Revisiting yardstick competition and spillover effects in in the new era of spatial econometrics: evidence from Italian cities

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Abstract

This paper exploits political and institutional features of Italian local governments to identify the presence of spatial interactions in spending decisions over the period 2001-2011. In particulr, I take advantage of the political cycle to isolate the effect of spending decisions of one municipality on neighbors' municipalities. The results of this analysis point to the presence of strategic interaction between neighboring municipalities and indicate that such a fiscal behaviour is more pronounced during electoral years, that is municipalities are engaged in yardstick competition. Moreover, to isolate any other source of spatial interactions from yardstick competition, I rely on a sample of municipalities experiencing a council dismissal, for which the political process is expected to be less marked - as they are led by a commissioner, who does not have any political concern. In this case, I build a measure of intensity of commissioner to induce variation in the spending decisions, finding, however, no evidence of spatial dependencies. Taken together these results suggest that the observed spatial dependence in spending decisions is unlikely to be driven by spillover effects, rather, it seems to be consent with the yardstick competition hypothesis.

Keywords: Spatial interactions, yardstick competition, spillover, political budget cycle, commissioner, external instruments.

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Acknowledgments:

1 Introduction

In the last two decades a substantial body of the public economics literature[1] has deeply focused on understanding horizontal fiscal interactions among local governments, and the most accredited explanations are based on both the yardstick competition hypothesis and benefit spillover.

In the yardstick competition model voters with no complete information on the cost of public goods and services compare expenditures and taxes in their jurisdiction with those of nearby jurisdictions (Salomon, 1987) and, hence, voters punish the incumbent politician if her tax rate decisions are not in line with those of the neighbors. Starting from the seminal work of Besley and Case (1995) – who show that neighbors' tax rates impact on the probability of re-election for the incumbent in US states – much of the empirical literature has developed documenting and showing the presence of yardstick competition (see, among others, Revelli, 2002a and 2006; Bordignon et al., 2003; Solé-Ollé, 2003; Allers and Elhrost, 2005; Edmark and Agren, 2008; Padovano and Petrarca, 2014).

Spatial dependencies might also arise for the presence of benefit spillover. In this case, expenditures and taxes of a municipality may have positive or negative effects beyond its own boundary, thus affecting the welfare of residents in neighboring municipalities. As a result, municipalities might decide the level of their fiscal policies by strategically taking into account fiscal policies of their neighbors (Case et al., 1993; Revelli, 2002b; Revelli, 2003; Baicker, 2005; Solé-Ollé, 2006).[2]

Although these works shed lights on the existence and (eventually) on the sources of spatial interactions in fiscal policies, the identification strategy is based on the "standard" spatial econometric framework. Within this framework, the simultaneity bias arising from the neighbors dependent variable is mainly addressed by using an instru-

[1] For a theoretical survey see, for example, Wilson (1999), while for an empirical survey on fiscal interactions see, among others, Brueckner (2003).

[2] Another source of spatial interdependence appears in tax competition models, where municipalities face mobile tax bases, which depend on both their own tax rate and their neighbors' tax rate giving rise to tax competition (Kanbur and Keen, 1993; Devereux et al., 2008). Yet, strategic interactions among local governments have been recently explained by political ideology. This idea is based on the assumption that the local incumbent politician, in order to take into account the common ideology, makes her decisions on taxes and expenditure by looking only to those neighbors belonging to the same political party (Geys and Vermier, 2008).

mental variable approach[3], where the neighbors' dependent variable is instrumented with all neighbors' exogenous variables.[4] However, as Gibbons and Overman (2012) have pointed out, using as instruments the exogenous characteristics of the neighbors does not offer a valid identification of causal relations, which leads to biased estimates. Therefore, in order to better identify strategic interactions, they suggest to rely on the "experimentalist paradigm", which requires the use of a pure and truly exogenous variations in the neighbors' dependent variable.

After the "tsunami" paper of Gibbons and Overman (2012), few works have exploited quasi-natural experiments to analyze strategic interactions in fiscal decisions among local governments. In particular, Lyytikäinen (2012) exploits a Finnish reform, in which the central government increased the lower limit of the municipal property tax rates, to instrument the tax rate of neighboring municipalities, finding that municipalities do not interact in their tax policies. Nevertheless, when the tax rate of neighboring municipalities is instrumented with their own exogenous characteristics (the standard approach), he finds a positive and significant effect. Similar results are obtained by Baskaran (2014), who exploits the tax increase experienced in 2003 by the municipalities belonging to the German state of North Rhine-Westphalia. The reform is used to test for tax mimicking in municipalities belonging to the state of Lower-Saxony, instrumenting the vector of the neighboring tax rate with a dummy variable equal to one for Lower-Saxony municipalities located at the borders with North Rhine-Westphalia. The quasi-natural experiment approach shows that there are no interactions in tax rate decisions by municipalities, while the standard approach points to a strong evidence of strategic interaction. Finally, Isen (2014) shows that there is no evidence of fiscal interactions at the local level by employing a RDD strategy for a sample of counties in Ohio, while, a positive and significant estimates of spillovers are found when the standard approach is used[5].

[3]According to Allers and Elhrost (2005), 14 empirical studies out of 19 present in their list use an instrumental variable approach, while only 3 of them adopted a maximum likelihood strategy. Moreover, among 14 studies conducted after the above mentioned survey, 12 of them use an instrumental variable approach, and 2 of them employ maximum likelihood estimator.

[4]An alternative way consists to rely on the maximum likelihood methodology, which requires additional assumptions on both distributional and functional form.

[5]In contrast to these results, Parchet (2014) finds evidence of strategic interactions in the choice of the personal income tax rate by Swiss municipalities in a quasi-natural experiment context. Similarly, Agrawal (2015) finds strategic interactions in setting local sales taxes among state border in U.S, by exploiting fiscal policies that vary discontinuously across states.

