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HORIZONTAL INTERACTION ON LOCAL COUNCILS' EXPENDITURES. EVIDENCE FROM ITALY.

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Abstract

This paper seeks for public spending interdependence among jurisdictions within some Italian local councils. We find significant positive interaction among spending of neighboring local councils both at the level of total expenditure and also for different subcategories. However, this result applies only when spatial dependence is analyzed among geographically contiguous jurisdictions; different criteria of proximity do not give rise to any substantial form of interaction among local governments. Attempts to identifying the source of this interaction seem to refuse yardstick competition hypothesis. Fiscal spill-overs among jurisdictions appear as a more plausible explanation; we also find evidence that local councils partnerships fail to effectively internalize these spill-overs. Finally, commuting affects spatial interdependence among jurisdictions.

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Horizontal interaction on local councils' expenditures. Evidence from Italy.

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1 Theoretical background

The recent Italian fiscal reform toward a system of decentralization of revenue-raising and government expenditure decisions should assign local councils more flexibility and freedom in the realm of public spending allocation and the relative provision of services (Zanardi, 2005; Baicker, 2005). Actually, instead of experience autonomy at a greater extend, there are theoretical reasons to suspect that local councils respond to the choices of neighboring jurisdictions in setting the level of its own decision variable so that we observe spatial interaction in local government expenditure level (Brueckner, 2003; Revelli, 2005). Rationales for this statement rely on different strands of theoretical literature.

According to the spill-overs model approach, several authors demonstrated that the benefits, or eventually detrimental effects, of public expenditure (i.e., with regards to spending on security services, infrastructure and road building, environmental services, recreation and cultural facilities, etc.) spread over the administrative boundary of one jurisdiction and affect the welfare of the residents of neighboring jurisdictions (Case et al., 1993; Kelejian and Robinson, 1993; Brueckner, 2003; Schaltegger and Zemp, 2003; Revelli, 2003 and 2005; Baicker, 2005; Solé Ollé, 2006; Freret, 2006). Within these models, the optimal value of the decision of one jurisdiction depends, of course, on his own characteristics but also on policies chosen elsewhere. Failing to take into account these spill-overs effects when setting the optimal value of a policy instrument, it can be shown that jurisdictions come to inefficient

Nash equilibria and do not maximize social welfare.

Another possible explanation for strategic interaction among jurisdictions builds on the features of the yardstick competition theory[1]. Within a framework of principal-agent relationship, imperfectly informed voters about costs and suitability of incumbent local fiscal policies infer the quality and reliability of their own politicians comparing other governments'performance as benchmark (Salmon, 1987). Then, fiscal policies of neighboring become crucial for the chance of a politician to be re-elected so that jurisdictions tend to mimic each other (Besley and Case, 1995; Bordignon et al., 2003; Redoano, 2003; Solè Ollè, 2003; Allers and Elhorst, 2005).

Jurisdictions engage in strategic interaction also when they are concerned in tax or welfare competition in order to attract investments and resources (Heyndels and Vuchelen, 1998; Figlio et al., 1999; Revelli, 2001; Feld and Reulier, 2003: Redoano, 2003); sometimes, both approaches are referred to as the resource-flow model (Bruckner, 2003). It can be shown that such a models adhere to Nash equilibria. Under some circumstances, this competition can ends up in a 'race to the bottom' mechanism with jurisdictions exerting downward pressure on each other's welfare benefits (Bruckner, 2000).

During the ten past years, a growing empirical literature has been devoted to assess whether fiscal interactions among jurisdictions are at work when analyzing their policy resolutions (see also Brueckner, 2003 and Revelli, 2005 for a survey). Recently, several papers focused on local governments (Heyndels and Vulchen, 1998; Brueckner and Saavedra, 2001; Bordignon et al., 2003; Allers and Elhorst, 2005; Solè Ollè, 2006). The process of decentralization that is taking place in most countries of Europe has assigned this tier of government with growing competences. There is the presumption that local governments can better match local citizen preferences. Local policy choices can highly affect citizens' welfare. It becomes relevant to get insight on the process of public policy formation at a local level since lower tier of government has to meet the challenge of even more localized form of competition. To our knowledge, the only paper dealing with Italian evidence is represented by Bordignon et al. (2003). However, it focus on the

[1]Bruckner (2003) assumes this literature to be a special category of spill-overs models in that it deals with information spill-overs.

tax side of local fiscal policies so that the relevance of previous issues with regards to local public expenditure remains untested in Italy and this paper is aimed to fill this gap. Since local jurisdictions are in general responsible for providing a number of different goods and services, the spending decision is furthermore a decision on how to allocate spending between different local goods and services. Thus, looking at local public expenditure, we test for interactions not only in the level but also in the composition of expenditures.

We investigate the presence of strategic interaction given to spatial correlation among the 246 Italian local councils of the Marche region when they set the level of current local public expenditure with reference to year 2000. We also test the robustness of our results when different budget categories of public expenditure are concerned admitting that some spending are more prone to mimicking behavior than others. To allow for spatial dependence when explaining public expenditure, we take into account not only geographic neighborhood but also socio-demographic and economic variables to weight the location of observations and their proximity. Further attempts are made in order to disentangle the source of the fiscal interdependence among jurisdictions. Among other possible causes of spatial interaction, we will address the importance of local councils partnerships, as instruments to internalize spill-overs, which have not received attention in previous research.

