Does Cooperation reduce Public Expenditures? Evidence from Italian Municipal Unions

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Abstract

Inter-municipal cooperation is a widespread phenomenon among municipalities as a way to provide local public services and allowing municipalities to exploit economies of scale and internalize externalities. However, little is known about its efficiency. The purpose of this paper is to test whether there are efficiency gains. We analyze the Italian experience of Municipal Unions, using unique administrative data on municipalities located in the Emilia Romagna region, for the period 2001-2011. We adopt a difference-in-differences approach combined

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with matching models to estimate the causal effect of entering (or forming) a Municipal Union on local expenditures. We find that being in a Union reduces the total current per capita expenditures by around 5%, compared to municipalities not in a Union. The effect is robust to several checks, persistent and increasing up to nine years after the entrance in a Municipal Union. Moreover, we find that enters a Municipal Union is not associated with a reduction of the level of local public services, letting us to conclude that the Municipal Union is a tool that promotes efficiency in terms of local expenditure reduction.

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1   Introduction

In the last fifty years municipalities across Europe have faced different economic and government budget challenges that put pressure on their performances in terms of efficiency, effectiveness and quality of public services. On the one hand, the demand for the provision of public goods has registered a general increase. Citizens are more conscious and demand a wider and more skilled set of public goods, together with greater level of accountability than in the past. On the other hand, the fulfillment of public finance requirements, imposed by central governments to local governments for achieving European Union fiscal discipline, has led municipalities to reduce their expenditures [Bel and Warner, 2015]. Therefore, municipalities - especially small ones - might find difficult to meet the demands of standard levels of local public goods while reducing their expenditure, since they cannot take advantages of economies of scale. To deal with these issues, central governments tried to rethink service delivery

through the implementation of new different institutional tools: amalgamation of municipalities and inter-municipal cooperation.

Municipal amalgamation is very different from inter-municipal cooperation, and aims to reduce the number of units of sub-national governments, by compulsory merging neighboring borders and creating new entities. The objective of municipal amalgamation is to achieve efficiency gains, from both the exploitation of economies of scale, since a larger area can be served after the coordination agreements, and the internalization of externalities [Oates, 1972, Case et al., 1993]. On the contrary, in the inter-municipal cooperation case, each municipality can still exploit scale economies and internalize externalities, however it remains a single entity. Municipalities reciprocally cooperate in order to provide a wide range of public services or organize service delivery between partners. Within this framework, the degree of institutionalization and the extent of decision-making powers are key elements [van Montfort and Hulst, 2011]. Municipalities can transfer their own decision-making powers on some public services to a standing organization. Hence, the latter becomes a new entity, along with the cooperating municipalities, entitled to provide only the transferred public services. Thus, municipalities enter into a formal agreement to co-operate without being replaced by a joint standing organization.

The literature has shown that the inter-municipal cooperation is a more flexible solution than amalgamation, since municipalities can maintain, on their own territory, decision power and local political representatives [Dollery et al., 2006, Feiock and Scholz, 2009, Blaeschke, 2014]. Moreover, inter-municipal cooperation might decrease the likelihood of free-riding with respect to the case of municipal amalgamation. Indeed, Saarimaa and Tukiainen [2015], using Finnish data, find that municipalities, before amalgamation, shift a part of the costs of additional expenditures to the future partners by increasing its debt or liquidating assets. Similar findings

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are shown by Fritz and Feld [2015], who observe higher debt dynamics for a sample of amalgamated German municipalities. They also show that debt dynamics are higher if the number of amalgamated municipalities increases, and if municipalities are either forced to merge or annexed.

Most of the empirical works have focused on the determinants of the inter-municipal cooperation. In particular, size of municipalities [Brasington, 2003, Carr et al., 2007], regional characteristics [Feiock, 2007, LeRoux and Carr, 2007], geographic factors [Morgan and Hirlinger, 1991, Post, 2002] and spatial proximity of municipalities [Di Porto et al., 2013] turn out to be relevant factors in favor of inter-municipal cooperation. However, few studies have analyzed the impact of inter-municipal cooperation on socio-economic variables[1] and, at the best of our knowledge, there are no studies that empirically explore the ex-post impact of the inter-municipal cooperation on both financial and service output variables.[2]

The aim of this paper is to fill this gap in the literature, by studying the causal impact of inter-municipal cooperation on local spending and on the provision of the local public services. More specifically, we investigate the Italian experience in the inter-municipal cooperation process[3], which starts in 1990 with the institution of the Municipal Union (Unione dei Comuni). We use unique administrative data, that

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[1]See Bel et al. [2012] for the case of solid waste services and Brasington [1999, 2003] for the case of public schooling.

