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AN EMPIRICAL ANALYSIS OF POLITICAL AND INFORMATIVE TRENDS ON MUNICIPALITIES OF AN ITALIAN REGION

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An Empirical Analysis of Political and Informative Trends on Municipalities of an Italian Region

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Abstract

The aim of this paper is to conduct an empirical investigation regarding the presence of political and informative trends in tax setting of local governments as an alternative theoretical explanation to the tax mimicking. Both phenomena have been tested on municipalities' cross-sectional data of the Marche region with a spatial econometrics model. Discriminating among several sources of tax mimicking, including public spending spill-over, some evidence was found in favour of the political trend. As regards the informative trend, non significant results were observed testing tax interaction among heterogeneous coalitions. However, some evidence is present on local public spending.

JEL Classification: • C31 - Cross-Sectional Models; Spatial Models; Treatment Effect Models • H71 - State and Local Taxation, Subsidies, and Revenue • H72 – State and Local Budget and Expenditures • H77 - Intergovernmental Relations; Federalism.

Keywords: informative trend, political trend, spatial econometrics, tax mimicking.

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1. Introduction

Strategic interaction in tax setting of local governments is receiving increasing interest in the empirical public economics literature. Interaction can be mainly due to tax competition (Oates, 1972; Wilson, 1986; Zodrow and Mieszkowski, 1986; Wildasin, 1988), or, alternatively, to yardstick competition (Salmon, 1987). In the case of tax competition, jurisdiction attracts the tax base (capital, workers, firms, and shoppers) from other jurisdictions reducing its tax rate. In equilibrium, tax rate and public expenditure are below their optimal levels, causing an under-provision of public goods (Wilson, 1999 for a review). As regards yardstick competition, it results from an asymmetrical information problem between voters and the politician incumbent (Besley and Case, 1995). Voters have less knowledge about the cost of providing public goods than their politician incumbent. Therefore, they use information on tax rate of neighbouring jurisdictions to evaluate his performance. Voters would punish the incumbent if his tax rate decisions are not in line with those of other ones. Consequently, the politician incumbent, well informed about voters comparison, copy-cats fiscal policies of neighbouring jurisdictions with the aim to be re-elected.

Ladd (1992) is the author of the first empirical study on strategic interaction in tax setting of jurisdictions, defining this phenomenon as *tax mimicking*. She tests this hypothesis observing changes in tax burdens of the US counties in line with those of neighboring jurisdictions, but the source of tax interactions is not clear. Other studies follow (Brueckner, 2003 for an overview), focusing on horizontal interactions among jurisdictions at the same level of government (Heyndels and Vuchelen, 1998; Brett and Pinkse, 2000; Bureckner and Saavedra, 2001; Büettner 2001; Hernández-Murillo, 2003; Rork, 2003; Feld et al., 2003; Feld and Reulier, 2005; Richard et al., 2005) and, more recently, on vertical interactions among multi-tiered levels of government (Keen, 1998; Besley and Rosen, 1998; Boadway and Hayashi, 2001; Esteller-Moré and Solé-Ollé, 2001; Goodspeed, 2002; Revelli, 2003; Devereux et. al., 2004, Andersson et al. 2004). Unfortunately, in many cases, it is not clear whether tax mimicking depends on tax or yardstick competition because the positive sign of the estimated slope of the reaction function, which corresponds to its theoretical value, is consistent with both phenomena (Wildasin and Wilson, 2004). A good starting point to distinguish tax competition from yardstick competition in tax mimicking analysis is the investigation of tax rate trend (Feld et al., 2003; Feld and Reulier, 2005): a downward trend signals the presence of tax competition whereas an upward trend reveals

the presence of yardstick competition. However, this analysis is not particularly robust and other empirical evidence is required. In the literature, significant contributions have been made in empirical investigation of yardstick competition. Case (1993) shows that the tax rate in US states is more sensitive to neighbouring tax rate change in those states where the governor will run for re-election. Besley and Case (1995) stress that yardstick competition results from an asymmetric information problem in the cost of providing public services between the incumbent politician and voters who evaluate his performance using the tax rate of neighbouring jurisdictions. Their estimations show significant impact of neighbours' tax rates on the probability of incumbent re-election in US states. Revelli (2002b) takes under study English districts. He shows that the popularity of the incumbent is positively correlated with neighbouring tax rate changes and negatively correlated with its own tax rate change. Bordignon et al. (2003) conclude that yardstick competition is absent where mayors are backed by large majorities or face a term limit. Solé-Ollé (2003) analyses tax mimicking among Spanish municipalities, observing that yardstick competition is present when «*tax rates are higher where past electoral margins are wider, where governments on the left are in charge, and in non-election years. In addition, tax interactions are less intense (although still present) in all these situations*» (Solé-Ollé, 2003:709). Other interesting results are those of Schaltegger and Küttel (2002). In particular, they analyse the impact of the fiscal autonomy and direct legislation on the tax setting of Swiss cantons, concluding that tax mimicking is lower when voters participate directly on policy proposals and jurisdictions are more independent in fiscal decisions. More recently, Allers and Elhorst (2005) tested some hypotheses of Solé-Ollé (2003), estimating two spatial lag coefficients on the Bordignon et al. (2003) approach, finding that large majorities are less sensitive to neighbouring tax rate changes than small ones, confirming previous empirical evidence on yardstick competition.

It is however more difficult to find some empirical evidence on tax competition and strategic interaction. In this kind of analysis, the impact of the jurisdiction's tax rate and neighbours tax rate on the tax base (Büettner, 2001, Revelli 2005) could be a good starting point.

The tax and yardstick competition are not the only causes of tax mimicking. The literature offers another source of tax interaction i.e. public expenditure spill-over (Allers and Elhorst, 2005). The interaction in public spending levels among neighbouring jurisdictions can affect their tax setting. However, it is not trivial to understand the direction of budget interdependences because the two processes could overlap. Moreover, Revelli (2002a) asserts that interdependence in public spending could be

wrongly attributed to spill-overs rather than tax mimicking. Unfortunately, few studies (Revelli, 2002a; Redoano, 2003) investigate these aspects and in the future it could be interesting to develop other ones.