The paper is organized as follows. Section 2 describes the spatial econometric procedure and the empirical specification adopted to investigate if the Italian municipalities under examination engage in fiscal interaction. Section 3 is devoted to describe estimation results. In the final section we attempts to discriminate among different potential sources which is driving observed fiscal interdependence among jurisdictions. The paper concludes with a resume of the principal indications emerged through the paper.

2 Empirical analysis

2.1 Econometric approach

While theoretical literature often assumes the presence of economic interaction among jurisdictions and analyzes its consequences on fiscal policy, to verify the existence and the magnitude of spatial

interdependence remains mainly an empirical issue. In the empirical literature, most of the papers have focused on the horizontal tax interactions (Ladd, 1992; Case, 1993; Besley and Case, 1995; Heyndels and Vuchelen, 1998; Brueckner and Saavedra, 2001). All of them have found evidence of positive interdependence among tax rates of competing jurisdictions. Following the seminal paper of Case et al. (1993), in this paper we test for horizontal interactions in the local expenditures setting focusing on 246 Italian *comuni*, the lowest tier of the Italian local government structure.

Traditionally, empirical models of local public expenditure relate local spending to measures of income and tax shares (including grant-in-aid), and, in addition, to variables reflecting socioeconomic and geographic characteristics of the municipality, that is to say they assume expenditures to be influenced only by observed local features and not by variables characterizing other municipalities (Aronsson et al., 2000). Adopting a linear specification, it corresponds to estimate the following model:

$$Y = X\beta + \varepsilon \tag{1}$$

where Y denotes a Nx1 vector of the dependent variable consisting of the per capita expenditures of the N local jurisdictions, that is the spatial units of observation, X denotes a NxK matrix of exogenous 'local' explanatory variables and ε is a Nx1 vector of independently and identically distributed error terms across observations.

Building on the spatial econometric approach developed by Anselin (1988), this model can be augmented to accomplish for interdependence between the expenditure decisions of jurisdictions. There are two possible sources of spatial correlation. Assuming that the spatial pattern is due to a spatial auto-regressive process in the dependent variable brings to extend equation 1 to include a spatially lagged dependent variable:

$$Y = \rho WY + X\beta + \varepsilon \tag{2}$$

This specification is identified as a spatial lag model. Here, W represents a NxN weight matrix that assigns neighbors to every jurisdiction; it is defined a-priori. The lagged variable WY is a weighted average of all other jurisdictions' spending so that ρ, called the spatial autoregressive coefficient, identifies the intensity and

the sign of the impact of neighbors'policy on one jurisdiction's spending function. If the coefficient ρ is significant, we conclude that jurisdictions are prone to an interactive behavior and engage in substantive mimicking among each other when setting their own spending. According to Brueckner (2003), when ρ is negative, we can assume that spill-overs are behind the observed spatial correlation; if positive, further research must be carried on to discriminate, among the spill-overs, yardstick competition or fiscal competition explanations, which is the nature of horizontal interactions.

A second approach to introduce spatial interaction, denoted as spatial error model, assumes that the error terms are correlated across space. Possible explanations for this spatial pattern call out for omitted variables that are spatially dependent, exogenous common shocks affecting local jurisdictions or model mis-specification. According to this approach and assuming a first-order spatial autoregressive process in the error term ε, we have:

$$\begin{cases} Y &= X\beta + \varepsilon \\ \varepsilon &= \lambda W\varepsilon + \xi \end{cases} \tag{3}$$

where W is the weight matrix, λ is the spatial correlation coefficient and ξ is a vector of independently and identically distributed error terms.

Turning to estimation procedures, both lag and error spatial models invalidate the use of OLS estimators. (Anselin, 1988; Brueckner, 2003). First, the assumption of strategic interaction among spatial units of observation modelled by a spatial lag model ends up in the endogeneity of the neighbors expenditure variable because of the presence, on both side of equation 2, of the vector Y. Ignoring the influence of neighbors' spending on one's jurisdiction expenses would lead to inconsistent estimation of the relevant parameter. When normality of the residuals apply, Anselin (1988) solves the simultaneity problem by using maximum likelihood (ML) methods. Otherwise, and more generally, instrumental variables (IV) or two stage least square (2SLS) estimation techniques represent a valid approach to tackle a spatial lag model. This method typically employs fitted values of $\widehat{WY}$, obtained regressing WY on WX and X, to instrument for the actual neighbor spending WY. We obtain estimates of the spending model that are consistent not only to endogeneity bias but also to the presence of spatially error auto-correlation (see Kelejian and Prucha, 1998). This approach,

however, requires some caution in the choice of instruments whose appropriateness must be adequately tested.

Second, if errors exhibit spatial dependence, as in the error spatial model, ignoring this feature would cause OLS estimator to be inefficient, even if unbiased. Again, Anselin (1988) offers an iterative two-stage procedure to maximize the log-likelihood function of the spatial error model which is robust to the above mentioned problem[2].