[2]Instead, there is a recent strand of literature testing the effect of amalgamation on municipal financial variables. Reingewertz [2012], by using data on Israelis municipalities, finds that amalgamated municipalities display lower per capita expenditure after amalgamation with respect to other municipalities. The same results are found for Swedish municipalities, as long as municipalities do not exceed a critical size [Hanes, 2015], and also for German municipalities [Blesse and Baskaran, 2016]. On the contrary, Moisio and Uusitalo [2013], by using a ample of Finnish municipalities, find that municipalities' spending was higher in the merged municipalities compared to similar municipalities that chose to stay independent, even after ten years of amalgamation.

[3]The number of Municipal Unions has notably increased over the time. In 2009, for example, the Municipal Unions were 289, involving 1,335 municipalities (17% of total municipalities), while, in 2016, the Municipal Unions are 537, involving 3,117 municipalities (39% of total municipalities).

allow us to observe municipalities belonging to the region Emilia Romagna - one of the most active Italian region in promoting inter-municipal cooperation - over the period 2001-2011. Exploiting the different timing in entering/forming Municipal Unions, we employ difference-in-differences models to identify the causal effect of the inter-municipal cooperation. To control for the different sources of biases that may arise due to the heterogeneity of the municipalities in the sample, we adopt parametric and non-parametric difference-in-differences matching models. Overall, our results confirm that being a member of a Municipal Union reduces total current per-capita expenditures by around 5%, compared to municipalities not in a Union. We are also able to investigate the persistence of the policy effect, and we find that the expenditure reduction is consistent and increasing up to nine years from the entrance in a Municipal Union. Our results survive a large number of robustness checks, thus we are confident that the link between the participation in a Municipal Union and local spending is causal. Moreover, we find that this spending cut is not associated with a reduction of the level of services and so indicating that the Municipal Union is an effective tool which supports municipalities to increase its efficiency.

The paper is organized as follows, Section 2 describes the institutional background, Section 3 and Section 4 illustrate, respectively, the empirical approach and the identification strategy, Section 5 comments the results, Section 6 presents our robustness checks and Section 7 concludes.

2 Institutional framework

The Italian Constitution counts five administrative government layers: the central authority and, at the local level, Regions, Provinces, Metropolitan Area (yet to be

constituted) and Municipalities. While most Regions and Provinces are ruled by "ordinary" statutes, some of them – the "autonomous" Regions and Provinces – are ruled by "ordinary" statutes[4]. Municipalities are the nearest level of jurisdiction to the citizens, and they are responsible for a large array of public functions in the fields of social welfare services, territorial development, local transport, infant school education, sports and cultural facilities, local police services, water delivery, waste disposal and infrastructural spending.

In Italy, there are more than 8.000 municipalities and, approximately 70% of them have a population lower than 5,000 inhabitants. The presence of so many small municipalities has led the national government, over the last 25 years, to stimulate processes of both amalgamation and inter-municipal cooperation. In particular, the inter-municipal cooperation has formally been introduced by the Law 142/1990, which allows municipalities to transfer their own decision-making powers, in terms of expenditure decisions, to a standing organization, called Municipal Union (Unione di Comuni). The Italian Municipal Unions can be compared to the Mancomunidades in Spain, the Intergemeentelijke diensten in Netherlands, the Zweckverbande in Germany, the Sivu, Sivom, Syndicats mixtes in France and the Opdrachthoudende & dienstverlenede verenigimgen in Belgium/Flanders.

According to the Law 142/1990, a Municipal Union is entitled to provide the public services transferred by the cooperating municipalities. In this framework, municipalities transfer a quota of money related to the public function(s) they want to share, and the Union provides those service(s). Therefore, the Union is a legal entity, with its own balance sheet, its own president – chosen among the mayors of

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[4]Italy counts five Autonomous Regions (Sicilia and Sardegna, which are insular territories, and Valle d'Aosta, Trentino Alto Adige and Friuli Venezia Giulia, which are northern boundary territories) and two Autonomous Provinces (Trento and Bolzano).

municipalities joining the Union – and its own council – composed by the council members of cooperating municipalities. Moreover, the Italian law prescribes that each municipality can be member of only one Union. The functions that are usually are transferred from municipalities to Municipal Unions are Administration and Management, Municipal police, Education, Roads & Transport Services, Planning and Environment and Social welfare. Municipalities can also transfer to Municipal Union other functions, such as Economic development, In-house production services, Culture, Sport and Tourism.