When all previous causes do not explain tax mimicking, Redoano (2003) considers an alternative source that she calls the *"intellectual trend"*. It is a common behaviour of agents not depending on strategic interaction. Agents show propensity to behave in the same way of his reference group (Manski, 1993). In this paper, we consider two kind of trends. We define them as *political* and *informative trends*. In particular, the political trend reflects a conformity behaviour of the policy maker on fiscal policy decisions taken by his political party (or political coalition group) in order to fill information gaps and to be in line with political ideology. Recently, Foucault et al. (2006) show that public spending interaction in French municipalities exists among mayors who share the same political affiliation. On the other hand, informative trend is based on the Case, Hines and Rosen (CHR) hypothesis (Case et al., 1989). In this case, the policy maker conforms his fiscal policy to generic neighbourhood's decisions to fill information gaps on the costs and benefits of public services.

In order to investigate the empirical presence of political and informative trends, the paper is organized as follows. Section 2 illustrates spatial econometrics models adopted to estimate tax mimicking and to discriminate among all its sources. Section 3 introduces data and variables used in regression analysis. Section 4 shows estimation results. Finally, section 5 concludes.

2. Spatial econometrics models and tax mimicking analysis

In the literature, fiscal policy interactions are generally estimated with spatial econometrics models (Paelinck and Klaassen, 1979; Anselin, 1988a). These kinds of models were successful in empirical analyses at the beginning of the 90's. The basic model for cross-sectional data is called *Spatial Autoregressive Model* (Anselin, 1988a) and it is reported in equation 1, where ϱ is the coefficient of the spatially lagged dependent variable that measures spatial interdependence; W_{1n} is the *nxn* spatial weight matrix[1]; y_n is the *nx1* vector of the observations on the dependent variable; X_n is the *nxk* matrix of explanatory variables; β is *kx1* vector of regression parameters; μ_n is the *nx1* vector of regression disturbances.

[1] Commonly, in empirical studies, elements of the spatial weight matrix W_{1n} correspond to geographical contiguity distance.

Table 1 – Parameter restriction of the SAR model

Spatial lag model	$\varrho \neq 0$	$\lambda = 0$	$y_n = \varrho W_{1n} y_n + X_n \beta + \mu_n$	$\mu_n \sim N(0, \sigma^2 I_n)$ $\lvert\varrho\rvert < 1$
SER model	$\varrho = 0$	$\lambda \neq 0$	$\begin{cases} y_n = X_n \beta + \mu_n \\ \mu_n = \lambda W_{2n} \mu_n + \varepsilon_n \end{cases}$	$\varepsilon_n \sim N(0, \sigma^2 I_n)$ $\lvert\lambda\rvert < 1$
CLRM	$\varrho = 0$	$\lambda = 0$	$y_n = X_n \beta + \mu_n$	$\mu_n \sim N(0, \sigma^2 I_n)$

The error structure is also spatially auto-correlated with a *nxn* spatial weighted matrix W_{2n} that could be equal to W_{1n} with identification problems. The coefficient λ associated with W_{2n} measures spatial shock diffusion and spatial externalities. Finally, ε_n is the *nx1* vector of disturbance with zero mean and constant variance.

$$\begin{cases} y_n = \varrho W_{1n} y_n + X_n \beta + \mu_n & \lvert\varrho\rvert < 1 \\ \mu_n = \lambda W_{2n} \mu_n + \varepsilon_n & \lvert\lambda\rvert < 1 \quad \varepsilon_n \sim N(0, \sigma^2 I_n) \end{cases} \tag{1}$$

With some restrictions on parameters, it is possible to obtain other models from equation 1 (Anselin, 1988a), as summarized in Table 1. In particular we have: *i)* the mixed regressive–spatial autoregressive (MR-SAR) model or the well-known *Spatial Lag Model*; *ii)* the *Spatial Error* (SER) *Model*; *iii)* the *Classic Linear Regression Model* (CLRM).

The joint presence of spatial autocorrelation and model misspecifications are tested with Moran's I statistics (Cliff and Ord, 1972, 1981). If this diagnostic test is significant, there is a need to select the appropriate spatial econometrics model for the regression analysis. Anselin (1988a,b) suggests to adopt the *Lagrange Multiplier tests* to select between the spatial lag model and the spatial error model, and the *Robust Lagrange Multiplier tests* (Anselin et. al., 1996) if both of the two previous standard are significant. All tests, Moran's I included, need normality conditions to be correctly interpreted.

After the spatial model selection, several estimators are used in the empirical analysis with the exception of the OLS estimator. In fact, the OLS estimator is biased and inconsistent in the case of a spatial lag model and unbiased, but inefficient, in the spatial error model for the non-diagonal structure of the disturbance variance matrix (Anselin, 1988a).

Under normality and homoskedasticity hypotheses, the spatial lag

model is estimated with the *Maximum Likelihood* (*ML*) estimator (Anselin, 1988a). For these reasons, several tests on normality and heteroschedasticity hypotheses are recommended before estimation of spatial econometrics models. When the two previous conditions are violated, the *Two Stage Least Square* (2SLS) estimator is adopted. This estimator is computationally more simple than *ML* and more robust because it does not require normal distribution of errors (Anselin, 1988a, 1992, 1999). Moreover, it is a consistent estimator when heteroskedasticity problems appear (Lee, 2005; Lee, Lin, 2005). In the 2SLS estimation, the endogeneity problem of the spatial lag variable $W_{1n}y_n$ is resolved using a set of instruments suggested by Kelejian and Prucha (1998): X_n, $W_{1n}X_n$, $W_{1n}^2X_n$,…,$W_{2n}X_n$, $W_{1n}W_{2n}X_n$,…,etc. Lastly, the *Generalized Method of Moments* (GMM) is less frequently adopted in empirical analysis of spatial autocorrelation though it is asymptotically more efficient than 2SLS.

On the other hand, the spatial error model can be estimated with the ML method (Anselin, 1988a, 1999) whereas the 2SLS estimator does not result consistent (Kelejian and Prucha, 1997). Anselin (1988a) discusses alternative estimation methods whereas Kelejian and Prucha (1999) show an estimator for the parameter λ based on the *Generalized Method of Moments*.

Finally, the SAR model can be estimate with the *Generalized Spatial Two Stage Least Squares* estimator (GS2SLSE) proposed by Kelejian and Prucha (1998) or with the *Best Spatial Two-Stage Least Squares Estimator* (BS2SLSE) suggested by Lee (2003).