2.2 Weights Matrix

The weights matrix, previously denoted as W, is fundamental when dealing with spatial correlation since it defines the concept of neighborhood among jurisdictions and introduces the potential spatial correlation among units of observations. Since it is posed a-priori by the researcher, it can influence arbitrarily the obtained results. In this paper, we will test the robustness of mimicking behavior using three different criteria to build the weights matrix: geographic (contiguity), demographic (population) and economic (income tax base[3]) proximity. The two last criterions, assuming proximity on the basis of 'distance' among jurisdictions in terms of population and (a proxy) of income, more then being real 'spatial' concepts, define similarities among jurisdictions and correct for possible spatial dependence arising from mutual influence and interactions among jurisdictions that regards as competitors those jurisdictions that share common characteristics (Case et al., 1993; Baicker, 2005).

The weight matrix W has zero diagonal elements and a representative off-diagonal element is w_{ij} with i denoting a jurisdiction and j its neighbor. According to the contiguity criterion, W is a positive matrix where the generic element $w_{ij} = 1$ if jurisdiction i and j share a common border and $w_{ij} = 0$ otherwise.

When using socio-demographic and economic criterion, we assign more weight to the jurisdiction with the most similar value of the reference variable, that is population or income tax base. Con-

[2]2SLS is not appropriate for obtaining a consistent estimator for the spatial autocorrelation coefficient in a spatial error model, as demonstrated by Kelejian and Prucha (1997). However, they propose (1998) a three-step procedure to estimate models with spatially lagged dependent variables and spatially autoregressive disturbances. They refer to their estimation procedure as a generalized spatial two-stage least squares (GS2SLS).

[3]We use features of the *IRPEF* tax base, the basic Italian tax.

sequently, each off-diagonal element is computed as the inverse of the 'distance' between jurisdictions. Denoting as S once the population and then the income tax base, we compute $w_{ij} = 1/|S_i - S_j|$.

As conventional in empirical application, after the weights are computed, the elements of each row of W are normalized so that they sum to unity.

2.3 Data

The local institutional structure of Italy consists of three tier of overlapping governments: *regioni*, *provincie* and *comuni*, the latter being the lowest level of the structure. For the empirical implementation of our investigation we use data on the 246 *comuni* of the Italian *regione* called Marche for the year 2000.

The dependent variable under examination is the euro per capita current public spending level[4]; data have been collected from local councils' balance sheet[5]. Recognizing that some typologies of expenses are more prone to generate mimicking behavior and that there is no reason to expect the same direction of spatial auto correlation for different spending categories[6], we test our basic model assuming as dependent variables the following disaggregated categories of spending: education, police, leisure (that is, cultural and sports spending), social services, road maintenance and transportation, territorial services (that is housing, town building, parks, environment, savage, water delivery and sanitation). These categories cover almost the entire range of spending responsibility of local governments and they represent more than a 60% of total current local expenditures. Again, all variables are expressed in euro per capita. Descriptive statistics of dependent variables are reported in table 1.

The empirical model of local public expenditure includes different socio-economic characteristics of local jurisdictions; as regards the above equations, they are collected in the X matrix of the exoge-

[4]It is the operational expenditure, it does not include investment expenses.

[5]It corresponds to the *Certificato del Conto di Bilancio* whose features are also available at www.finanzalocale.interno.it.

[6]It happens either because some spending categories are more comparable among jurisdictions than others or because there is diverse complementary among different kinds of expenses. That is, the presence of spill-overs or yardstick and fiscal competition is more plausible with regard to specific categories of spending.

Table 1: *Descriptive statistics of variables.*

	Mean	St.Dev.
Categories of spending (in euro per capita):		
Total	677.84	361.14
Education	79.70	33.61
Social	57.25	66.16
Police	31.28	23.53
Leisure	32.48	31.74
Road and transportation	77.11	44.94
Territorial	107.10	68.33
Regressors:		
Population density (Population per km^2)	147.08	193.29
Share of Old People (>64 years)	28.75	10.01
Share of Young People (<15 years)	17.00	5.02
GDP per capita (in 1000 euro)	20.53	7.85
Grants (in euro)	325.10	180.59
Coast (1=jurisdiction being on the coast; 0=otherwise)	0.14	0.35
Election year 2000 (1=jurisdiction calling for election; 0=otherwise)	0.03	0.17
Lefty-wing (1=left wing party ruling; 0=otherwise)	0.30	0.46
Large Majority (1=share of votes more than 65%; 0=otherwise)	0.27	0.45
Unione di Comuni (1=jurisdiction joining Unione di Comuni; 0=otherwise)	0.08	0.28
Comunità Montana (1=jurisdiction joining Comunità Montana ; 0=otherwise)	0.50	0.50
Share of commuters	57.37	16.16

nous variables. The only available economic variables are: income and grants from national level of government, both in Euro per capita; they measure the availability of resources to be potentially devoted to public spending. We expect the coefficient of income to be positive if public good is normal and Wagner's law is satisfied. The sign of grants is expected to be positive due to the fly-paper effect. Demographic characteristics of the jurisdiction can influence the composition of public spending for services providing they determine the needs and preferences of population for public goods. We proxy these effects testing the impact on the dependent variables of proportion of population being old (more than 64 years) and young (less than 15 years). The inclusion of population density provides information about scale economies and potentially congestion effects in the provision of public good [7]. Finally, we use

[7]Other variables reflecting jurisdictional characteristics (population, income square per capita, unemployment rate, percentage of foreign people living in the jurisdiction, demographic index, urban contiguity, etc.) have been dropped from

a dummy variable which equals 1 if the jurisdiction is on the sea. This variable introduces a measure of neighborhood that cannot be resumed within the weighting matrix. It also reflects the extra-spending need of a local councils because of potential congestion effects connected to tourists attraction and hospitality. At the same time it controls for the presence of topographical amenities that, if omitted, could provide false evidence of strategic interaction given that natural features may be unobservable in the data so that the amenity level may thus be part of the error term pointing to spatial error correlation (Brueckner, 2003).