Taken together, these findings seem to suggest that most of the existing literature has overestimated the size of fiscal interactions, since no evidence of strategic interaction at the local level is found when relying on a quasi-natural experiment approach.[6] However, these papers based on the experimental paradigm estimate fiscal strategic interactions by relying on a source of exogenous variation, which mainly derives from a one-shot reform occurred in a specific year, thus imposing to use a first-difference specification instead of exploiting the panel dimension. Moreover, these studies focus on the tax side of the local budget, without explicitly consider local expenditures. Finally, all these works do not investigate whether effects coming from different mechanisms can lead to significant results, that is the sources of spatial dependence are not conisdered. Accordingly, at the best of my knowledge, no one has investigated strategic interactions in expenditure decisions at the local level, and the source of such dependences, by using a pure genuine external instrument within a panel framework.[7]

In this paper I aim to fill this gap by assessing the existence of spatial effects influencing the spending decisions of local governments - and identifying the source of such interdependence -, by using information on all Italian municipalities (except for those in autonomous regions) over the period 2001-2011. In order to properly identify spatial interactions, I exploit the exogenous variation in spending decisions due to the political cycle. Italian cities, indeed, are characterized by staggered times of elections[8], so that, for the local policy maker's perspective, being surround by municipalities in different years of the term - which in turns lead to different spending behavior - can be considered as good as randomly assigned. Thus, I take advantage of this unique feature to show, first, that the municipal expenditure is strongly affected by the political cycle and then I use the political cycle of neighbors municipalities as a way to induce exogenous variation in neighbors' expenditure. Second, I investigate the source of spending interactions by interacting neighbors' spending decision with a set of dummies indicator accounting for each year in the term, i.e., electoral period, pre-electoral period and so on. Coherently with the theory of yardstick competition hypothesis, I find that strategic interactions in local spending are stronger during electoral years, while there

[6] On the contrary, when the tax rate of neighboring municipalities is instrumented with their own exogenous characteristics, a positive and significant effect is detected.

[7] There are only few papers explicitly focusing on strategic interactions in local expenditures (Case et al., 1993; Figlio et al., 1999; Baicker, 2005; Revelli 2002b and 2003; Foucalut et al., 2008; Costa et al., 2015; and Ferraresi et al., 2017) and all of them rely on the standard spatial econometric approach.

[8] See Alesina and Paradisi (2017) for a discussion on the reason of staggered dates.

are no effects for other yeras of the term. This last evidence also indicates that other sources of spatial dependence are likely to be ruled out. Spatial interactions not driven by yardstick competition, such as spillover effects, should indeed be orthogonal with respect to the political cycle and, thus, an indication accounting for their presence should have been detected in any year of the term.

Furthermore, in order to provide a direct test for the presence of other sources of spatial interactions, I narrow the possibility of municipalities to engage in yardstick competition, so as any left spatial dependence in local spending might be attributed to spillover effects. More in detail, I test whether spatial interactions are more pronounced among municipalities that experience a council dismissal. These municipalities are indeed less affected by the political process, as they are temporary guided by a commissioner who does not have any electoral concerns. However, the results indicate that spatial interactions are not driven by these municipalities.

In addition, to test for the robustness of this last result, I assemble a dataset based only on those municipalities that in the period 2001-2011 have experienced a council dismissal and/or have been surrounded by (at least) one municipality that has experienced a council dismissal. Clearly, within this sample, the variation in the neighbors' expenditure induced by the political cycle of neighboring municipalities turns out to be less marked, that is the instrument is weak. Therefore, following recent evidence on the impact of council dismissal on local expenditure (Galletta, 2017), I build a measure of the intensity of the commissioner, by computing the number of days, within the year, for which a municipality has been put under commissioner: the longer the period of council dismissal, the higher the variation in the municipal expenditure. The neighbor's value of this variable is then used to induce exogenous variation in the neighbors' spending. While the neighbor's intensity of commissioner significantly impacts on the neighbors' spending, I find no evidence on spatial interactions among this group of municipalities.

What these results simply suggest is that the observed spatial dependence in spending decisions among Italian municipalities is unlikely to be driven by spillover effects, rather, it seems to be consent with the yardstick competition hypothesis. Similar findings, but with the focus being on the tax side of the budget, have recently been shown by Lopes da Fonseca (2017), who, relying on an exogenous reform of the local finance occurred in Portugal in 2007, demonstrates that strategic interactions at the local level are driven by yardstick competition, and not by spillover effects.

The remainder of this work is structured as follows. Section 2 describes the institutional context and the data. Section 3 illustrates the econometric strategy and presents the empirical results, while Section 4 investigates the source of spatial interactions. Robustness test of the results are provided in Section 5. Section 6 concludes.

2 Data and institutional setting

The Italian Constitution defines four administrative government layers: central government, regions, provinces and municipalities. While most regions and provinces are ruled by ordinary statutes, some of them – the autonomous regions and provinces – are ruled by special statutes. Municipalities are the smallest level of jurisdiction and are around 8,000, although this number is decreasing because of the law 56/2014, which is incentivizing amalgamation. Most municipalities (around 90%) have less than 15,000 inhabitants and the average size is around 6,400 inhabitants.

Municipalities in Italy are responsible for several public functions, such as social welfare services, territorial development, local transport, infant school education, sports and cultural facilities, local police services, water delivery, waste disposal as well as most infrastructural spending. According to our data, municipalities' total expenditure accounts, on average, for about 8.7% of all total public expenditures in Italy during the period 2001-2011. Municipalities' current expenditure, on average, accounts for 71% of the municipalities' total expenditure, which corresponds to 63 billion euros per year during 2001-2011. Among current expenditure, approximately 75% is concentrated on four main functions: Administration and Management, Roads & Transport Services, Planning and Environment and Social welfare. The remaining 25% of the current expenditure is allocated to the Municipal police, Education, Culture, Sport, and Tourism. Finally, a very low amount of resources goes to three functions, Economic development, In-house production services and Justice, managed by many medium-sized and small municipalities networking with other municipalities.

The empirical analysis is based on a dataset for Italian municipalities resulting from a combination of different archives publicly available from the Italian Ministry of the Interior, the Italian Ministry of the Economy and the Italian Institute of Statistic. It includes a full range of information organized into three sections: 1) municipal financial data; 2) electoral data covering the results of elections in which the mayors in office during the period covered by the dataset were elected; 3) municipal demographic

and socio-economic data such as population size, age structure, average income of inhabitants. I restrict the sample to municipalities located in ordinary statute regions and I do not include municipalities with missing values. Finally, I obtain a balanced panel sample of 5,572 municipalities, including 61,292 observations from 2001 to 2011.[9]

The dependent variable, is the per capita expenditure of municipalities (*current spending*). I use this aggregate measure of expenditure and not those disaggregated by functions, because many municipalities (especially the small ones) have expenditure crossing more than one function, but often registered only in one function. I also include, for robustness, a set of time-varying variables which characterize a municipality's demographic and economic situation. In particular, I include the population of the municipality *(pop)* and the inverse of the population (1/*pop*): these variables can capture the presence of scale economies or diseconomies in the provision of public goods. Moreover, I build a municipal indicator (*dependency ratio*) given by the proportion of people not in the labor force (0 to 14 and 65+) and those in the labor force (15 to 64) usually used to measure the pressure on productive population. In terms of economic and financial controls, I include the per capita personal income tax base (*income*), i.e. a proxy of per capita average income, and per capita transfer from upper tiers of governments (*grants*). The summary statistics of all the variables used in the analysis are reported in Appendix, Table A1.

