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HORIZONTAL INTERACTION ON LOCAL COUNCILS' EXPENDITURES. EVIDENCE FROM ITALY

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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 between spending of neighboring local councils both at the level of total expenditure and also for different sub-categories. However, this result apply only when spatial dependence is analyzed among geographically continuous jurisdictions; different criterion of proximity do not give rise to any substantial form of inter-action among local governments. Attempts to identifying the source of this interactions seem to refuse yardstick competition hypotheses. Spill-overs among jurisdictions manifest as a more plausible explanation; we also find evidence that local councils partnerships fail to effectively internalize them. Finally, commuting affects spatial interdependence among jurisdictions.

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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' (Brueckner, 2003) so that we observe spatial interaction in local government expenditure level. Rationales for this statement rely on different strands of theoretical literature.

According to the spill-overs model approach, several authors demonstrated that the benefits 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, Rosen and Hines, 1993; Brueckner, 2003; Revelli, 2003 and 2005; Schaltegger and Zemp, 2003; Solé Ollé, 2005). Within these models, the optimal value of one jurisdiction 's decision 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 reelected so that local jurisdictions tend to mimic each other (Besley and Case, 1995; Bordignon, Cerniglia e Revelli, 2003; Redoano, 2003; Revelli, 2005).

Jurisdictions engage in strategic interaction also when they are concerned in tax or welfare competition in order to attract investment and resources[2] (Revelli, 2005; Baicker, 2005; Bruckner, 2000 and 2003; Saavedra, 2000; Ladd, 1992; Figlio, Kolpin and Reid, 1999; Zodrow and Mieszkowski, 1986; see

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

[2] That is, the welfare benefit (damage) from a policy could activate immigration flow from (emigration flow to) neighboring jurisdiction.

Wilson (1999) for a survey); 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; in addition, under some circumstances, this competition can end up in a 'race to the bottom' mechanism with jurisdiction exerting downward pressure on each other's welfare benefits (Bruckner, 2000).

During the ten past years, a growing empirical literature have been devoted to assess whether fiscal interactions among jurisdiction are at work when analyzing their policies resolutions (Figlio, Kolpin and Reid, 1999; Revelli, 2003). Few papers deal with Italian evidence (Bordignon, Cerniglia and Revelli, 2003) and to our knowledge none of them tests the relevance of previous issues focusing on local public expenditure data. 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 the expenditure side, we can 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 category of public expenditures 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 some measure of neighborhood but also socio-demographic and economic variables to weight the location of observation and their proximity. Further attempts are made in order to disentangle the source of the fiscal interdependence among jurisdictions.

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 tax mimicking. Section 3 is devoted to describe estimation results. In the next section we attempts to discriminate among 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 conse-

quences 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; 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/or 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 N x 1 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 N x K matrix of exogenous 'local' explanatory variables and ε is a N x 1 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 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 autoregressive or spatial lag model. Here, W represents an N x N 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 is 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 invalidates the use of OLS estimators. (Anselin, 1988; Brueckner, 2003). First, the assumption of strategic interaction among spatial units of observation modeled by a spatial lag model ends up in the endogeneity of the neighbors expenditure variables because of the presence, on both side of equation 3, of the vector Y. Ignoring the influence of neighbors' spending on one's jurisdiction expenses would lead to inconsistent estimation of the relevant parameters. 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, to instrument for the actual neighbor spending WY. We obtain estimates of the spending model which 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 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 (Anselin, 1988)[3].

[3]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 esti-

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 criterions to build the weights matrix: geographic (contiguity), demographic (population) and economic (income tax base[4]) proximity. The two last criterions, assuming proximity on the basis of 'distance' among jurisdictions in terms of population and, in a broad sense, 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. Consequently, 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 institutional 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

mate 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).

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

Table 1: *Descriptive statistic of variables.*

	Mean	St.Dev.	Obs.
Categories of spending (in euro per capita)			
Total	677.84	361.14	246
Education	79.70	33.61	246
Social	57.25	66.16	246
Police	31.28	23.53	246
Leisure	32.48	31.74	246
Road and transportation	77.11	44.94	246
Territorial	107.10	68.33	246
Regressors			
Population density (Population per km^2)	147.08	193.29	246
Share of Old People (<15 years)	28.75	10.01	246
Share of Young People (>65 years)	17.00	5.02	246
GDP per capita (in 1000 euro)	20.53	7.85	246
Grants (in euro)	325.10	180.59	246
Coast (1=jurisdiction being on the coast; 0=otherwise)	0.14	0.35	246
Election year 2000 (1=call for election; 0=otherwise)	0.03	0.17	246
Election year 1999 (1=call for election; 0=otherwise)	0.79	0.41	246
Lefty-wing (1=left wing parting ruling; 0=otherwise)	0.30	0.46	246
Share of Voters (Share of votes to majority)	61.39	13.27	246
Share of commuters	57.37	16.16	246
Unione di Comuni (1=jurisdiction joining Unione di Comuni; 0=otherwise)	0.03	0.18	246
Comunità Montana (1=jurisdiction joining Comunità Montana ; 0=otherwise)	0.50	0.50	246

capita current public spending level[5]; data has been collected from local councils' balance sheet[6]. 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[7], 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, enviroments, 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

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

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

[7]It happens either because they are more comparable among jurisdictions 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.

different socio-economic characteristics of local jurisdictions; as regards to the above equations, they are collected in the X matrix of the exogenous 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 old (more than 65 years) and young (less than 15 years). The inclusion of population density provide information about scale economies and potentially congestion effects in the provision of public good [8]. Finally, we use 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 account 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

[8] Other variables reflecting jurisdictional characteristics (population, unemployment rate, percentage of foreign people living in the jurisdiction, demographic index, urban contiguity, etc) have been dropped from the regression since they do not revealed significant influence on local expenditures or they were too correlated with the others.