Finally, the regional administrations are endowed with strong regulatory powers regarding municipalities belonging to Unions. In fact, each region, through its own regional law, can stimulate and promote Municipal Unions within its territory, by means of regional transfers. Some Regions - such as Veneto, Toscana and Emilia Romagna - sustained the creation of Municipal Unions using different financial incentives (e.g length of permanence or size of the Union), whereas other regions did not promote any form of support. A particular case is Lombardia, which has created a special register of Municipal Unions (Unioni di Comuni Lombardi), such that only registered municipalities have access to regional transfers.

The share of the Municipal Unions budget on the total expenditure of local governments has increased over time. For example, in 2007, the total expenditures of Municipal Unions accounted for about 0.10% (403 million of euro) of the total local expenditures in Italy (350 billion of euro). In 2013, the total expenditures of Municipal Unions are more than doubled, accounting for about 0.30% (970 million of euro) of the total local expenditures in Italy (334 billion of euro). However, these percentages do underestimate the real expenditure quota of the Unions, because Municipalities do not often transfer their expenditure quota of the function delegated to the Union, and continue to register it as an expenditure of the Municipality.

On the revenue side, the Municipal Union relies on both transfers from municipalities within the Union and transfers from higher level of governments (State and regional governments).

3   Empirical Approach

As discussed in the previous section, the regional administrations regulate and implement the Municipal Unions through their own laws. Consequently, the process of organization of Municipal Unions has not been homogeneous both over space, i.e. across regions in Italy, and over time (during the period of our analysis 2001-2011). This implies that municipalities in a Union located in different regions are not properly comparable, and therefore we cannot identify a unique (aggregate) effect of the policy on municipalities expenditures.

Hence, we decide to restrict our analysis to one region only, Emilia Romagna. This is an administrative region of northern Italy, with a population average of about 4 million inhabitants over the period 2001-2011 (approximately 7.50% of the Italian population). The average GDP, over the same period, is 116 billion euros (approximately 9% of the Italian GDP).

The choice of Emilia Romagna depends, first of all, on the availability of data on all municipalities in the territory of this region. Second, inter-municipal cooperation is a widespread phenomenon throughout Emilia Romagna. During the last decade, indeed, the number of Municipal Union has noticeably increased, involving the greatest proportion of municipalities among ordinary status regions.

Third, Emilia Romagna is a good example of an economically strong, productive and administratively efficient area. We are, therefore, confident that the effect we find is a good indicator of the overall efficacy of the Municipal Union policy.

3.1 Data

We use data on Italian municipalities, resulting from a combination of different archives publicly available from the Italian Ministry of the Interior, the Italian Ministry of Economy and the Italian Institute of Statistic. Our data includes a full range of information organized into two sections: 1) municipal financial data; 2) municipal demographic and socio-economic data, such as total current expenditures, population size, age structure, average income of inhabitants. As mentioned above, we only consider Emilia Romagna Region, and we can potentially observe 348 municipalities for the period 2001-2011. However, we exclude Bologna because of its specific status of Metropolitan Area, which normally provides a much wider range of services than other municipalities. Moreover, due to the lack of observations in some variables/years of interest our final sample reduces to an average value, over the period 2001-2011, of 335 municipalities, for a total of 3,686 observation[5].

3.2 Municipal Unions in Emilia Romagna

In our data we have information on municipalities that at some point, during the period 2001-2011, have decided to enter or form a Municipal Union. Figure 1 shows the map of all municipalities in Emilia Romagna in 2001. There are only one Municipal Unions, including 9 municipalities and serving 20,767 inhabitants, around 1% of the regional population. Figure 2 shows a completely different picture, indeed, in 2011 the Municipal Unions sum up to 31, involving 160 municipalities and serving 1,5 million of inhabitants, that is 34% of the total population of Emilia Romagna.

The Municipal Unions are composed, on average, by 5 municipalities (from a minimum of 2 to a maximum of 10) and cover an average population of approximately

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[5]Summary and descriptive statistics are shown, respectively, in the Appendix, Table A1 and A2.

43,000 inhabitants. The *Unione Valle Tidone*, composed by only two municipalities, is the smallest, serving 3,096 inhabitants. The *Unione Comuni Modenesi del Distretto Ceramico*, composed by 4 municipalities, is the largest Municipal Union, serving 107,138 inhabitants.