3 Estimation strategy

The classical model of spending interactions in a panel framework can be written as follows:

$$G_{it} = \gamma WG_{-it} + \beta X_{it} + \mu_i + \tau_t + \varepsilon_{it} \tag{1}$$

where G_{it} is the per capita expenditure of municipality i at time t, $WG_{-it} = \sum_{j \neq i} \omega_{ij} G_{jt}$ is the weighted per capita average expenditure of the neighboring municipalities j at time t; ω_{ij} are weights that aggregate the per capita expenditure of neighboring municipalities into a single variable WG_{-it} and ω_{ij} are normalized so that

[9] Over 89,111 (8,101 municipalities for 11 years) potential observations, the sample includes 61,292 observations. As a matter of fact, I exclude 15,378 (1,398 municipalities for 11 years) observations referring to municipalities in Special Statute Regions and Province and 12,441 observations (1,131 municipalities for 11 years) relative to municipalities/years where data are not complete or data are missing.

$\sum_{j \neq i} \omega_{ij} = 1$. A very often used approach is to consider neighbors only contiguous municipalities, as this is a neutral and simple definition which captures the idea that interactions are more likely to take place between closely jurisdictions. In this way, $\omega_{ij} = 1/m_i$, where m_i is the number of municipalities contiguous to municipality i and $\omega_{ij} = 0$ if municipalities are not contiguous. The vector X_{it} includes control variables described in Section 2. μ_i is an unobserved municipal specific effect, τ_t is a year specific intercept and ε_{it} is the classical error term.

As already mentioned, the simultaneous determination of expenditures makes the variable WG_{-it} endogenous. The traditional approach of the spatial econometric would suggest to instrument the neighbors' expenditure variable by using the set of neighbors' exogenous variables. However, Gibbons and Overman (2012) have pointed out that using as instruments the exogenous characteristics of neighbors does not offer in general a valid identification of causal relations, which also can lead to biased estimates, since the characteristics of neighboring municipalities can have a direct effect on the expenditure of a given municipality. In addition, spending decisions of neighboring municipalities can influence their own characteristics. As a consequence, the characteristics of the neighbors cannot be used as instruments. In order to properly identify strategic interactions, they suggest instead to frame the empirical analysis within the "experimental paradigm", which exploits sources of exogenous variations in the neighbors dependent variable. This is the kind of approach I follow in the next section.

3.1 The Political Cycle as external instrument

The political economy literature (Rogoff and Sibert, 1988; Rogoff, 1990) has shown that policy makers have an incentive to manipulate policy decisions close to elections, and such an incentive is found to be particularly stronger at the local level (Kneebon and McKenzie, 2001; Akhmedov and Zhuravska, 2004; Drazen and Eslava, 2010).

Providing a causal evidence of the existence of the political budget cycle is not an easy task, as it might be difficult to separate the election year effect from other changes in macroeconomic conditions. However, a possible way to to overcome this issue consists to exploit the staggered time of elections, which is a typical feature of Italian municipalities. More specifically, the random assignment of the timing of elections generates a random assignment of the political cycle of municipalities, that is the position in the term of a single municipality in a given year can be considered as good as randomly assigned. It follows that from a municipality perspective, being

surrounded by municipalities that are in different years of the term is like to flip a coin and, thus, the timing of neighboring elections can be used as a source of exogenous variation in the neighbors' municipal expenditure, providing that the political cycle is associated with the budget cycle.

The key question is then whether Italian municipalities are affected by the political budget cycle. The empirical evidence supports this hypothesis by considering both taxes (Alesina and Paradisi, 2017) and expenditure (Ferraresi et al., 2016; Repetto, 2017). In addition, Figure 1 depicts the estimated coefficients of a pooled OLS regression where I use the per capita expenditure as the dependent variable, and five dummy variables, one for each year of the term, as regressors. Although purely descriptive, the figure corroborates the presence of the political budget cycle for Italian municipalities: municipal expenditure increases as elections get closed.

***** insert here FIGURE 1 *****

The presence of the political budget cycle among Italian municipalities allows the municipality attributes X, which are unlikely to be valid instruments, to be replaced with a variable that induces a continuous exogenous change in the average value of the municipal expenditure of neighbors. Hence, I build a continuous variable accounting for the electoral cycle (*political cycle*), which measures in every year t the number of years from last election. In particular, this variable takes on the following values:

$$political\ cycle_{it} = \begin{cases} 5 & election\ year \\ 4 & one\ year\ before\ election \\ 3 & two\ years\ before\ election \\ 2 & three\ years\ before\ election \\ 1 & one\ year\ after\ election \\ 0 & commissioner \end{cases}$$

where the highest value, 5, corresponding to the election year and the lowest value, 0, corresponding to a no-term period, namely when the municipality is led by a commissioner.

Then, I use this continuous variable to build the variable *neighbors' political cycle*, measuring the political cycle in the neighboring municipalities - where higher values of

this variable are associated to neighbors' municipalities closer to the year of election - , to instrument WG_{-it}, the per capita expenditure of neighboring municipalities.

Consider a municipality A, in year 2008, with two neighbors, B and C. Suppose that municipality B is in its electoral year, while municipality C is in its pre-electoral year. Hence, the value of the instrument for the neighbors of municipality A is equal to 4.5, namely the weighted average of the political cycle of the municipality B (5) and that of municipality C (4). Take now another municipality in the same year, say D, that has two neighbors, E - which is 2 years lasting from the following elections - and F, which is 3 years lasting from the following elections. It follows that the value of the instrument for the neighbors of municipality D is equal to 2.5, namely the weighted average of the political cycle of municipality E (3) and that of municipality F (2). The rationale behind this instrument is that the variation in the neighbors' expenditure can be explained by the position of each neighboring municipality on its own term, being the intuition that higher level of expenditure are likely to occur when municipalities get close to election years. Clearly, the validity of the instrument is based on the assumption that the neighbors' political cycle is uncorrelated with the error term of equation (1). While this assumption is not directly testable, I argue that it is likely to hold since the instrument is based on the timing of elections of neighboring municipalities, which, from the single municipality perspective can be reasonably considered as exogenous. It is unlikely, indeed, that municipalities manipulate their timing of election in view of spending decision of neighbors.

3.2 Results

According to the first stage results (Table A2), I find that the instrument, *neighbors' political cycl*e, has a positive and highly significant effect on the neighbors' spending variable, both in the specification without control variables (col. 1) and with control variables (col. 2), suggesting that, as expected, the expenditure of neighboring municipalities increases when getting close to elections. In terms of point estimates, the coefficient of *neighbors' political cycl*e is equal to 2.19 in the specification where I do not include municipal control (col. 1), and it declines to 2.13 (col. 2) when allowing for control variables. In addition, the instrument results to be a good predictor, as the Kleibergen-Paap F statistics take on the value of 23.849 and 23.504, respectively to the used specification.