3 Results

We first present the results obtained using the contiguity weights matrix and we then compare these figures with those obtained adopting different schemes of 'distance' among jurisdictions.

3.1 Contiguity weights matrix

Estimation results of the total local spending model, adopting the contiguity weights matrix, are reported in table 2. Column 1 reports the OLS estimates of the non spatial model. This model accounts for roughly 50% of local spending variation. According to similar results emerged in the applied literature, all variables show to be statistically significant with the proportion of young population being the sole exception. These estimates reveal that local spending is higher as income and grants per capita increase and the share of old population decreases. The positive (but modest, and overall, weakly significant) impact on total spending of population density denotes that potential congestion effects prevail on scale economies. Jurisdictions laying on the coast absorb additional amount of total spending. Detecting for spatial autocorrelation, Moran's I statistic, based on OLS residual, provides useful insight given that it is assumed to be a measure of spatial dependence[8]. Looking at the diagnostics in table 2, the Moran's test

the regression since they do not revealed significant influence on local expenditures and/or they were too correlated with the others.

[8]Moran's test is usually assumed to be a test for spatial autocorrelation however it shows power against other alternatives than spatial autocorrelation, such as heteroscedasticity and non-normality.

(Moran's I= 4747, p-value=0.000) points to some mis-specification of the model of total local spending and suggests to re-estimate it allowing for the presence of spatial autocorrelation. Since the Jarque-Bera test (J-B test=4788, p-value=0.000) rejects the assumption of normality of the residuals, the 2SLS estimation procedure would be more appropriate than ML approach. Given that the instruments are valid, this procedure solves the simultaneity-problem and, in the mean time, yields coefficients that are consistent even in the presence of spatially correlated errors (see Kelejian and Prucha, 1998). The goodness of instruments will be evaluated according to the Sargan test. Under the null hypothesis that instruments are valid, this test statistics is distributed as a chi-squared in the number of over-identifying restrictions. If it rejects, there are doubts on the appropriateness of instruments. The 2SLS estimated coefficients are reported in column 2 of table 2; for completeness, we also indicate the OLS estimates of the spatial model. Focusing on the coefficient of weighted values of neighbors' spending, that is on the spatial interaction coefficient, we find evidence that contiguous Italian local councils interact when setting total level of per capita spending, the interaction being positive and significative[9]. The estimated impact on local spending is $\rho = 0.238$, meaning that an every euro spending increase by jurisdiction *i*'s neighbors causes, *c.p.*, an increase on jurisdiction *i*'s spending of about 0.24 euro. Remaining variables of the baseline model almost replicate the sign and significance of OLS estimates with the exception of population density and the share of young resident. The Sargan test accepts the null hypothesis (Sargan test=5.705; p=0.399) confirming the validity of our model. When comparing spatial OLS and 2SLS estimates, we observe a substantial difference among coefficients only when we look at the ρ value of spatial interaction which is considerably lower in the 2SLS results.

We now check if the mimicking behavior observed in total local council expenditure can be generalized to all spending categories or if it reflects the presence of interaction among jurisdictions mainly within specific typology of expenses which could be more directly

[9]The significance of the spatial interaction coefficient confirms the indication of the superiority of a spatial lag model vs an error spatial model that we derived looking at frequently used LM tests of spatial model selection (Anselin, 1988; Anselin et al., 1996). Again, they are based on OLS residuals. They are not reported here for the sake of synthesis and also because they could be less powerful when non-normality is detected, as is in our case.

Table 2: *Total spending model. OLS and 2SLS estimates.*

	NON-SPATIAL MODEL	SPATIAL MODELS	
	(1)	(2)	(3)
REGRESSORS	OLS	OLS	IV
ρ	-	0.41***	0.24**
		(4.99)	(2.25)
dens	0.19*	0.16	0.17
	(1.63)	(1.46)	(1.57)
old	-7.89***	-8.88**	-8.46***
	(-2.97)	(-3.49)	(-3.34)
young	-5.27	-9.23*	-7.55*
	(-1.28)	(-2.30)	(-1.87)
pilproc	20.04***	19.01***	19.45***
	(7.66)	(7.59)	(7.81)
grants	1.66***	1.41***	1.52***
	(12.06)	(10.05)	(10.46)
coast	115.43**	97.92*	105.34*
	(1.97)	(1.75)	(1.89)
cons	-0.57	-80.45	-46.61
	(-0.01)	(-1.16)	(-0.67)
REGRESSION DIAGNOSTICS			
Adjusted R2	0.52	0.56	
Jarque-Bera normality test	4788***		
Breusch-Pagan test	865.067***		
Moran's I	4.75***		
Sargan test			5.705
Observations	246	246	246

Notes: t values in parenthesis; * significant at 1%, ** significant at 5%, *** significant at 10%.

comparable or strategic for the local government. Table 3 looks at local council spending by category. We report 2SLS estimates only when Moran's test detects spatial autocorrelation that needs to be accounted for; otherwise, if Moran's I is not significant, we retain OLS estimates[10]. For the sake of synthesis, we do not report OLS spatial estimates.