In this study, we are interested in investigating the presence of tax mimicking. As such, the empirical model estimated is the spatial lag model reported in equation 2. However, we test the presence of spatial autocorrelation in error terms to investigate the presence of spatially distributed shock.

$$t_n = \varrho W_n t_n + X_n \beta + \varepsilon_n \qquad (2)$$

At first, tax interaction (ϱ) is investigated on contiguous municipalities. In this case, elements of the spatial weight matrix W_n assume value 1 when jurisdiction j's borders is common with jurisdiction i's, and zero otherwise. Usually, the rows of W_n are standardized, i.e. $\sum_j \omega_{ij} = 1$, so that the spatial lag variable $W_n y_n$ corresponds to an average tax rate weighted with geographical distance[2].

[2] Weights are determined *a priori* by the researcher, inevitably affecting the estimation results.

We test the main source of tax interaction among neighbouring municipalities adopting Allers and Elhorst's model (2005) reported in equation 3. It shows two spatial interaction parameters (ϱ, ϱ') associated to a dummy variable *D=0;1* that identify characteristics of jurisdiction. For example, *D* assumes value 1 when jurisdiction is ruled by the left-wing coalition, and zero otherwise. In this case, the parameters $\varrho_{D=1}$ and $\varrho'_{D=0}$ measure the intensity of tax interaction respectively among left-wing and no left-wing coalitions. In equation 3, M_n is an *nxn* diagonal matrix with diagonal elements equal to 1 when *D=1* and (I_n-M_n) is its complementary matrix with diagonal elements equal to 1 for those observations where *D=0*. In this model, X_n is an explanatory variables matrix where the constant is suppressed and substituted with two dummy variables with coefficients $\delta_{D=1}$ and $\delta'_{D=0}$. They take value 1 respectively when *D=1* and *D=0*, and zero otherwise.

$$t_n = \varrho_{D=1} M_n W_n t_n + \varrho'_{D=0} (I_n - M_n) W_n t_n + \delta_{D=1} + \delta'_{D=0} + X_n \beta + \varepsilon_n \qquad (3)$$

As regards the estimation methods, the 2SLS is adopted when heteroschedasticity and normality problems are found whereas the ML method in all the other cases. As regards 2SLS instruments, we use X_n and $W_n X_n$ in regression analysis of equation 10 (Kelejian and Prucha, 1998), and X_n, $M_n W_n X_n$, $(I_n - M_n) W_n X_n$ in regression of equation 3.

Firstly, yardstick competition is explored on Solé-Ollé (2003) hypotheses reported in Table 1. Solé-Ollé (2003) has stressed the relationship between tax mimicking and yardstick competition as follows: tax rates are higher and tax interactions are less intense when: *i)* past electoral margins[3] are wider; *ii)* left-wing governments are in power; *iii)* governments are in non-election years. Therefore, it is possible to verify the presence of yardstick competition, comparing the intensity of tax interactions and the level of average tax rate between large and small majorities[4], left-wing and right-wing coalitions, government in election and no-election year (Tab. 1). The average tax rate ($\bar{t}$) is estimated as in equation 4.

[3] Solé-Ollé (2006) considers *"electoral margin"* variable to analyse the effect of party competition on budget outcomes. Electoral margin is measured as the difference in absolute value between the incumbent vote share and 50%.

[4] Large majority shows *m* and more of vote share whereas small majority shows a vote share less then *m*.

Table 1 – Yardstick competition effects on tax mimicking and tax rate

Yardsitick competition	ϱ	ϱ'	Tax rate
Left-wing coalition	weak		high
Right-wing coalition		strong	low
% Share of votes $\geq$ m	weak		high
% Share of votes $<$ m		strong	low
No election year	weak		high
Election year		strong	low

m = threshold of votes share.

$$\bar{t}_{D=1} = \frac{\hat{\delta}_{D=1}}{1-\hat{\varrho}} \qquad \bar{t}'_{D=0} = \frac{\hat{\delta}'_{D=0}}{1-\hat{\varrho}'} \tag{4}$$

Regarding political trend, we take into consideration the role of information and political ideology in fiscal decisions made by the incumbent. Probably, the politician could prefer to conform to his party's or coalition's decisions rather than to those of a generic neighbourhoods in presence of incomplete information on the costs and benefits of public goods offered to his citizens. In empirical analysis this phenomenon is detected when tax interaction among neighbouring jurisdictions ruled by the same political coalition is positive. In particular, we investigate this phenomenon estimating equations 3 and 4. It is clear that this result could overlap with the yardstick competition analysis regarding tax interaction among coalitions presented in Table 1. In this case, we take into account the combination of different results in Table 1 in order to discriminate between two phenomena.

The presence of political trend is tested using a *geographical weight matrix*, in order to detect the presence of information problems, and/or a *political weigh matrix* (Foucault et al., 2006), useful to show the impact of the political ideology on tax setting of local governments. In our study, we focus on geographical distance rather than political distance.

Finally, informative trend is investigated by equation 3, analysing tax interaction of the heterogeneous coalitions without a clear political ideol-

ogy[5]. It is plausible to suppose that they mainly interact to fill information gaps because they have not a clear political identity. However, we can not totally exclude that they do not exhibit an opportunistic behaviour. Therefore, we estimate tax interaction among heterogeneous coalitions both in election year and no election year using equation 5. In order to conduct this analysis, we make changes in equation 3, introducing three spatial interaction parameters associated to dummy variables *D=0;1* and *Q=0;1* that identify characteristics of jurisdiction. In our regression analysis, *D* assumes value 1 when jurisdiction is governed by heterogeneous coalition, and zero otherwise. On the other hand, *Q* assumes value 1 when jurisdiction is in election year, and zero otherwise.

$$t_n = \varrho_{D=1,Q=1} A_n W_n t_n + \varrho'_{D=1,Q=0} (E_n - A_n) W_n t_n + \varrho''_{D=0} (I_n - E_n) W_n t_n + \delta_{D=1,Q=1} + \delta'_{D=1,Q=0} + \delta''_{D=0} + X_n \beta + \varepsilon_n \quad (5)$$

In equation 5, E_n is an *nxn* diagonal matrix with diagonal elements equal to 1 when *D=1* and $(I_n - E_n)$ corresponds to its complementary matrix with diagonal elements equal to 1 for those observations where *D=0*. In our regression analysis, the parameter $\varrho''_{D=0}$ measures the intensity of tax interaction among no-heterogeneous coalitions. In addition, we introduce A_n matrix. It is an *nxn* diagonal matrix with diagonal elements equal to 1 when both dummies *D* and *Q* are equal to 1, and zero otherwise. Therefore, parameters $\varrho_{D=1,Q=1}$ and $\varrho'_{D=1,Q=0}$ measure respectively the intensity of tax interaction among heterogeneous coalitions in election year and no election year. Finally, the constant variable is substituted with three dummy variables with coefficients $\delta_{D=1,Q=1}$, $\delta'_{D=1,Q=0}$, and $\delta''_{D=0}$. When *D=1*, parameters $\delta_{D=1,Q=1}$ and $\delta'_{D=1,Q=0}$ take value 1 respectively when *Q=1* and *Q=0*, and zero otherwise. Lastly, $\delta''_{D=0}$ assumes value 1 when *D=0*, and zero otherwise.