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[9]. Looking at the diagnostics in table 2, the Moran's test (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, the 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. 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[10]. 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=0.39861) confirming the validity of our model.

We now check if the mimicking behavior observed in total

[9]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.

[10]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.

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

REGRESSORS	OLS		t-values	IV		t-values
ρ	-		-	0.24	**	2.25
dens	0.19	*	1.63	0.17		1.57
old	-7.89	***	-2.97	-8.46	***	-3.34
young	-5.27		-1.28	-7.55	*	-1.87
pilproc	20.04	***	7.66	19.45	***	7.81
grants	1.66	***	12.06	1.52	***	10.46
coast	115.43	**	1.97	105.34	*	1.89
cons	-0.57		-0.01	-46.61		-0.67
Adjusted R2	0.52					
Observations	246			246		
REGRESSION DIAGNOSTICS						
Jarque-Bera normality test	4788	***				
Breusch-Pagan test	865.067	***				
Moran's I	4.75	***				
Sargan test				5.705		

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 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[11].

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[12]. 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 negative benefit spill-over and 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 detect the presence of spatial effect: the spending model can be properly estimated by OLS. However, these spending model specifications provide unsatisfactory explanation of spending determinants since R2 usually takes small values. This is likely because there is no reason to assume all spending cate-

[11]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.

[12]The significance of ρ confirms the indication provided by LM tests that all pointed to prefer a spatial lag model to depict spatial dependence. See *supra*.

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 5%, ** significant at 1%, *** significant at 10%.

gories 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 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.

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 5%, ** significant at 1%, *** significant at 10%.

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[13]. 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 socio-economic 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

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

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 interactions 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 benefit spillovers. This is because the reduced-form of the reaction function, allowing for spatial dependence, of these theories is exactly the same (Brueckner, 2003). In what follows, we try to identify the source of the detected interaction or, at least, to rule out the less likely potential explanation.

Empirical investigation of the yardstick competition features makes inference on assumed links between the jurisdictions's interaction and the political process. Few studies accomplish for yardstick competition in spending level decisions (Freret, 2006; Costa-Font and Moscone, 2006). Researchers found that yardstick behavior in tax setting is at work mainly when politician 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 political, electoral and ideology variables have some explanatory power in interpreting the spending decision and, particularly, if they affect the strategic interaction among the Italian jurisdictions that we already observed. Thus, we focus on those spending categories that performed a significant spatial lag coefficients (see table 2). Specifically, we test the relevance of the political cycle by election year dummies in the 2000 and in the 1999. Given yardstick competition, we expect positive sign of these dummies revealing opportunistic behavior of incumbents in election years. We introduce an ideological dummy which assign 1 if the governing coalition is left-wing. Usually, left-wing governments are assumed to be more prone to increase public expenditures than right-wing governments[14] and also it controls for the expectation that left-wing are less involved in mimicking than right-wing government. We finally add a continuous variable that counts the percentage of voted gathered by the ruling coalition. It proxy the positive expectation of re-election of a politician when backed by high percentage of voters and we know that governments with large majority are less prone to engage

[14]For some critical notes on the role of ideology in determining the size of public expenditure see Costa-Font and Moscone (2006).

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

Regressors	Total	Police	Road et al.	Territory
ρ	0.256**	0.469**	0.523***	0.450**
	(2.43)	(2.13)	(5.02)	(2.09)
election2000	-42.037	1.165	14.516	-21.370
	(-0.44)	(0.14)	(1.21)	(-0.87)
election1999	-31.641	0.563	3.394	-16.506
	(-0.77)	(0.15)	(0.66)	(-1.55)
left-wing	-44.551	-0.765	-0.963	-6.016
	(-1.22)	(-0.24)	(-0.21)	(-0.64)
%votes	2.947**	-0.119	-0.035	0.202
	(2.49)	(-1.17)	(-0.24)	(0.66)
Sargan	8.657	7.865	17.642	11.123
p-values	0.46949	0.54776	0.03956**	0.2674

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

in mimicking. Descriptive statistics of these variables are resumed in table 1.

Estimates for the selected spending model including previous variables are reported in table 5. Our results do not support yardstick competition hypothesis since all coefficients of the political, electoral and ideology variables do not differ significantly from zero[15], the only exception being the share of votes within the total spending model. This result, however, could be a consequence of the not appropriateness of our data to test political strategic behavior among local councils given that only few jurisdictions in the year 2000 called for election.

