meetings of the Political Methodology Society*.
- Franzese, Jr., Hays, J.C. (2007). Spatial econometric models of cross-sectional interdependence in political science panel and time-series-cross-section data. *Political Analysis*. 15(2): 140–164.
- Fredriksson, P.G., Millimet, D.L. (2002). Strategic interaction and the determination of environmental policy across U.S. States. *Journal of Urban Economics*. 51: 101–122.
- Gérard-Varet, L-A., Thisse, J-F. (1997). Local public finance and economic geography. *Annales d'Économie et de Statistique*. 45: 19–35.
- Greene, W.H. (2005). *Econometric Analysis*. 6<sup>th</sup> ed., Upper Saddle River, NJ, Pearson Prentice Hall.
- Hillman, A.L. (2003). *Public Finance and Public Policy*. Cambridge University Press.
- Hsiao, C. (1986). *Analysis of panel data*. Cambridge University Press, Cambridge.

- Kelejian, H.H., Prucha, I. (1998). A generalized spatial two-stage least squares procedures for estimating a spatial autoregressive model with autoregressive disturbances. *Journal of Real Estate Finance and Economics*. 17: 99–121.
- Kelejian, H.H., Prucha, I. (1999). A generalized moments estimator for the autoregressive parameter in a spatial model. *International Economic Review*. 40: 509–533.
- Lee, L.-F. (2003). Best spatial two-stage least squares estimation for a spatial autoregressive model with autoregressive disturbances. *Econometric Reviews*. 22: 307–335.
- Paltridge, M.D. (2005). Does income distribution affect U.S. state economic growth. *Journal of Regional Science*. 45(2): 363–394.
- Revelli, F. (2005). On spatial public finance empirics. *International Tax and Public Finance*. 12: 475–492.
- Rosen, H.S. (2008). *Public Finance*. 8<sup>th</sup> ed., McGraw Hill.
- Saavedra, L.A. (2000). A Model of Welfare Competition with Evidence from AFDC. *Journal of Urban Economics*, 47: 248–279.
- Salmon, P. (1987). Decentralisation as an incentive scheme. *Oxford Review of Economic Policy*. 16: 319–327.
- Schaltegger, C.A., Kuttel, D. (2002). Exit, voice, and mimicking behaviour: Evidence from Swiss cantons. *Public Choice*. 113: 1–23.
- Solé-Ollé, A. (2006). Expenditure spillovers and fiscal interactions: Empirical evidence from local governments in Spain. *Journal of Urban Economics*. 59(1): 32–53.
- St’astná, L. (2009). Spatial interdependence of local public expenditures: Selected evidence from the Czech Republic. *AUCO Czech Economic Review*. 3: 7–25.
- Tiebout, C.M. (1956). A pure theory of local expenditures. *Journal of Political Economy*. 64: 416–424.
- Wildasin, D.E. (1988). Nash equilibria in models of fiscal competition. *Journal of Public Economics*. 35(2): 229–240.

## APPENDIX:

**Table A1 – Descriptive statistics of environmental management and protection and cultural and sportive expenditures considered as alternative dependent variables**

	Mean	Standard deviation	Maximum	Minimum
envprotexp	44	29	234	0
wenvprotexp	42	24	354	3
cultsprtexp	80	65	458	0
wcultsprtexp	75	39	315	14

Source: Portuguese National Statistics (I.N.E.) and own calculus.

**Table A2: Estimation 2SLS of environmental management and protection expenditures with intercept and common lagged dependent variables as instruments**

	Basic Model	t-stat		Model testing H1	t-stat		Model testing H2	t-stat		Model testing H3	t-stat		Extended Model	t-stat		
wenvproexp	0.384498	5,405356	*	0.381554	5,361853	*	0.384349	5,400273	*	0.377009	5,196101	*	0.377896	5,199600	*	
valueres	0.398817	5,686558	*	0.416842	5,879677	*	0.398521	5,677498	*	0.407217	5,629655	*	0.424525	5,785613	*	
proptax	-0.397895	-6,291818	*	-0.505363	-7,093799	*	-0.404009	-5,371437	*	-0.395813	-6,076586	*	-0.499131	-6,009486	*	
transfac				-0.275714	-3,026095	*							-0.266505	-2,889354	*	
ideolalig				0.250995	2,417360	*							0.240412	2,264848	*	
house							0.004756	0,150321					-0.003069	-0,095840		
chambmaj										-0.114399	-0,765507		-0.113093	-0,750625		
assembmaj										0.118754	1,653584	**	0.081399	1,119173		
electy										0.011075	0,059630		0.015678	0,084116		
Robustness Tests		p-value		p-value			p-value			p-value			p-value			
Wald test ( $\rho=0$ )		29,2179	0.0000	*	28,7495	0.0000	*	29,1630	0.0000	*	26,9995	0.0000	*	27,0358	0.0000	*

T-values: \*1% statistical significant; \*\*5% statistical significant; \*\*\*10% statistical significant. Intercept value is not reported.

**Table A3: Estimation 2SLS of cultural and sportive expenditures with intercept and common lagged dependent variables as instruments**

	Basic Model			Model testing H1			Model testing H2			Model testing H3			Extended Model			
		t-stat			t-stat			t-stat			t-stat			t-stat		
wcultsprtexp	0.441477	7,703455	*	0.434165	7,390549	*	0.469332	7,842567	*	0.435779	7,577527	*	0.455827	7,411477	*	
valueres	0.385746	5,842513	*	0.410094	6,076384	*	0.372775	5,585274	*	0.373735	5,526261	*	0.387711	5,546003	*	
proptax	-0.434687	-7,205798	*	-0.500405	-7,571460	*	-0.487781	-7,154993	*	-0.415488	-6,716710	*	-0.528313	-7,039850	*	
transfac				-0.148591	-1,789811	**							-0.139340	-1,659328	**	
ideolalig				0.256897	2,718254	*							0.233735	2,418696	*	
house							0.050432	1,698048	**				0.043181	1,436908	***	
chambmaj										0.129261	0,965551		0.105007	0,773543		
assembmaj										0.061695	0,958728		0.030837	0,470336		
electy										0.020483	0,123955		-0.001027	-0,006146		
Robustness Tests		p-value		p-value			p-value			p-value			p-value			
Wald test ( $\rho=0$ )		59,3432	0.0000	*	54,6202	0.0000	*	61,5059	0.0000	*	57,4189	0.0000	*	54,9300	0.0000	*

T-values: \*1% statistical significant; \*\*5% statistical significant; \*\*\*10% statistical significant. Intercept value is not reported.