Our results show that mimicking is not a common feature of all spending categories. We observe that jurisdictions react to increases of their neighbors' spending by increasing their own spending in half of the six analyzed categories of local expenditure, that is when police, road and territorial expenditures are concerned[11].

[10]However, in such cases we check the robustness of Moran's I verifying that 2SLS yield a spatial lag estimated coefficient that is not statistically different from zero. In all cases, it did not failed.

[11]The significance of ρ confirms the indication provided by LM tests that all

Table 3: *Different spending categories models. OLS and 2SLS estimates.*

	Education OLS	Social OLS	Police 2SLS	Leisure OLS	Road 2SLS	Territorial 2SLS
ρ	-	-	0.431*	-	0.464***	0.496**
	-	-	(1.94)	-	(4.35)	(2.29)
density	-0.022*	0.050*	0.011	0.028**	-0.000	0.042
	(-1.67)	(1.65)	(1.17)	(2.11)	(-0.02)	(1.57)
old	0.121	-0.518	0.194	-0.933	0.205	0.915
	(0.40)	(-0.75)	(0.88)	(-3.04)	(0.63)	(1.47)
young	1.117**	-0.513	-0.253	0.545	-0.145	-2.221**
	(2.39)	(-0.47)	(-0.76)	(1.14)	(-0.30)	(-2.32)
GDP pc	1.048***	0.985	0.126	1.182***	0.411	1.154**
	(3.54)	(1.44)	(0.59)	(3.91)	(1.34)	(1.91)
grants	0.065***	0.081**	0.042***	0.092***	0.112***	0.071**
	(4.21)	(2.26)	(3.28)	(5.77)	(6.05)	(2.06)
coast	2.909	0.310	9.276*	2.605	4.954	28.587**
	(0.44)	(0.02)	(1.85)	(0.38)	(0.73)	(1.92)
const	17.283**	26.896	-2.408	-8.535	-6.864	6.887
	(2.17)	(1.46)	(-0.38)	(-1.05)	(-0.8)	(0.32)
R^2	0.304	0.041	-	0.186	-	-
Moran's I	0.597	1.548	1.689*	1.316	4.589***	5.084***
Sargan	-	-	4.857	-	8.134	8.363

Notes: t values in parenthesis; * significant at 1%, ** significant at 5%, *** significant at 10%.

The impact of interaction spans from $\rho = 0.43$ of police to $\rho = 0.50$ of territorial spending. The presence of some degree of complementarity among jurisdictions's spending rules out the potential of strategic substitution among jurisdictions in public services provision that we would observe if jurisdictions' reaction function were negatively sloped.

For the remaining spending categories, the Moran's I never detects the presence of spatial effects: the spending model can be properly estimated by OLS. However, these spending model specifications provide unsatisfactory explanation of spending determinants since R^2 usually takes small values. This is likely because there is no reason to assume all spending categories to be explained by the same set of variables. More over, better fit would require a more detailed and appropriate empirical specification model. On the other hand, it is not really surprising that we do not find mimicking since Italian local councils, especially if they are small as usually happens within our sample, have limited discretion in the realm of these spending categories both because they are assigned limited competence from upper levels of government and because

pointed to prefer a spatial lag model to depict spatial dependence. See *supra*.

Table 4: *Estimates of spatial auto-correlation coefficient using different weight matrix. OLS and 2SLS estimates.*

Weight matrix	Total	Education	Social	Police	Leisure	Road	Territorial
Contiguous	0.238**	-0.302	0.260	0.431*	0.075	0.464***	0.496**
	(2.25)	(-1.15)	(0.48)	(1.94)	(0.02)	(4.35)	(2.29)
Population	-0.103	0.333	0.944	0.616**	0.133	0.19	-0.003
	(-0.79)	(1.58)	(1.51)	(2.03)	(0.40)	(4.35)	(-0.01)
Income tax	0.038	0.145	0.576	0.476*	-0.163	0.150	0.280
base	(0.24)	(0.78)	(0.60)	(1.81)	(-0.39)	(0.96)	(0.66)

Notes: t values in parenthesis; * significant at 1%, ** significant at 5%, *** significant at 10%.

they suffer from limited financial resources.

Considering the relevance of other factors than mimicking on local spending, overall results show that income, grants and coast exert a positive impact on local spending but, except for grants, relative coefficients are not always significant. At the level of single spending categories, focusing on the impact of grants, we observe a reduced relevance of the fly-paper effects comparing to total spending. Coefficients of the proportion of young are usually negative except when, reasonably, education and leisure expenditures are involved; these coefficients, however, sometimes show to not differ significantly from zero. The density variable assumes different sign capturing either potential economy of scale or congestion effects in the provision of public good. The proportion of old people does not effect significantly local spending allocation.

3.2 Other weights matrices

In this section we analyzes the impact of the neighborhood criterions resumed within the weight matrix when studying interactions between jurisdictions. As stated above, we use population and income tax base to measure similarities among jurisdictions and we compare estimates obtained using the above matrices with those associated to the use of contiguity weight matrix.