As the second stage is concerned (Table 1), it turns out that the coefficient of *neigh-*

bors' spending is positive (0.56) and statistically significant at 10% in the specification without control variables (col. 1). When municipal controls are included (col. 2), the coefficient of *neighbors' spending* is statistically significant at 5%, and it is slightly larger (0.64) with respect to that obtained in the specification without controls.

These findings obtained by employing a pure genuine external instrument point to the existence of a positive horizontal interdependence in the expenditure of Italian municipalities. In particular, I find that a one-euro increase in the average expenditure of the neighbors generates, ceteris paribus, an increase in the expenditure of municipality i from 0.56 to 0.64 euro. In practice, it reveals that public goods/services provided by neighbors' municipalities are complements of the municipality's own goods/services provision. However, less immediate evident is the source of such interdependence. I turn to this next.

***** insert here TABLE 1 *****

4 Source of spatial dependence

4.1 Yardstick competition hypothesis

The hypothesis of yardstick competition assumes that voters do not have complete information on the type of policy maker, and they compare policies carried out in their municipality with those of nearby municipalities (Salmon, 1987). As a result, the local policy maker has an incentive to look at what her neighboring municipalities do in order to increase (or not to lose) political consensus. Hence, to test for yardstick competition, I interact the neighboring expenditure variable, *neighbors' spending*, with a dummy variable taking on the value of one for each year in the term, and zero otherwise. In formal terms the estimated model takes the following form:

$$G_{it} = \gamma WG_{-it} + \lambda \left(WG_{-it} \times d_{it}\right) + \beta X_{it} + \mu_i + \tau_t + \varepsilon_{it} \tag{2}$$

where d_{it} is a set of five dummies for each year in the term, namely the election year, one year before election, two years before election, three years before election and one year after election. Then, I instrument the two endogenous variables, i.e., the expenditure of the neighboring municipalities, WG_{-it}, and its interaction with the dummy variable indicating the year of term, $WG_{-it} \times d_{it}$, by using the political

cycle in the neighboring municipalities, *neighbors' political cycle*, and the political cycle in the neighboring municipalities interacted with the corresponding dummy variable indicating the year of term.

Table 2 shows the second stage results[10] for Eq. (2), where municipal controls are included. According to the estimate in col. 1, where the neighbors' expenditure is interacted with the election year dummy, I find the presence of yardstick competition in local expenditures among Italian municipalities. In fact, the coefficient of *neighbors' spending* is positive (0.64) and 5% significant, and it is found to be larger during electoral years, as the interacted coefficient *neighbors' spending* $\times$ *election* is positive (0.13) and statistically significant at 5%. In columns (2), (3), (4) and (5) the expenditure of neighbors is interacted with a dummy indicating: a) one year before election, b) two years before election, c) three years before election and d) 1 year after election, respectively. However, these interaction terms turn out to be not statistically significant.

What these results simply suggest is that local policy makers set their expenditures in line with those of neighboring municipalities and such a behavior is stronger in electoral years compared to non-electoral years: a result consistent with the yardstick competition hypothesis.

Notice that these results also reveal that other sources of spatial dependence are likely to be rulled out. In fact, were other sources of spatial dependence in place, they should be detected in any year of the term, as there are no reason to believe that other spatial dependence, such as spillover effetcs, depend on the years of the term.

***** insert here TABLE 2 *****

4.2 Other sources of spatial interdependence

While the previous section indirectly revealed that, besides yardstick competition, the other sources of spatial dependence are less likely to occur, this section provides a direct test against their presence. To test for for other sources of interdependence, i.e., spillover effects, is not an easy task, since any detected spatial effects would be

[10]The corresponding results of the first stage are shown in the Appendix, Table A3. Note that the Kleibergen-Paap F statistics indicate that the instruments are strong, being the value of this statistic above the rule-of-thumb of 10, except in the specification of col. (5), where the expenditure of neighbors is interacted with the dummy variable *1 year after election*.

potentially affected by the presence of the electoral process, and thus leading to biased estimates.

Suppose, instead, that each municipality is led by a policy maker, who cannot be affected by political concerns, so that political and electoral motivations are ruled out. In this case is likely to believe that any observed spatial interactions in local expenditure is due to spillover effects. In this regards, I take advantage of the fact that in Italy the municipal council can be dismissed by the Ministry of Interior and the major (and the municipal council), in turns, is replaced – for a given period – by a commissioner.[11] The commissioner is in charge of the overall governance and functioning of the municipality in which she intervenes, including decisions on the budget. Once the period of commissioner finishes, there are local elections and the commissioner is then replaced by the elected mayor and the elcted council. In this framework, it is reasonable to argue that any decisions of the commissioner can not be driven by electoral reasons, since she does not have any political concerns. Consequently it appears unlikely that municipalities, when put under commissioner, engage in yardstick competition, and thus any evidence of spatial interactions for these municipalities should be linked to spillover effects.

In order to account for the municipal council dismissal, I build a dummy variable, *commissioner*, which takes on the value of one if municipality i at time t is put under commissioner and zero otherwise. Figure 2 plots the share of commissioner municipalities on the total number of municipalities over the period 2001-2011, showing that, every year, approximately 2% of Italian municipalities experience a council dismissal.

***** insert here FIGURE2 *****

To formally test for the presence of spillover effect, I interact the neighboring expenditure variable with the dummy variable *commissioner* and I estimate the following model:

$$G_{it} = \gamma WG_{-it} + \lambda \left(WG_{-it} \times commissioner_{it}\right) + \beta X_{it} + \mu_i + \tau_t + \varepsilon_{it} \qquad (3)$$

were the coefficient associated with the interaction term, λ, significant it would imply the presence of spillover effects. Then, I instrument the two endogenous variables,

[11] According to the Italian Law 267/2000 there are three main reasons for council dismissal: a) mafia infiltration, b) resign of official and c) not approval of the annual budget. For more details see Decreto Legislativo n.367, 18/08/2000, art. 141.

i.e., the expenditure of the neighboring municipalities and its interaction with commissioner, by using the political cycle in the neighboring municipalities and the political cycle in the neighboring municipalities interacted with the variable *commissioner*.

Table 3 shows the second stage results[12] of Eq. (3). According to the estimates in col. 1, where municipal controls are excluded from the regression, the coefficient of *neighbors' spending* is positive (0.63) and statistically significant at 10%, implying that there are some interactions in spending decisions between neighboring municipalities, but these interactions are not driven by spillover effects, since the interaction term n*eighbors' spending* ×*commissioner* yields an estimation not statistically significant. The same figure emerges when municipal controls are included. Indeed, following the estimates of col. 2, it turns out that the coefficient associated to *neighbors' spending* is positive (0.71) and statistically significant at 5%, while, again, its interaction with *commissioner* is not statistically significant. These findings support the existence of interactions in local expenditure, but do not corroborate the existence of spillover effect in municipal decisions.