Regarding 2SLS estimation of equation 5, a set of instrument variables is represented by X_n, $A_n W_n X_n$, $(E_n - A_n) W_n X_n$, and $(I_n - E_n) W_n X_n$.

3. Data and variables

Tax mimicking is investigated in the Italian local property tax rate called *Imposta Comunale sugli Immobili* (ICI). It represents the main tax revenue for Italian municipalities. Municipalities impose ICI tax rate in the range from 4 to 7‰ on private and business. The introduction of this local property taxation in 1993[6] was considered an instrument to regain the

[5] They mainly correspond to *Lista Civica*.

[6] Contemporary to the ICI tax rate introduction, an important municipal electoral reform was

lost local fiscal autonomy. In fact, the tax reform that took place in the Seventies eliminated much of the local taxation in favour of grants from the central government.

In the empirical analysis, we focus on 1994[7] data because we suppose that political and informative trends have more probability to appear in years immediately after tax introduction characterised by more information problems on public services costs and benefits.

We test tax mimicking on municipalities of the Marche region because no previous research has been carried out on this area. In fact, only two works have taken Italy into consideration: Bordignon et al. (2003) highlight the presence of yardstick competition in the metropolitan area of the Lombardia region while Mazzucato (2006) investigates tax interaction in the municipalities of the Veneto region.

The Marche region is located in the centre of Italy and consists on 5 provinces and 246 municipalities (*comuni*) which represent the lowest level of government in Italy. A small part of the municipalities, corresponding to 14 per cent, overlook the Adriatic sea and the remaining municipalities extend up to the Umbro-Marche Appennine mountains with a gradual morphological change. The strategic location on the coast could be consistent with the fiscal exportation hypothesis because it provides market power to municipalities to attract tourism. This aspect is analysed introducing a dummy named "*coast*" in the empirical models. It assumes 1 if a municipality is on the sea, or 5 kilometres distant from it, and zero otherwise. This dummy is also introduced in regression analysis to control for the presence of amenities effect depending on geographical characteristics (Brueckner, 1998).

Other characteristics can affect ICI tax rate (Bordignon et al., 2003): *i)* size of *area* and *population*; *ii) young* and *old* population corresponding respectively to the percentage of children 0-14 years old and percentage of elderly people over 64; *iii) disposable income* and *grants* from central government; *iv)* opportunistic behaviour of the incumbent in *election year* and in case of low margin of victory; *v)* political ideology of coalition. All these aspects are included in the explanatory variables matrix X_n of the empirical model (Eq. 2) and are summarised in Table 2.

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passed, supporting fiscal decentralization process that had started from the 90's. It introduced an electoral term limit for the mayors who could not be re-elected for more than two consecutive terms every four years.

[7] The year of introduction is not considered in empirical analysis because of the co-partnership of the central government in the collection of ICI tax yield.

Table 2 – Descriptive statistics

1994	Obs.	Mean	Std. Dev.	Min	Max
Ordinary ICI rate ‰	246	5.12	0.55	4.00	6.00
Public Expenditure per-head	246	907.0	467.6	382.0	6064.0
Area kmq	246	39.4	40.1	3.8	269.6
Density	246	168.8	237.1	5.3	1801
Popultation	246	5835	11680	148	100464
% Population 0-14 (young)	246	13.4	1.9	6.3	19.2
% Population ≥ 65 % (old)	246	22.1	5.0	10.1	42.5
% Population ≥ 75% (old 75 +)	246	9.09	2.60	3.9	19.8
Grants per-head (euro)	246	307	150	106	1817
Income per-head (euro)	246	5339	870	3288	8595
Long-run unemployment rate %	246	34.4	15.3	5.6	55
Electoral distance %	246	43.6	11.4	0	69.9
Coast	246	0.14	-	0	1
Year 1993	246	0.27	-	0	1
Left-wing coalition	246	0.34	-	0	1
Right-wing coalition	246	0.38	-	0	1
Heterogeneous coalition	246	0.28	-	0	1
Election year	246	0.057	-	0	1
Share of votes ≥ 70%	246	0.073	-	0	1

Table 3 – Data source

VARIABLE	DATA SOURCE
Ordinary ICI rate ‰	IFEL - Istituto per la Finanza e l'Economia Locale
Public Expenditure per-head	Regione Marche - Servizio Controllo di Gestione
Area kmq	SISTAR - Regione Marche
Popultation	Istat - http://demo.istat.it/
Grants per head (euro)	Ministero dell'Interno, Regione Marche-Servizio Controllo di Gestione
Income per-head (euro)	Ministero dell'Interno, Ministero dell'Economia e delle Finanze
Long-run unemployment rate %	Istat - XIII Censimento generale della popolazione e delle abitazioni - 20 ottobre 1991
Electoral distance (100-vote share)%	Ministero dell'Interno
Coast (1= jurisdiction on the sea or 5 km distant from the sea; 0= otherwise)	Istat - Ionio data bank
Year 1993 (1= jurisdiction imposes ICI rate on 4‰ in 1993; 0= otherwise)	IFEL - Istituto per la Finanza e l'Economia Locale
Left-wing coalition (1= left-wing coalition ruling; 0= otherwise)	Ministero dell'Interno
Right-wing coalition (1= rigt-wing coalition ruling; 0= otherwise)	Ministero dell'Interno
Heterogeneous coalition (1 = heterogeneous coalition ruling; 0= otherwise)	Ministero dell'Interno
Election year (1= jurisdiction in election year; 0= otherwise)	Ministero dell'Interno
Share of votes ≥ 70% (1= majority government with 70% and more of vote share; 0= otherwise)	Ministero dell'Interno

Positive impact of population in tax rate is consistent with congestion effects in the provision of public services or, alternatively, with the leviathan hypothesis of the government in charge (Heyndels and Vuchelen, 1998). With regard to young and old people, we expect a positive impact on tax rate in both cases. Nevertheless, it could become negative if municipalities adopt other forms of financial resources to produce public goods and services for them. Income and grant per-capita have a negative impact on tax rate level. However, it is also likely that an increase in tax base produces more public revenues without increasing tax rates. This leads to positive relation between the tax rate and disposable income. Unfortunately, disposable income data set are is not available for 1994 and the taxable income is used as its proxy[8].