Given our interest in detecting possible spatial dependence in local jurisdictions spending decision, we only focus on the returned estimate of the spatial coefficient. Specifically, we report in table 4 the ρ value that we obtain when using 2SLS estimation procedure. Technically, we wouldn't undertake this estimation step because

in all cases Moran's I do not detect spatial autocorrelation so that a non spatial model specification should be considered appropriate and we should rest on OLS estimators[12]. Actually, testing the significance of the jurisdictions' inter-dependence with a 2SLS framework, we see that Moran's I fail to capture spatial mis-specification, that instead is depicted by 2SLS, only when we specify a police spatial spending model.

Taking together these results, it emerges that strategic interaction occurs in the Marche region mainly between geographically close jurisdictions; almost absent is interdependence when socioeconomic weights matrix are concerned. Interestingly enough, infact, only police expenditure exhibits mimicking behavior with regard to any of the matrix assumed. This results, however, should be assumed with caution.

Given that opposite results can be derived when using different weights matrix, we thing that choosing an appropriate weight matrix is a critical issue. Of course, different weights capture a different aspect of the interactions between jurisdictions on which the research is interested on but, especially if policy advises are derived from, it would be appropriate to test the robustness of the posed spatial pattern evaluating the performance of several different neighboring criterions to build the weighting matrix.

4 The source of interaction

Using the contiguity matrix we find support to spatial interaction in total spending as well in police, road and territorial local councils expenditures. However, this evidence of interdependence in local councils's spending decisions is consistent with different theories, such as yardstick and fiscal competition and expenditure spill-overs. This is because the reduced-form of the reaction function of these theories, allowing for spatial dependence, is exactly the same (Brueckner, 2003; Revelli, 2005). In what follows, we try to identify the source of the detected interaction or, at least, to rule out the less likely potential explanations.

Empirical investigation of the yardstick competition hypothesis makes inference on assumed links between the interaction among jurisdictions and the political process. Few studies accomplished

[12]All not published estimation results are available on request upon authors.

for yardstick competition in spending level decisions (Freret, 2006; Freret and Elhorst, 2006) obtaining mixed results with regards its influence. Instead, concerning tax setting behavior, it has been founded that yardstick comparison is at work mainly when politicians can re-run for election (Case, 1993; Bordignon et al., 2003), when mayors are not backed by large majorities (Bordignon et al., 2003; Sollè Ollè, 2003; Allers and Elhorst, 2005) or when right-wing coalition rules (Sollè Ollè, 2003). Accordingly, we test if similar predictions hold within those spending categories that performed a significant spatial lag coefficients (see table 2 and table 3) so that we can interpret spatial interaction among local councils as a consequence of yardstick competition. To this aim, following Bordignon et al. (2003) and Allers and Elhorst (2005), we adopt an estimation method that considers two different strategic interaction regimes defined by an appropriate dummy as follows:

$$Y = \rho_{D=0} ZWY + \rho_{D=1}(I - Z)WY + \alpha_{D=0} + \alpha_{D=1} + X\beta + \varepsilon \qquad (4)$$

The dummy D reflects political characteristics of jurisdictions; it is equal to 1 when the attribute is matched by the jurisdiction and 0 otherwise. The matrix Z is a diagonal matrix whose diagonal elements equal the dummy variable D while the matrix (I-Z) is its complementary. The spatial interaction coefficients $\rho_{D=0}$ and $\rho_{D=1}$, and the associated intercepts $\alpha_{D=0}$ and $\alpha_{D=1}$, describe the two different reaction regimes.

For the empirical specification, we consider three separate characteristics of jurisdictions that could drive different reaction regimes: i) the jurisdiction calls for elections in year 2000; ii) the ruling government is backed by a large majority, that is it gathered more than 65% of valid votes; iii) a left wing coalition rules[13]. Descriptive statistics of these variables are resumed in table 1. We can conclude that detected spending interaction can be a consequence of yardstick behavior if we observe a statistically significant difference in the reaction of the two regimes and the reaction is stronger (that is, the spatial correlation coefficient is higher) among jurisdictions involved in election[14] and it is weaker when mayors are backed by large majority and left-wing coalition rules.

[13]In the opposite group of non left-wing coalition we group the righ-wing coalitions and all remaining small independent local coalitions.

[14]The election climate should exacerbate strategic comparison with other jurisdictions performance.

Table 5: *Yardstick competition model estimates for different spending categories. 2SLS estimates.*

Regressors	Total	Police	Road et al.	Territory
Election 2000	0.025	0.256	0.047	-0.213
	(0.06)	(0.34)	(0.09)	(-0.19)
No Election 2000	0.257**	0.440**	0.468***	0.517*
	(2.44)	(1.97)	(4.41)	(2.40)
χ_2 of equality between ρs	0.32	0.06	0.72	0.44
Majority	0.421***	0.517**	0.363***	0.082
	(3.13)	(2.16)	(2.64)	(0.27)
No Majority	0.156	0.484*	0.514***	0.635***
	(1.23)	(1.76)	(4.32)	(2.85)
χ_2 of equality between ρs	2.71*	0.01	1.12	2.85*
Left-wing	0.396	0.557	0.744***	0.728**
	(1.44)	(1.16)	(3.14)	(2.21)
Right-wing	0.259**	0.435*	0.448***	0.661***
	(2.44)	(1.91)	(4.14)	(2.95)
χ_2 of equality between ρs	0.24	0.06	1.60	0.03

Notes: t values in parenthesis; * significant at 1%, ** significant at 5%, *** significant at 10%. All estimates include: population density, share of old and young, GDP and grants per capita, coast and constants.