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5 Robustness tests

One potential weakness of the analysis on the other sources of spatial dependence is that the identification of spillover effects relies on a quota relatively small of municipalities, namely only those put under commissioner.

Hence, to test for the robustness of these results, I build a new sample, which includes municipalities that have been put under commissioner over the period 2001-2011 and municipalities which have at least one of their neighbors experiencing a city council dismissal over the same period.[13] More precisely, once a municipality has experienced a city council dismissal (even for just a year) and/or it has been surrounded by a municipality that has been put under commissioner, it enters into the dataset.

[12]The corresponding results of the first stage are shown in the Appendix, Table A4. Note that the Kleibergen-Paap F statistics indicate that the used instruments are valid being the value of the statistic equals to 11.569 in the specification without controls variables and 11.305 in the specification with control variables.

[13]It follows that the final sample is a balanced sample of 2,462 municipalities observed for the period 2001-2011, leading to 27,082 observations.

The rationale behind such a restriction is based on the fact that municipalities put under commissioner can not engage in yardstick competition, but, at the same time, a municipality - though not put under commissioner - can not strategically mimic neighboring municipalities, if these, in turn, experience a council dismissal.

Then, I estimate Eq. (1) on this sample of municipalities, for which the political process should be less pronounced. While, on the one hand, the restriction of the sample might help to interpret any detected evidence of spatial interactions (γ) as spillover effects;[14] on the other hand, such a restriction imposes to find another source of exogenous variation in the neighboring municipal expenditure, as the political cycle of neighboring municipalities is expected to be a weak instrument.[15] Therefore, I build a new variable, *intensity of commissioner*, that is a measure capturing the intensity of commissioner, being the intuition that the longer the period a municipality experiences a council dismissal, the stronger the shock (negative) on expenditure.[16] More precisely, for each municipality I create a variable accounting for the number of days over which it has been put under commissioner. For example, if a municipality has been put under commissioner on October 1^{st}, 2004 and the commissioner concluded his mandate on July 1^{st}, 2006 the value taken by this variable is equal to 92 (days) for the year 2004, 365 (days) for the year 2005 and 181 (days) for the year 2006. Then, I use this variable to build the variable *neighbors' intensity of commissioner*, measuring the intensity of

[14] It seems reasonable to argue that within this sample the political cycle is less marked, however its presence cannot be completely excluded, as the sample includes also observations related to municipalities which were put under commissioner at a given time, say, *t-2*, but they are no longer under commissioner at time *t*.

[15] Indeed, estimating Eq. (1) on this restricted sample of municipalities by using, as an instrument, the political cycle of neighboring municipalities (*neighbors' political cycle*) leads to a weak Kleibergen-Paap F statistics (below the rule of thumb value of 10) and the coefficient associated to the *neighbors' spending* is not statistically significant in the specification without control variables, nor in the specification with control variables. Results of this analysis are available upon request. On the contrary, when replicating the analysis on a sample composed only by municipalities that have never been put under commissioner and/or never surrounded by municipalities put under commissioner, the results indicate a positive horizontal interdependence in the expenditure of Italian municipalities and the estimated coefficients are similar to those obtained in the baseline specification as of Table 1. Results on this analysis are available upon request.

[16] This intuition follows recent findings of Galletta (2017), who shows that the presence of a commissioner significantly reduces local spending in Italian municipalities. The usual action taken by the commissioners is, indeed, to review the municipal budget by cutting it. Hence, a negative shock on the expenditure is expected.

commissioner in the neighboring municipalities to instrument WG_{-it} , the per capita expenditure of neighboring municipalities. As well documented and formally tested by Galletta (2017), the city council dismissal of its neighboring municipalities can be treated as an exogenous shock from the perspective of the single municipality, thus the measure of intensity of commissioner in neighboring municipalities might be used as a pure genuine external instrument. After all, it is unlikely that a municipality deliberately experiences a council dismissal in view of spending decisions of neighboring municipalities.

Before examining the results, it is interesting to look at the geographical distribution of municipalities put under commissioner. As shown in Table 4, the share of municipalities put under commissioner during the period 2001-2011 is larger in South Italy[17], if compared to other regions. In particular, data in Table 4 indicate that on average, during the considered period, the share of municipalities experiencing a council dismissal is around 6% for municipalities belonging to South Italy, while, for the rest of Italian municipalities the same value is much lower (around 1.5%). As a consequence, the instrument is expected to be more effective in municipalities belonging to South Italy.

***** insert here TABLE 4 *****

Turning to the results, when using all Italy (Table 5), I find that the coefficient associated to *neighbors' spending* is not significant in the specification without controls variable (col. 1), nor in the specification where controls are included (col. 2). These results indicate that there are no spending interactions among Italian cities; even though these findings must be read with some cautions since the instrument appears to be really weak (the Kleibergen-Paap F statistics is below the rule of thumb of 10).

On the contrary, when relying on the sample of municipalities belonging to South Italy, where there is much more variation in the share of municipalities put under commissioner, the results turn out to be more robust. Indeed, the instrument becomes stronger (Kleibergen-Paap F statistics is equal to 12.580 in the specification without control variables and it is equal to 15.138 in the specification with control variables) and the first stage results (Table A5) indicate that *neighbors' intensity of commissioner* negatively and significantly impacts (1% significance level) on expenditure decisions of

[17]The definition of South Italy includes municipalities belonging to the following regions: Calabria, Campania, Basilicata, Molise and Puglia.

neighboring municipalities, both in the specification without control variable (-0.15; col. 3) and in the specification with control variables (-0.17; col. 4), suggesting that the longer the period of commissioner, the larger - as expected - the negative shock on the municipal expenditure. Nevertheless, in the second stage (Table 5), the *neighbors' spending* coefficient is not statistically significant in the specification without controls (col. 3), nor in the specification where controls are included (col. 4).

Taken together, the analysis conducted in this section does not support the evidence of strategic interaction among Italian municipalities. Stated differently, when municipalities are not allowed to exploit the political process any spatial dependence in expenditures vanishes: a result consistent to that found in previous sections and poitning again to yardstick competion as the main source of spending interactions among Italian cities.

***** insert here TABLE 5*****

6 Conclusions

In this study I analyzed whether spending decisions among Italian municipalities are affected by their neighbors' policies and I also investigated the sources of such interactions. While all the existing studies on spatial interactions in local expenditure are based on the "standard" spatial econometric approach, which uses internal instruments to deal with endogeneity of the expenditure of neighboring municipalities, this paper exploits a pure genuine external instrument.

In one case, I used the political cycle of neighbors' municipalities as a source of exogenous variations in the neighbors' expenditure. The results of this analysis pointed to the existence of strategic interactions in spending decisions. Further investigations suggested that such a behavior is stronger in electoral years compared to non-electoral years, a finding consistent with yardstick competition models.