Political characteristics are assumed to affect tax rate too. As such, a dummy "*election year*" has been introduced. It takes value 1 when municipality is in the election year, and zero otherwise. It indicates the presence of opportunistic behaviour of the incumbent in case of a negative correlation with tax rate level. In fact, the incumbent, in order to increase his re-election probability, imposes a lower tax rate level in the election time with respect to other policy makers. Another opportunistic behaviour of the incumbent is tested taking into account the "*electoral distance*" variable. It is measured as the difference between 100% and the vote share obtained by the incumbent in the previous election. When this variable goes to 100%, electoral competition is maximal; *vice versa*, when it assumes value zero, electoral competition is absent. This variable shows that the incumbent engages in competition, manipulating fiscal variables, when he has a low margin of victory (or a high "electoral distance") in accordance with a less probability to be re-elected. In particular, he keeps his tax rate (public expenditure) lower (higher) than other ones. This means that the "*electoral distance*" coefficient assumes negative (positive) sign in regression analysis. As far as political ideology is concerned, a dummy is frequently used in empirical studies to control the impact of ideological behaviour of coalition in tax settings of local government. Left (right[9]) wing coalition imposes a higher (lower) level of tax rate than the right (left) wing one, guaranteeing a wider (lower) public expenditure.

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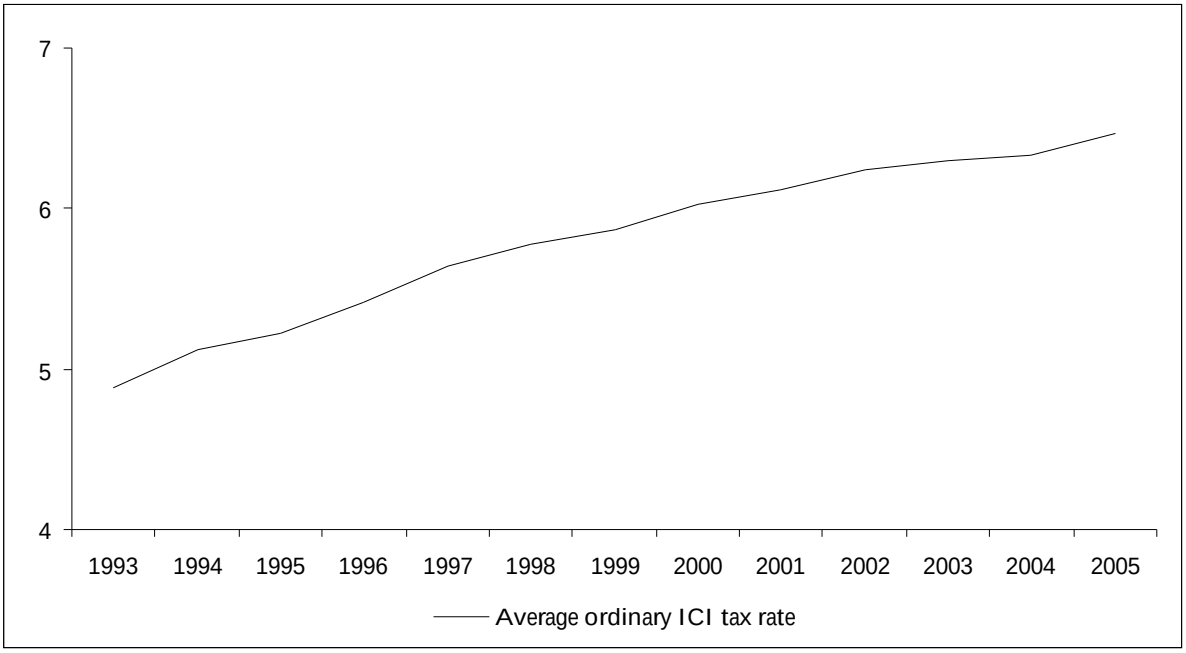
[8] The taxable income data are available from the *Reddito delle Persone Fisiche* from *Ministero dell'Economia e delle Finanze - Dipartimento per le Politiche Fiscali*.

[9] In 1994, local right-wing coalition was partially similar to the central government coalition that was in power and which was made up of *Democrazia Cristiana* (DC), *Partito Socialista Italiano* (PSI), *Partito Repubblicano Italiano* (PRI), *Partito Liberale Italiano* (PLI), *Partito Social Democratico Italiano* (PSDI).

Figure 1 - Average ordinary ICI tax rate (‰) for the Marche municipalities, 1993-2005



For the relevant presence of the left-wing coalition in the governments of municipalities in the Marche region, in this study, the dummy on political ideology assumes 1 for the left-wing coalition, and zero otherwise.

Socio-economic and political variables are not the only ones that can affect the tax rate. In fact, strategic interaction can also have a significant influence in the tax setting of local governments. In this case, municipalities take into account the neighbouring tax rates in their fiscal decisions. It is like considering $W_n t_n$ in the empirical model (Eq. 2).

Strategic interaction is mainly due to tax or yardstick competition. Tax competition has lower probabilities to appear in the Marche municipalities (and generally in Italy) for the following reasons: *i)* low inter-jurisdiction mobility of population; *ii)* the tax rate range (4-7‰) does not allow for wide margins of manoeuvre for the policy maker; *iii)* the average tax rate has increased in time (Fig. 1). Increase in tax rates could be more consistent with yardstick competition and public expenditure spill-overs (Allers and Elhorst, 2003). However, this last hypothesis is controversial because it is very difficult to discriminate the directions of budget interdependences because tax rate and public spending processes overlap.