Estimates for the selected spending models assuming different regimes are reported in table 5. Distinguishing between councils running for election or not, we always obtain results that contrast with yardstick competition in that mimicking is more pronounced among councils not experiencing election[15]. Moreover, the difference between spatial interaction coefficients is not statistically significant. Turning to vote margins gained by ruling coalitions and strategic interaction, we see that yardstick hypothesis is not refused only in realm of territory expenses: in this case, large majority do not engage in strategic interaction and the difference in the reaction of the two government types are significant. For the remaining spending categories, either the value of the spatial coefficients or the statistical insignificance of their difference do not give support to yardstick competition. Similar conclusions hold for the impact of government ideology on expenditure mimicking among municipalities. Taking these results all together, we can conclude that yardstick competition is not the more suitable explanation for

[15]These results, however, could be a consequence of the not appropriateness of data given that only few jurisdictions called for election in the year 2000.

the observed interaction among jurisdictions.

The existence of spill-overs in the provision of different local public services has been documented in empirical literature (Case et al., 1996; Revelli, 2003; Solè Ollè, 2006). It has been argued that these externalities could be internalized, enhancing the efficiency of a jurisdiction's fiscal policy, by reshaping the territorial organization. This one can be achieved, for example, by different kinds of inter-jurisdiction agreements for the administration of those spending categories that exert benefit or detrimental spill-overs. They allow to coordinate economic policies of cooperating jurisdictions in order to take the spill-overs effects of fiscal policy into account (Schaltegger and Zemp, 2003; Baicker, 2005). Following this reasoning, we tried to empirically address the possibility of fiscal spill-overs behind the detected spending inter-dependence among jurisdictions evaluating the role played by local councils partnerships as instruments to correct for externalities. Recently, Italian law supported the realization of *unione di comune* (hereafter, UC), a voluntary agreement among local councils finalized to the management of chosen functions among the ones usually assigned to local councils. In the mean time, the same regulatory legal scheme provided for UC has been assigned to *comunitá montana* (hereafter, CM). This is an historical Italian institution born to address territorial and mounting areas problems that, however, during last years has expanded its competencies being involved in the provision of several local services. Both UC and CM are instructive examples of inter-jurisdictions agreements and the main difference between them rely on *unione di comune* being a voluntary agreement while local councils in *comunitá montana* are identified by the law and are forced to stay together. This difference is relevant since it can influence their effectiveness to realize adequate equivalence between administrative boundaries and the area where all costs and benefits apply, that is to properly internalize spill-overs; of course, UC is supposed to be more powerful. To address these issues empirically, we use two dummies that takes value 1 if the jurisdiction joins, respectively, CM or UC in the year 2001[16];

[16]We chose this year instead of 2000 because the number of local councils within *unione di comune* is bigger in 2001 making our conclusion more robust. This won't introduce any bias in our results since it has been demonstrated that all councils joining an *unione di comune* in the Marche region were already cooperating in the very previous years before the constitution of the *Unione* itself (Ermini and Salvucci, 2006). Anyway, we checked that conclusions do not differ

Table 6: *Estimates of the impact of inter-jurisdictions agreements on different spending categories. 2SLS estimates.*

Regressors	Total	Police	Road et al.	Territory
Comunità Montana	0.384***	0.490**	0.470***	0.730***
	(3.66)	(2.09)	(4.37)	(3.66)
No Comunità Montana	0.313*	0.384*	0.216	0.810**
	(1.79)	(1.20)	(1.06)	(2.51)
χ_2 of equality between ρs	0.15	0.10	1.96	0.05
unioni di comuni	-0.559	0.429	0.381	0.806
	(-0.96)	(0.63)	(0.68)	(1.65)
no unioni di comuni	0.299**	0.437*	0.485***	0.546***
	(2.90)	(1.97)	(4.59)	(2.63)
χ_2 of equality between ρs	2.20	0.00	0.04	0.25

Notes: t values in parenthesis; * significant at 1%, ** significant at 5%, *** significant at 10%. All estimates include: population density, share of old and young, GDP and grants per capita, coast and constants.

descriptive statistics of these variables are resumed in table 1. As estimation procedure we adopt the one suggested by Bordignon et al. (2003) and Allers and Elhorst (2005) that has been previously exposed by equation 4. If it is the presence of externalities to drive spatial interaction among councils, we expect strategic interaction to be weaker within councils affiliated to a partnership. Local councils assign to this institution the administration of those functions and services that generate spill-overs, while directly managing and retaining those functions that do not affect others and that are not affected by others'policies. Hence, they do not need anymore to react to neighboring fiscal policies[17]. On the contrary, councils not affiliated to partnership are more influenced by other jurisdictions's expenses so that they are more prone to engage in strategic interaction to correct them.

Table 6 reports our estimates considering the two different reaction regimes: councils inside and outside *comunitá montana* and in and out *unione di comune*. As usual, we examine only those spending categories that showed spatial lag interdependence. Considering the impact on strategic interaction of being in a *comunità*

using one or the other dummy. Ask authors for estimation results.