Furthermore, I tested for the presence of other sources of spatial dependence, namely spillover effects, by relying on municipalities that experience a council dismissal. These municipalities, indeed, cannot engage in yardstick competition as they are led by a commissioner, who does not have any political concerns. As a consequence, any left spatial dependence in spending decisions can reasonable be attributed to spillover effects. In this case, I dealt with endogeneity issue by building a measure of the intensity

of commissioner of neighbors municipalities, given by the number of days over which a municipalities has experienced a council dismissal. While this instrument has a good explanatory power, I did not observe any spatial dependence in expenditure.

These results, taken together, have two main implications. First, yardstick competition is likely to be the most accredited source of spatial dependence in local expenditure among Italian municipalities, a result also consistent to recent findings for Portuguese muncipalities. Second, beside yardstick competition, the finding of no other sources of spatial interactions is in contrast with many other empirical studies that, using the standard approach, have found the presence of spillover effects in spending decisions, even with Italian data. Therefore, any empirical results assessing the presence of spillover effects in spending decisions, if based on the traditional approach of the spatial econometrics, must be interpreted with some cautions.

Appendix

Here Tables A.1, A.2, A.3, A.4 and A.5

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Table 1: Spatial interaction in spending decisions. IV estimates using neighbors' political cycle as an instrument

Dependent Variable: spending per-capita		
	(1)	(2)
Neighbors' spending	0.56*	0.64**
	(0.32)	(0.33)
political cycle	0.74*	0.62
	(0.43)	(0.40)
Kleibergen-Paap F	23.849	23.504
Year Effects	Yes	Yes
Municipality Effects	Yes	Yes
Municipality Controls	No	Yes
Observations	61,292	61,292
R-squared	0.11	0.14
Number of municipalities	5,572	5,572

Note: period 2001-2011. Neighbors' political cycle is used as an instrument for neighbors' spending. Municipal control variables are: *population*, *population dependency ratio*, *1/population*, *income* and *grants*. Robust standard errors clustered at municipal level are shown in parenthesis. Significance at 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 2: Detecting yardstick competition. IV estimates.

Dependent Variable: spending per capita					
	(1)	(2)	(3)	(4)	(5)
Neighbors' spending	0.64**	0.69**	0.71**	0.67**	0.61
	(0.32)	(0.31)	(0.31)	(0.31)	(0.62)
Neighbors' spending × Election	0.13**				
	(0.06)				
Neighbors' spending × 1 year before election		-0.05			
		(0.05)			
Neighbors' spending × 2 years before election			-0.02		
			(0.06)		
Neighbors' spending × 3 years before election				-0.10	
				(0.12)	
Neighbors' spending × 1 year after election					-0.14
					(0.56)
Election	-109.57**				
	(47.62)				
1 year before election		43.73			
		(39.87)			
2 years before election			17.33		
			(49.80)		
3 years before election				77.28	
				(92.19)	
1 year after election					108.90
					(447.08)
Kleibergen-Paap F	11.274	13.028	12.229	11.809	0.165
Year Effects	Yes	Yes	Yes	Yes	Yes
Municipality Effects	Yes	Yes	Yes	Yes	Yes
Municipality Controls	Yes	Yes	Yes	Yes	Yes
Observations	61,292	61,292	61,292	61,292	61,292
R-squared	0.13	0.14	0.14	0.14	0.14
Number of municipalities	5,572	5,572	5,572	5,572	5,572

Notes: period 2001-2011. Neighbors' political cycle and neighbors' political cycle × election are used as instruments for neighbors' spending and neighbors' spending × election; Neighbors' political cycle and neighbors' political cycle × 1 year before election are used as instruments for neighbors' spending and neighbors' spending × 1 year before election; Neighbors' political cycle and neighbors' political cycle × 2 years before election are used as instruments for neighbors' spending and neighbors' spending × 2 years before election; Neighbors' political cycle and neighbors' political cycle × 3 years before election are used as instruments for neighbors' spending and neighbors' spending × 3 years before election; Neighbors' political cycle and neighbors' political cycle × 1 year after election are used as instruments for neighbors' spending and neighbors' spending × 1 year after election. Municipal control variables are: *population*, *population dependency ratio*, *1/population*, *income* and *grants*. Robust standard errors clustered at municipal level are shown in parenthesis. Significance at 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 3: Spatial interaction in spending decisions and spillover effects. IV estimates.

Dependent Variable: spending per-capita		
	(1)	(2)
Neighbors' spending	0.63*	0.71**
	(0.34)	(0.34)
Neighbors' spending × commissioner	-0.04	-0.05
	(0.17)	(0.15)
commissioner	20.35	22.21
	(124.85)	(108.73)
Kleibergen-Paap F	11.569	11.305
Year Effects	Yes	Yes
Municipality Effects	Yes	Yes
Municipality Controls	No	Yes
Observations	61,292	61,292
R-squared	0.11	0.14
Number of municipalities	5,572	5,572

Note: period 2001-2011. Neighbors' political cycle and Neighbors' political cycle × commissioner are used as instruments for neighbors' spending and neighbors' spending × commissioner. Municipal control variables are: *population*, *population dependency ratio*, *1/population*, *income*, political cycle and *grants*. Robust standard errors clustered at municipal level are shown in parenthesis. Significance at 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table 4: Distribution of municipalities put under commissioner in the period 2001-2011