The existence of spill-overs in the provision of different local public services has been documented in empirical literature (Case et al., 1996; Solè Ollè, 2005). 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 form of inter-jurisdiction agreements in those spending categories for which we detected potential benefit spill-overs. They allow to coordinate economic policies in order to take the external effects of fiscal interaction into account (Schaltegger and Zemp, 2003; Baicker, 2005). Moreover, several papers suggest to take vertical fiscal externalities among different tiers of local government, along with horizontal ones, into account when analyzing inter-jurisdictional strategic interaction (Revelli, 2003; Revelli, 2005). This happens because the spatial dependence among jurisdictions of the same tier of the institutional system instead of representing real interaction could reflect reaction to constrains coming from the competing levels

[15]This is true as you peak single variable and also when tested together by joint F test of significance.

of government structure. Following this reasoning, we tried to empirically address the possibility of fiscal spill-overs behind the detected spending inter-dependency among jurisdictions given that a jurisdiction operates within a complex and multi-level institutional structure. Specifically, we focus on the role played by local councils partnerships as instruments to correct for externalities. Recently, Italian law (law n.142/90 and d.lgs. 267/2000) supported the realization of *unione di comune*, a voluntary agrement among local councils finalized to the management of most of any of the function usually assigned to local councils. In the mean time, the same regulatory legal schemes provided for *unione di comune* have been assigned to *comunità montana*. This is an historical Italian institution born to address mounting areas problems that, however, during last years has expanded its competencies being involved in the provision of different services. Both are instructive examples of inter-jurisdiction agreements but the main difference between them rely on *unione di comune* being a voluntary agreement among jurisdictions while local councils in *comunità montana* are forced to stay togheter[16]. It can influence their effectiveness to realize adequate equivalence between administrative boundaries and the area where all costs and benefitapply, that is to properly internalize spill-overs. Assuming spatial pattern to be a consequence of fiscal spill-overs, we would observe that if these institutions work properly, interactions between the fiscal choices of neighboring municipalities should drop given that the spending budget is mainly managed by the partnership (see also Solè Ollè, 2005)[17]. To our aim, we use two dummies that takes value 1 if the jurisdiction joins, respectively, *unione di comune* or *comunità montana*. Descriptive statistics of these variables are resumed in table 1.

Table 6 reports our estimates. In no regression the dummies for being in *unione di comune* or in *comunità montana* affect significatively the spending. However, within the disaggregated spending category, they show a consistent pattern of the impact on the dependent variable that reveals that *unione di comune* tends to not charge on the local councils budget while *comunità montana* seems to absorb additional amount of public funding. These regularities suggest to detect deeper and with more appropriate econometric approaches the role played by local councils partnerships, mainly when *unione di comune* is concerned. In fact, the absence of significant impact of this form of voluntary agrement on public spending should not be taken as conclusive since it could have been attributed to the limited spread of *unione di comune* in the year 2000, an occur-

[16]However, they are free to adhere to any kind of local councils partnership.

[17]Solè Ollè (2005) also 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.

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

Regressors	Total	Police	Road et al.	Territory
ρ	0.263**	0.421*	0.472***	0.494**
	(2.48)	(1.89)	(4.30)	(2.28)
Comunità montana	-49.170	1.760	6.133	2.30
	(-1.19)	(0.50)	(1.14)	(0.23)
Unione di comuni	4.177	-0.459	-15.352	-5.988
	(0.05)	(-0.06)	(-0.42)	(-0.28)
Sargan	6.179	5.105	11.319	8.844
p-values	0.519	0.647	0.125	0.264

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

rence that changes dramatically when more recent years are considered (see Ermini and Salvucci, 2006). The potential explanatory power of variables that proxy for agreements among jurisdictions can be assessed also looking at what happens, for example, to interaction within police spending. Police is one of the function where *unione di comune* is more active. Focusing on the magnitude of the spatial interaction coefficient, we see that it was $\rho = 0.431$ in the baseline police spending model and now is $\rho = 0.421$: this drop is consistent with the presumption that there were benefit spill-overs that have been partly internalized by local councils partnerships[18]. To sum up, at this stage there is not clear-cut evidence in favour of spill-overs explanation of fiscal interdependence among jurisdictions but we suspect the role of voluntary agrement to be more pronounced in the future.

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 fiscal mobility, especially when dealing with residents (Allers and Elhorst, 2005; Solè Ollè, 2005). 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 jurisdictions, especially in the realm of road, police and environment spending. We use a variable that measure 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

[18]We observe a similar decrease in the spending for the territorial spending, another typically assumed function by the *unione di comune*. However, this drop is too tiny for being considered seriously.

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 5%, ** significant at 1%, *** significant at 10%.

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 who 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 coefficent 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 neighbor 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. It can be argued also 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.

5 Concluding remarks.

We examined if spending decision of jurisdictions shows 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 interactions 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. Moreover, we believe that analyzing the role played by commuters and local councils partnerships in determining horizontal interaction among jurisdictions deserves a better understanding and a more suited econometric approach. They could provide useful insight for an effective territorial reshaping to internalize potential spill-overs and give reasons for future investigation.

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