[17]Solè Ollè (2005) observes that, if spill-overs are detected and externality-correcting instruments are present but not fully effective, then the estimated impact of the spill-overs should be considered a lower bound of its real value.

montana, we generally do not find evidence to our expectations of smaller ρs for local councils in CM and, also, the difference among ρs are not significant. However, we think it is instructive that our results support the idea of spill-overs behind strategic interaction only in the realm of territory expenses. Since CMs'partners are not chosen freely[18], they may experience difficulties in internalizing spill-overs in functions different from those they were created for. Turning to local councils in or out *unione di comune*, we see that interaction among jurisdictions belonging to UC is never significant while it is significant for those outside UC, a result consistent with our expectations. The difference among ρs is, however, not significant. To sum up, at this stage there is not clear-cut evidence in favor of spill-overs explanation of fiscal interdependence among jurisdictions. Nevertheless, we think the role of partnership, and especially of voluntary agreements, has to be examined more deeply in the future. First, it is interesting to underline that strategic interaction within jurisdictions belonging to UC takes values smaller than those resulting for local councils outside UC in the case of police and road expenses, that are exactly two spending categories where UC is extremely active: these results may indicate that there were benefit spill-overs that have been partly internalized by local councils partnerships. Secondly, we are estimating spending equations in the year 2000 during which *Unione di comune* was not very widespread, an evidence that changes dramatically when more recent years are considered (see Ermini and Salvucci, 2006) so that the importance and efficiency of voluntary agreements could have been improved. This possibility deserves future research.

It remains another possible source of interaction to be ascertained for. Fiscal competition among jurisdictions could give rise to the observed positive interactions among local councils expenditure levels. This kind of explanation, however, has been usually neglected in study dealing with non-USA data given that elsewhere we do not observe high tax basis mobility, especially when dealing with residents (Allers and Elhorst, 2005; Solè Ollè, 2006). Ruling out this option, we can however consider the impact on inter-jurisdictions interaction given to a particular form of resident 'temporary' mobility, that is commuting. This phenomenon can give rise to spill-overs that drive the observed interaction among juris-

[18]Therefore, they may not represent an optimal administrative area in terms of equivalence of benefits and costs.

Table 7: *Estimates of the impact of commuting on different spending categories. 2SLS estimates.*

Regressors	Total	Police	Road et al.	Territory
ρ	0.267**	0.468*	0.487***	0.426**
	(2.72)	(2.11)	(4.91)	(2.44)
Commuters	-9.303***	-0.335*	-0.852***	-2.144***
	(-4.84)	(-1.95)	(-3.50)	(-4.46))
Sargan	11.776	5.216	5.892	5.670
p-values	0.067*	0.516	0.435	0.461

Notes: t values in parenthesis; * significant at 1%, ** significant at 5%, *** significant at 10%. All estimates include: population density, share of old and young, GDP and grants per capita, coast and constant.

dictions, especially in the realm of road, police and environment spending. We use a variable that measures the percentage of residents in a jurisdictions that commute; related summary statistics are reported in table 1. Being an indicator of out-flow migration, it is expected this variable to determine a decrease in public local spending. As with regard to interaction among jurisdictions, commuting can cause external spill-overs. When residents commute, they can cause congestion of roads and transportation facilities and an extra-need for security and environment services in the terminal jurisdiction that is then in charge of the relative spending. On one side, the need of similar services could increase in the origin jurisdiction of the commuter and local councils ends up to mimic each other showing complementarity in the provision of public services. However, possible substitution in the provision of public good cannot be ruled out, so that the sign of the interaction remains a fact of empirical test.

We report in table 7 the estimate of commuting variable impact and the ρ coefficient that we obtain running the basic spending model regression including also the commuting variable. As expected, the higher the percentage of commuters, the lower is the jurisdiction's spending. This is true with regard to any of the spending categories examined. As far as we are concerned in interaction among governments, we always detect positive interaction, meaning that the spending in a given jurisdiction tends to increase as neighbors increase their own spending. Focusing on the magnitude of interaction, we see that it usually increases when the basic model include the commuting variable, the sole exception

being the territorial expenditure model. Reasonably, there is bigger need for coordination in road and police services when commuters moves across jurisdictions. These results are consistent with the hypotheses of spill-overs as the driving source of interaction among local councils[19].

5 Concluding remarks

We examined if spending decisions of jurisdictions show some degree of interdependence. Taken together, our results show that there is significant interaction between spending of neighboring local councils in the analyzed Italian region both at the level of total expenditure and also for different sub-categories. Always, the spatial interaction coefficient takes positive values meaning that a jurisdictions reacts to contiguous jurisdictions' increases in public expenditures by increasing its own public expenditures.

The interdependence, however, is manifest only when we assume geographic proximities among jurisdictions; jurisdictions do not engage in mimicking behavior with other jurisdictions that share similar demographic and economic features.

Identifying the source of this interaction is not an easy issue because either theoretical model do not offers clear and unambiguous predictions and either because some limitation of the data. However, we think that presence of spill-overs is the more appropriate reason for the spatial interaction among jurisdictions given also that we fail to find influence of opportunistic behavior appealing to political, ideologic and electoral motivations, that is to yardstick competition. Moreover, we believe that analyzing the role played by commuters and local councils partnerships in determining horizontal interaction among jurisdictions deserves a better understanding. They could provide useful insight for an effective territorial reshaping to internalize potential spill-overs and give reasons for future investigation.

[19]It can be argued that commuters could be a crude proxy for the relevance of yardstick competition: commuters are better informed on what's going on in neighboring jurisdictions forcing politician to mimicking behavior. However, given previous results when accomplish for political and electoral variables (see table 5), we do not thing this is a plausible reasoning.

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