In empirical analysis, tax interaction is tested estimating the parameter *rho*. In regression, we introduce the "*Year 1993*" dummy to remove the impact on ρ of the central government co-partnership in the collection

of ICI tax yield of municipalities. In fact, in 1993, the central government collected the ICI taxation yield of 4‰. It is probable that municipalities which imposed the ICI rate at minimum level in 1993, increased the tax rate in the following year due to a decrease in grants from the central government as a result of the fiscal decentralization process. This dummy assumes 1 when the municipality imposes 4‰ in 1993, and zero otherwise.

4. Estimations and results

4.1 Tax mimicking

The preliminary analysis of the presence of spatial autocorrelation is conducted using Moran's I test that shows a weak presence of spatial auto-correlation in case of contiguous municipalities (Tab. 4). Only when political variables are not considered as regressors, Moran's I test is not significant. Probably, heteroschedasticity problems detected with Breusch-Pagan (BP) test affect Moran's I test results. Regarding spatial model selection, the Lagrange Multiplier (LM) tests selected the spatial lag model as the most appropriate.

Although results of the Jarque-Bera (JB) test indicate a normal distribution of the error terms, we detect the presence of heteroschedasticity in spatial lag model with the Pagan-Hall (PH) test. Consequently, the 2SLS estimator with a robust variance-covariance matrix is adopted instead of the ML estimator.

Estimation results are reported in Table 4. They show the presence of tax mimicking. In particular, the parameter of tax interaction is weakly significant and equivalent to 0.34 when political variables are included in our regression. This means that a one per cent increase in a neighbouring municipality's tax rate increases its own tax rate by 0.34 per cent.

Regression analysis indicates that socio-economic variables are not significant. This could signal low correlation between tax rate and public expenditure level if these variables are considered as public spending proxy.

Significant variables are instead the "Year 1993", with a negative impact on the tax rate level, and the "coast" dummy that shows a positive correlation with the ICI tax rate in support of the fiscal exportation hypothesis on coastal municipalities of the Marche region.

Table 4 – Tax mimicking estimation results, 1994

	1 (*)	2 (*)	3 (*)
ϱ	0.41**	0.34*	0.34*
	(2.03)	(1.76)	(1.76)
Area	0.0012	0.0010	0.0010
	(1.2)	(1.04)	(1.03)
Population	-0.039	-0.027	-0.027
	(-1.23)	(-0.76)	(-0.77)
Young	0.000074	-0.015	-0.016
	(0.00)	(-0.48)	(-0.50)
Old	0.0034	-0.0034	-0.0037
	(0.30)	(-0.30)	(-0.32)
Grants per-head	-0.024	-0.35	-0.36
	(-0.01)	(-0.15)	(-0.15)
Income per-head	-0.21	-0.30	-0.28
	(-0.37)	(-0.51)	(-0.48)
Coast	0.22*	0.25**	0.25**
	(1.86)	(2.16)	(2.16)
Year 1993	-0.43***	-0.44***	-0.44***
	(-5.12)	(-5.42)	(-5.38)
Left-wing coalition	-	-0.21**	-0.21**
	-	(-3.08)	(-3.06)
Election year	-	-0.13	-0.13
	-	(-1.20)	(-1.18)
Electoral distance	-	-	-0.00074
	-	-	(-0.23)
Const	3.13***	3.97***	4.02***
	(2.57)	(3.29)	(3.26)
Jarque-Bera test	0.594	0.806	0.807
Breusch-Pagan test	0.027**	0.236	0.116
Moran's I test	0.106	0.097*	0.094*
LM Error	0.218	0.205	0.201
LM Lag	0.082*	0.09*	0.089*
Adjusted R^2	0.17	0.21	0.21
Breusch-Pagan Hall test	0.011**	0.056**	0.033*
Hansen J test	0.341	0.670	0.741
Observations	246	246	246

i) Dependent variable: ordinary ICI tax rate ‰; ii) t-value in parentheses; iii) results of the tests are in p-value; iv) coefficient significant at level *** 1%, ** 5%, *10%; v) coefficients on income per head, population, and grants per head are multiplied by 10^4 for readability; vi) (*) Eicker-Huber-White "sandwich" robust variance-covariance matrix; vii) 2SLS estimation with instrument variables: WnXn, Xn.

As regards the political variables, the ‘‘election year’’ dummy is not significant, though the sign of the coefficient is consistent with the incumbent’s opportunistic behaviour. The coefficient of the ‘‘electoral distance’’ dummy is negative. This result indicates that incumbents with a

low margin of victory manipulate tax rate in order to be re-elected. Nevertheless, this coefficient is not statistically significant. On the other hand, the coefficient of the "left-wing coalition" dummy is particularly significant but the sign is negative, outlining an opposite behaviour to left-wing ideology devoted to guarantee higher levels of fiscal imposition and public expenditure than right-wing coalition. This result could depend on higher income per-head in the jurisdictions ruled by the left-wing coalitions[10].

4.2 The source of tax mimicking

In the previous subsection, tax mimicking was found significant in case of the geographical proximity. In this section, we investigate its determinants. Tax competition was ruled out a priori, mainly for low inter-jurisdictional mobility of population and for the increase of tax rates with the passage of time. Other hypotheses are tested, like yardstick competition, political and informative trends, estimating equations 3 and 4. We use the 2SLS estimator both in the presence of heteroschedasticity problems and in order to use the same methodology adopted in the previous tax mimicking analysis.

Estimation results on yardstick competition are presented in Table 5. First of all, there is no evidence in favour of yardstick competition when we observe tax interaction between large and small majorities (Tab. 1). In fact, the intensity of tax mimicking of large majorities is higher than that of small ones. Average tax rate could be in line with this phenomenon or simply reflecting stronger tax mimicking of large majorities. However, the t-value of the difference between $\bar{t}$'s of majorities refuses the null hypothesis.

Yardstick competition does not result from estimation of tax interaction of municipalities in election year because the coefficient is not statistically significant, though its negative sign is consistent with a re-election desire of the incumbent.

Lastly, the intensity of tax mimicking within political coalition is tested. Results show that only tax interaction of the right-wing coalitions is significant and very strong, with a coefficient of 0.91. Moreover, results are confirmed by the t-value of the difference between ϱ's and δ's. On the other hand, tax interaction of the left-wing coalitions is less intense with a coefficient of 0.083. Although these results are in line with yardstick

[10] In 1994, income per-head was equal to 5.481 euro in jurisdictions ruled by a left-wing coalition and equal to 5.301 euro in those ruled by a right-wing one. Grant per-head was 275 euro for the former and 329 euro for the latter.