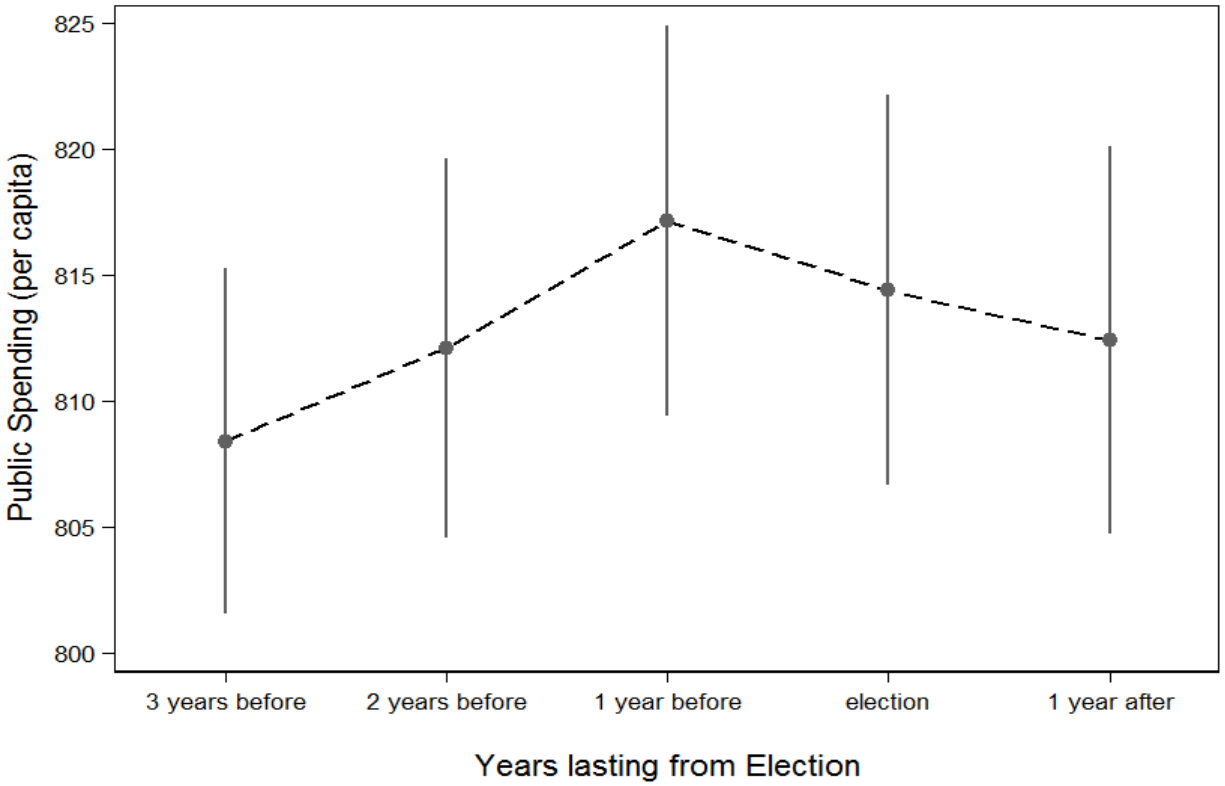
	South Italy			**Rest of Italy**		
Year	Commissioner	Municipalities	%	Commissioner	Municipalities	%
2001	36	1,079	3.3	34	4,493	0.8
2002	73	1,079	6.8	61	4,493	1.4
2003	62	1,079	5.7	75	4,493	1.7
2004	61	1,079	5.7	72	4,493	1.6
2005	64	1,079	5.9	65	4,493	1.4
2006	59	1,079	5.5	66	4,493	1.5
2007	62	1,079	5.7	67	4,493	1.5
2008	71	1,079	6.6	76	4,493	1.7
2009	75	1,079	7.0	54	4,493	1.2
2010	72	1,079	6.7	59	4,493	1.3
2011	60	1,079	5.6	88	4,493	2.0
Average	63	1,079	5.9	65	4,493	1.5

Table 5: Spatial interaction in spending decisions. Restricted sample. IV estimates using intensity of commissioner as an instrument

Dependent Variable: spending per-capita	Italy		South Italy	
	(1)	(2)	(3)	(4)
Neighbors' spending	-2.17	-0.81	-0.28	0.14
	(7.70)	(3.84)	(0.40)	(0.29)
Intensity Commissioner	-0.05	-0.07	-0.10***	-0.12***
	(0.15)	(0.08)	(0.04)	(0.04)
Kleibergen-Paap F	0.165	0.218	12.580	15.138
Year Effects	Yes	Yes	Yes	Yes
Municipality Effects	Yes	Yes	Yes	Yes
Municipality Controls	No	Yes	No	Yes
Observations	27,082	27,082	8,514	8,514
R-squared	0.01	0.02	0.04	0.23
Number of municipalities	2,462	2,462	774	774

Notes: period 2001-2011. Sample of commissioner municipalities and municipalities that share a common border with at least one municipality put under commissioner in the period 2001-2011. Neighbors' intensity of commissioner is used as an instrument for neighbors' spending. Municipal control variables are: *population*, *population dependency ratio*, *1/population*, *income, political cycle* and *grants*. Robust standard errors clustered at municipal level are shown in parenthesis. Significance at 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Figure 1: Political budget cycle for Italian municipalities



Notes: This graph is based on the estimates of a pooled OLS model, where I use the municipal spending per capita as the dependent variable and five dummies variables indicating each year of the legislature. The number of observations is 61,292. Dots represent point estimates, while lines denote the 95% confidence interval.