Table 5 – Estimation results of yardstick competition, political and informative trends on ICI rate (‰), 1994

	ϱ	ϱ'	δ	δ'	$\bar{t}$	$\bar{t}'$
Share of votes ≥ 70% (*)	0.34		4.19*		6.31	
Share of votes < 70%		0.27		**4.34*****		6.00
test p = p'	(0.903)		(0.952)		(0.711)	
Election year	-0.18		**6.47****		5.47	
No Election year		**0.34***		**3.92*****		5.94
test p = p'	(0.249)		(0.275)		(0.404)	
Heterogeneous coal. (*)	-0.002		**5.26****		5.25	
No heterogeneous coal.		**0.58****		**2.10***		5.03
test p = p'	**(0.097)***		**(0.085)***		(0.832)	
Left-wing coal.	0.083		**5.17*****		5.64	
No left-wing coal.		**0.59****		**2.80****		6.82
test p = p'	(0.120)		(0.154)		(0.413)	
Right-wing coal. (*)	**0.91****		0.61		6.90	
No right-wing coal.		0.030		**5.11*****		5.26
test p = p'	**(0.008)****		**(0.008)****		(0.880)	

i) Dependent variable: ordinary ICI rate ‰; ii) p-value in parentheses; iii) coefficient significant at level *** 1%, ** 5%, *10%; iv) test p = p' is difference test between parameters estimated; v) (*) Eicker-Huber-White "sandwich" robust variance-covariance matrix; vi) instrument variables: $M_nW_nX_n$, $(I_n-M_n)W_nX_n$, X_n.

competition hypothesis, we can not conclude that tax mimicking among contiguous municipalities depends on this phenomenon because tax interaction of the left-wing coalitions is not statistically significant. Moreover, the left-wing coalitions show an average tax rate (5.61‰) lesser than the right-wing coalition (6.70‰), contrary to Solé-Ollé (2003) hypotheses on yardstick competition.

The strong tax interaction observed among right-wing coalitions does not seem to be consistent with an opportunistic behaviour. They were not in election time in 1994; therefore, they had not any particular interest to engage in electoral competition as well to lead a political budget cycle increasing their tax rate before the election year. Yardstick competition does not seem to be the main source of tax mimicking. Probably, these results outline the presence of political trend. Information problems could have affected tax setting of the right-wing coalition. In this case, the politician prefers to conform his fiscal policy to the decision taken by his political party rather than the neighbourhood fiscal policy.

In order to investigate the informative trend, we estimated tax mimicking of heterogeneous coalitions without clear political ideology and more likely prone to mimic the others to fill information gaps. We suppose that this behaviour is more intense immediately after the first years of tax rate introduction, characterized by more uncertainty on costs and benefits of fiscal decisions. Estimation results of heterogeneous tax interaction is negative (ϱ = -0.002) but not significant. This result is not consistent with the informative trend hypothesis, therefore, this evidence deserves to be investigated in future empirical analyses.

For a complete investigation, public spending interactions have been tested[11], including standard variables[12] in the spatial lag model reported in equation 2. In this case, dependent variable is public spending rather than tax rate. In addition, all results must be interpreted as elasticity since variables are expressed in logarithm form.

Table 6 presents the estimation results of public spending. The Jarque-Bera test signals the strong presence of normality problems. Probably, they invalidate spatial diagnostic tests that, however, suggest the presence of the spatial lag model rather than the SER model. In presence of non-normal error terms, we adopt the 2SLS estimator.

The 2SLS estimation shows the presence of public expenditure interaction. A one per cent increase in a neighbouring municipality's public expenditure increases its own public spending by 0.29 per cent. With regard to socio-demographic variables, not a single coefficient is significant. Probably, this result corroborates low correlation between tax rate and public expenditure level observed in previous tax mimicking analysis. On the other hand, economic variables, such as grants and income per-head, show significant and positive coefficients that are consistent with the presence of the *fly-paper effect*.

The analysis of the sources of expenditure interaction is reported in Table 7. Regarding yardstick competition, we expect that municipalities ruled by large (small) majorities show less (more) intense public spending interaction because they have widespread (limited) electoral support and, consequently, they interact less (more) with their neighbours to be re-elected. Moreover, we suppose that jurisdictions in election (no election) year show a strong (weak) interaction on public spending decisions because they need (do not need) to be in line with other ones in order to be re-elected.

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[11] In 1994, ICI revenues corresponded to 18% of current public expenditure and only to 10% of the total. They did not represent the main financial resource of local public expenditure.

[12] Squared income per-head was dropped for collinearity problems.

Table 6 - Public expenditure estimation results, 1994

	1	2	3
ϱ	0.29**	0.29**	0.29**
	(2.58)	(2.53)	(2.55)
Density	0.010	0.0021	0.0023
	(0.33)	(0.07)	(0.08)
Population	0.031	0.028	0.026
	(1.45)	(1.31)	(1.21)
Young	-0.16	-0.14	-0.12
	(-1.08)	(-0.91)	(-0.82)
Old	-0.32	-0.34	-0.34
	(-1.48)	(-1.59)	(-1.58)
Old 75 +	0.23	0.25	0.25
	(1.42)	(1.52)	(1.51)
Grants per-head	0.67***	0.67***	0.67***
	(10.59)	(10.64)	(10.69)
Income per-head	0.42**	0.44***	0.43**
	(2.89)	(2.97)	(2.91)
Long-run unemployment rate	0.024	0.026	0.029
	(0.87)	(0.91)	(1.03)
Left-wing coalition	-	0.028	0.028
	-	(0.81)	(0.84)
Election year	-	0.075	0.074
	-	(1.16)	(1.15)
Electoral distance	-	-	0.0011
	-	-	(0.83)
Const	-2.11	-2.17	-2.20
	(-1.39)	(-1.41)	(-1.43)
Jarque-Bera test	7.6e-39***	1.0e-39***	2.9e-37***
Koenker-Bassett test	0.534	0.584	0.537
Moran's I test	0.000***	0.000***	0.000***
LM Error	0.000***	0.000***	0.000***
LM Lag	0.000***	0.000***	0.000***
LM Error robust	0.163	0.130	0.100
LM Lag robust	0.020***	0.025**	0.033**
Adjusted R^2	0.55	0.55	0.55
Breusch-Pagan Hall test	0.538	0.798	0.823
Sargan test	0.368	0.510	0.499
Observations	246	246	246

i) All variables are in logarithm; ii) dependent variable: current public expenditure; iii) t-value in parentheses; iv) test results are in p-value; v) coefficient significant at level *** 1%, ** 5%, *10%; vi) 2SLS estimation with instrument variables: WnXn, Xn.

Results show that public spending interaction of jurisdiction with large majorities (ϱ'=0.38) is higher than small majorities (ϱ'=0.27). Moreover, t-value of difference between ϱ's rejects the null hypothesis.

Yardstick competition does not result from the estimation of public expenditure interaction with regard to municipalities in the election year. Although they show stronger interaction (ϱ=0.98) rather than others (ϱ'=0.27), this result is not statistically significant.

Table 7 – Estimation results of yardstick competition on public expenditure, 1994

	ϱ	ϱ'	δ	δ '
Share of votes ≥ 70%	0.38**		-2.80*	
Share of votes < 70%		0.27**		-2.04
test p = p'		(0.620)		(0.596)
Election year	0.98**		-6.23**	
No Election year		0.27**		-1.53
test p = p'		(0.128)		(0.134)

i) All variables are in logarithm; ii) dependent variable: current public expenditure; iii) p-value in parentheses; iv) coefficient significant at level *** 1%, ** 5%, *10%; v) test p = p' is difference test between parameters estimated; vi) instrument variables: MnWnXn, (In-Mn)WnXn, Xn.

Table 8 – Estimation results of informative trend on public expenditure, 1994

	ϱ	ϱ'	ϱ''	δ	δ'	δ''
Heterogeneous coal.	0.63***			-4.42**		
No heterogeneous coal.		0,14			-1,06	
test p = p'		(0.011)**			(0.010)**	
Heterogeneous coal. (election year) (*)	0,066			-4,15		
Heterogeneous coal. (no election year)		0.60***			-3,93	
No heterogeneous coal.			0,12			-0,64
test p = p' = p''		(0.050)**			(0.037)**	

i) All variables are in logarithm; ii) dependent variable: current public expenditure; iii) p-value in parentheses; iv) coefficient significant at level *** 1%, ** 5%, *10%; v) test p = p' is difference test between parameters estimated; vi) instrument variables: MnWnXn, (In-Mn)WnXn, Xn; vii) (*) AnWnXn, (En-An)WnXn, (In-En)WnXn, Xn.

Finally, we investigate the presence of the informative trend. Results are reported in Table 8. We observe a positive and significant expenditure interaction among heterogeneous coalitions. A one per cent increase in a neighbouring municipality's tax rate increases its own tax rate by 0.63 per cent. Probably, the lack of information affects fiscal decisions of these coalitions because they take into account fiscal policies of the neighbouring jurisdictions. Nevertheless, we make a thorough investigation because 10% of them are in election time. Consequently, we estimate spatial econometric model illustrated in equation 5. Results show that only heterogeneous coalitions not in election year interact significantly with the other ones. This result corroborates the presence of public spending interaction due to informative trend on the CHR hypothesis.

Finally, these last results confirm that political trend detected in tax setting of contiguous municipalities is likely the main source of tax mimicking observed in 1994.

5. Conclusion

The common sources of tax mimicking are tax competition and yardstick competition. In addition, we assume that there are other sources of tax interaction, namely political and informative trends. These trends reflect the presence of social interaction due to conformity behaviour of the policy maker on fiscal policy decisions taken by his reference group i.e. the political party in the case of political trend and the generic neighbourhood in the case of informative trend. Both phenomenon are mainly due to the lack of information on the costs and benefits of public services offered to citizens. Moreover, political trend also depends on political ideology of the policy maker.

Theoretical framework shows that conformity behaviour of the policy maker leads to tax mimicking and a higher equilibrium tax rate. Moreover, the leviathan policy maker has a tax rate higher than the benevolent one as well is more sensitive to changes in neighbours' tax rates but less to changes in up-tiered government tax rate.

Empirical analysis is conducted on the Marche municipalities data. It shows the presence of tax mimicking in case of geographical distance. This result was expected because the period immediately after tax rate introduction was characterized by higher uncertainty on the costs and benefits of fiscal decisions that leads the policy maker to conform his fiscal choices to those of his geographical and political neighbourhood.

Firstly, tax mimicking is observed in 1994 with regard to contiguous municipalities. We detected that the ICI tax rate mainly depends on neighbourhood's tax rate, ideology affiliation and on the coastal location of municipalities. Socio-economic variables do not affect this tax rate, indicating low correlation between tax rate and public expenditure. On the other hand, we do not observe opportunistic behaviour in local tax setting when we introduce "*election year*" and "*electoral distance*" dummies in regression analysis.

An empirical investigation of the sources of tax mimicking was conducted. We do not find any evidence in favour of yardstick competition when we estimate tax interaction among jurisdictions ruled by large and small majorities or between municipalities in election year or not. On the other hand, results show that only the right-wing coalition interacts significantly. This result does not support yardstick competition, because

less intense tax interaction of the left-wing coalition, although consistent with this phenomenon, is not statistically significant. The data show that right-wing coalitions were not in election time in 1994; therefore, they had not particular reasons to engage in opportunistic behaviour in order to be re-elected as well to lead a political budget cycle increasing tax rate before election year. Probably, it is possible that information problems have affected right-wing coalitions tax setting. In an uncertain context due to lack of information on the costs and benefits of public services, the right-wing coalition could have preferred to conform to their political reference group rather than to the neighbourhood in general.

Robust results were obtained analysing current public expenditure interactions and their sources because the literature offers controversial opinions on public budget transmission mechanism. Estimations show that spending interactions are probably due to an informative trend because we observe a significant interaction among heterogeneous coalitions. This result could confirm CHR hypothesis on neighbourhood effects due to incomplete information. Empirical evidence on public spending highlights that the spill-over effects can not be an alternative source of tax mimicking. This result outlines that political trend could be a probable explanation of the tax mimicking observed among contiguous municipalities.

The informative trend was not observed in tax setting of local governments. In fact, the coefficient of tax interaction is negative although not significant. Therefore, this aspect should be further investigated in future empirical studies.

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