Figure 2: Share of municipalities put under commissioner in the period 2001-2011

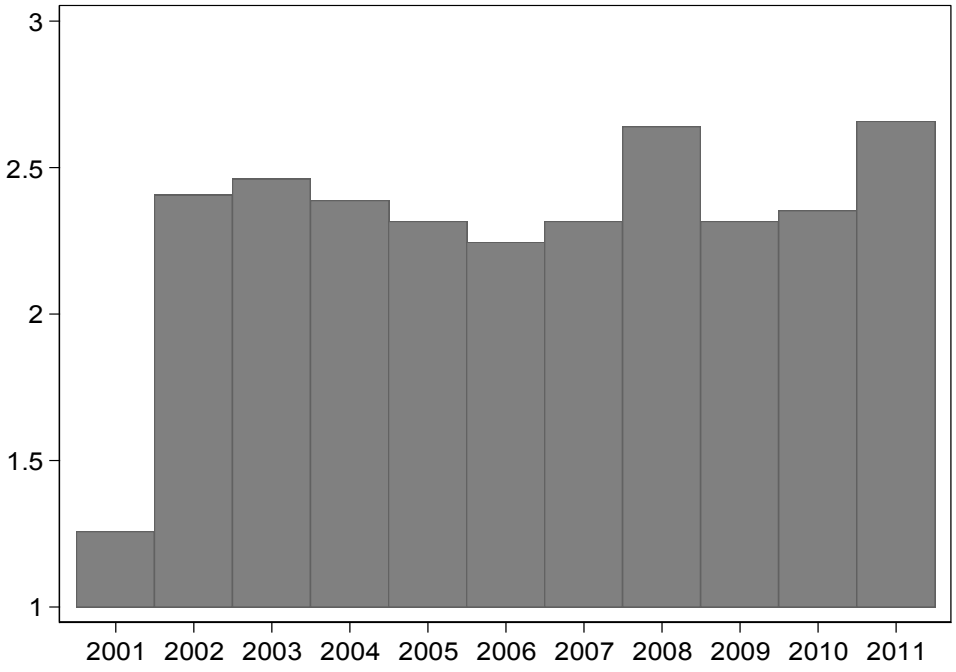


Table A1: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
spending per capita	61,292	811.16	418.56	6.25	13204.38
neighbors' spending	61,292	804.74	281.98	0.00	5689.15
political cycle	61,292	2.88	1.46	0.00	5.00
commissioner	61,292	0.02	0.15	0.00	1.00
neighbors' political cycle	61,292	2.87	0.99	0.00	5.00
neighbors' spending × election	61,292	154.11	340.40	0.00	4387.66
neighbors' spending × 1 year before election	61,292	145.35	332.44	0.00	4804.56
neighbors' spending × 2 years before election	61,292	146.56	332.74	0.00	5296.95
neighbors' spending × 3 years before election	61,292	190.55	368.21	0.00	5689.15
neighbors' spending × 1 year after election	61,292	150.72	337.36	0.00	5281.07
neighbors' election × election	61,292	0.68	1.48	0.00	5.00
neighbors' political cycle × 1 year before election	61,292	0.55	1.23	0.00	5.00
neighbors' political cycle × 2 years before election	61,292	0.53	1.17	0.00	5.00
neighbors' political cycle × 3 years before election	61,292	0.64	1.20	0.00	5.00
neighbors' political cycle × 1 year after election	61,292	0.41	0.95	0.00	5.00
election	61,292	0.19	0.39	0.00	1.00
1 year before election	61,292	0.18	0.38	0.00	1.00
2 years before election	61,292	0.18	0.39	0.00	1.00
3 years before elction	61,292	0.24	0.43	0.00	1.00
1 year after election	61,292	0.19	0.39	0.00	1.00
commissioner intensity	61,292	2.78	21.68	0.00	366.00
neighbors commissioner intensity	61,292	2.83	11.80	0.00	366.00
population	61,292	7795.98	46549.53	35.00	2761477.00
populaiton dependcy ratio	61,292	0.53	0.11	0.21	2.11
1/population	61,292	0.00	0.00	0.00	0.03
income	61,292	10942.47	3684.97	212.70	196577.70
grants	61,292	291.02	276.41	0.00	35567.26

Table A2: First stage result of Table 1

Dependent Variable: Neighbors' spending	(1)	(2)
Neighbors' political cycle	2.19***	2.13***
	(0.45)	(0.44)
political cycle	0.35	0.30
	(0.27)	(0.27)
Kleibergen-Paap F	23.849	23.504
Year Effects	Yes	Yes
Municipality Effects	Yes	Yes
Municipality Controls	No	Yes
Observations	61,292	61,292
Number of municipalities	5,572	5,572

Notes: Period 2001-2011. Municipal control variables are: population, population dependency ratio, 1/population, income and grants. Robust standard errors clustered at municipal level are shown in parenthesis. Significance at 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table A3: First stage result of Table 2

Panel A. Dependent Variable: Neighbors' Spending	(1)	(2)	(3)	(4)	(5)
Neighbors' political cycle	2.05***	2.31***	2.26***	1.67***	2.80***
	(0.49)	(0.46)	(0.43)	(0.46)	(0.54)
neighbors' political cycle × Election	0.68				
	(0.68)				
neighbors' political cycle × 1 year before election		-0.77			
		(0.83)			
neighbors' political cycle × 2 years before election			-0.38		
			(0.93)		
neighbors' political cycle × 3 years before election				2.32**	
				(1.11)	
neighbors' political cycle × 1 year after election					-3.26***
					(1.15)
Election	-2.00				
	(2.40)				
1 year before election		3.08			
		(2.36)			
2 years before election			2.93		
			(2.84)		
3 years before election				-8.15**	
				(3.50)	
1 year after election					6.44**
					(2.66)
Kleibergen-Paap F	13.20	13.03	13.63	12.78	13.77
Observations	61,292	61,292	61,292	61,292	61,292
Panel B. Dependent Variable: Neighbors' Spending ×	election	1 year before	2 years before	3 years before	1 year after

		election	election	election	election
Neighbors' political cycle	-3.58***	-2.16***	-3.75***	-3.76***	-2.51***
	(0.72)	(0.74)	(0.75)	(0.96)	(0.81)
neighbors' political cycle × election	24.67***				
	(4.28)				
neighbors' political cycle × 1 year before election		25.48***			
		(5.03)			
neighbors' political cycle × 2 years before election			23.78***		
			(5.20)		
neighbors' political cycle × 3 years before election				14.83***	
				(5.05)	
neighbors' political cycle × 1 year after election					5.18
					(4.18)
Election	720.52***				
	(15.89)				
1 year before election		727.35***			
		(15.88)			
2 years before election			730.70***		
			(15.67)		
3 year before election				756.89***	
				(15.17)	
1 year after election					785.57***
					(11.00)
Kleibergen-Paap F	21.32	13.02	18.69	24.77	4.86
Observations	61,292	61,292	61,292	61,292	61,292

Notes: Period 2001-2011. Municipal control variables are: population, population dependency ratio, 1/population, income and grants. Robust standard errors clustered at municipal level are shown in parenthesis. Significance at 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table A4: First stage result of Table 3

Panel A. Dependent Variable: Neighbors' Spending		
	(1)	(2)
Neighbors' political cycle	2.07***	2.02***
	(0.44)	(0.43)
neighbors' political cycle × commissioner	2.76	2.49
	(3.43)	(3.20)
commissioner	-2.11	-1.88
	(8.67)	(8.19)
Kleibergen-Paap F	5.66	5.7
Observations	61,292	61,292
Panel B. Dependent Variable: Neighbors' Spending × commissioner		
	(1)	(2)
Neighbors' political cycle	-0.23	-0.25
	(0.27)	(0.26)
neighbors' political cycle × commissioner	32.21***	32.16***
	(9.75)	(9.74)
commissioner	671.94***	671.95***
	(28.35)	(28.33)
Kleibergen-Paap F	5.66	5.7
Observations	61,292	61,292

Notes: Period 2001-2011. Municipal control variables are: *population, population dependency ratio, 1/population, income, political cycle and grants*. Robust standard errors clustered at municipal level are shown in parenthesis. Significance at 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Table A5: First stage result of Table 5

Dependent Variable: Neighbors' spending	Italy		South Italy	
	(1)	(2)	(3)	(4)
Neighbors' Intensity Commissioner	-0.02	-0.02	-0.15***	-0.17***
	(0.05)	(0.04)	(0.04)	(0.04)
Intensity Commissioner	0.02	0.02	0.04*	0.04*
	(0.02)	(0.02)	(0.02)	(0.02)
Kleibergen-Paap F	0.165	0.218	12.58	15.138
Year Effects	Yes	Yes	Yes	Yes
Municipality Effects	Yes	Yes	Yes	Yes
Municipality Controls	No	Yes	No	Yes
Observations	27,082	27,082	8,514	8,514
Number of municipalities	2,462	2,462	774	774

Notes: period 2001-2011. Sample of commissioner municipalities and municipalities that share a common border with at least one municipality put under commissioner in the period 2001-2011. Municipal control variables are: *population*, *population dependency ratio*, *1/population*, *income, political cycle* and *grants*. Robust standard errors clustered at municipal level are shown in parenthesis. Significance at 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.