The decision to enter into a Municipal Union belongs to the single municipality, even though the regional government has the power to regulate the process of inter-municipal cooperation within its boundary. In particular, the government of the Emilia Romagna approved in 2008 an important regional law (Regional Law 2008, n.10) aiming at reorganizing the territory, in terms of institutional bodies, in order to rationalize public expenditure. Emilia Romagna transformed the mountain communities (an institutional organization formed only by mountain municipalities) in Municipal Unions and strongly encouraged municipalities to form Municipal Unions, by means of financial incentives directly to the Union. This is reflected in Figure 3, which depicts the percentage of municipalities belonging to a Municipal Union over the time. Notice that the rate of participation of municipalities in Municipal Unions is less than 20% until 2007, but it has a striking increase from 2008, reaching almost 50% by the end of the decade.[6]

Table 1 shows that the number of municipalities in Union increases over the time, switching from 9 (2.67% of all municipalities) in 2001 to 160 (47.06% of municipalities) in 2011. As previously said, the bulk of municipalities forming and/or joining a Union occurred between 2007 and 2009. Indeed, in 2007, 54 municipalities (16.12%) were in a Union, while in 2008 the number of municipalities in a Union increased up to 70 (20.83%). Finally, for the years 2009 and 2010, the number of municipalities in a Union was, respectively, 132 (39.88%) and 150 (43.73%).

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[6]The trend is continuously growing and by 2016 the percentage of municipalities in unions is 81%.

3.3 Expenditures

We are interested in the impact of belonging to a municipal Union on the fiscal performance of municipalities. Hence, in our analysis, we use the total current expenditure of each municipality, in per-capita terms. Since this is an aggregate measure it allows us to compare the performances of municipalities in a Union and not in a Union.

Notice that the total current expenditure for municipalities in a Union includes the transfers of these municipalities to the Union. In fact, the services provided by the Unions are essentially financed through those transfers and by direct expenditures registered in the budget of the municipalities.

As a preliminary piece of evidence it is interesting to look at the mean difference in per capita expenditure between municipalities in Union and municipalities not in a Union. In particular, the average per capita expenditure of municipalities in a Union is 751.10 euros and 835.99 euros for the others. This gives a differences of 84.88 euros p.c.[7] which is statistically different at 1%.

Figure 4 depicts the evolution of the current expenditure p.c. (in logs) for municipalities in a Union and municipalities not in a Union. Up to 2008, we observe a similar trend for all municipalities. However, after 2008, the expenditure of municipalities in a Union sharply decreases; whereas, the expenditure of municipalities not in a Union increases reaching a peak in 2009 and then stabilizes at a relatively high level. Notice that this timing corresponds to the introduction in 2008 of the regional reform law mentioned above, which has been followed by a strong increase in the number of Municipal Unions. Before 2008 only few municipalities were in Unions, whereas the bulk of entering and/or forming a Union occurred after 2008, as previously shown in Figure 3

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[7]From now on per capita is reported as p.c.

4 Identification strategy

In this section we describe the main strategies to identify the causal effect of being a member of a Municipal Union on the spending decisions of single municipalities. Ideally, we would like to compare decisions on expenditure when municipalities belong to a Municipal Union (treated group) to the counterfactual situation, that is what would have happened to the treated group if there had been no participation in the Municipal Union. This is impossible, therefore we have to define a suitable control that can credibly estimate the counterfactual. The best way would be to randomly assign participation and non participation in a Municipal Union across municipalities, and compare the average outcomes (expenditure) of the two groups. In the absence of a randomized control trial, we need to turn to quasi-experimental methods. The main concern with these approaches is that municipalities in the Municipal Union could be different from the municipalities not in the Municipal Union, and these differences might be correlated with expenditures, that is unobservable characteristics that vary across municipalities, but are fixed over time, might confound the identification.

We exploit the panel dimension of our data and employ a difference-in-differences methodology. For each year, we have a group of municipalities that are in the Municipal Union (treated municipalities) and a group of municipalities that do not take part in Unions, and can act as control group. We therefore compare the change in outcomes in the treatment group before and after the participation in a Municipal Union, to the change in outcomes in the control group for the same period. We estimate the following two-way fixed effect linear model

$$Y_{it} = \mu_i + \tau_t + \gamma MU_{it} + \beta \mathbf{x_{it}} + \varepsilon_{\mathbf{it}} \tag{1}$$

where Y_{it} is log per capita expenditure in municipality i at time t, MU_{it} is a dummy variable that takes on the value one if municipality i at time t belongs to the Municipal Union and zero otherwise. μ_i are a set of municipalities fixed effects, and we also control for exogenous shocks, τ_t, common to all municipalities in period t. $\mathbf{x_{it}}$ is a vector of time-varying variables, accounting for demographic and socio-economic characteristics. In particular, we include the population of the municipality (*population*), the population density, calculated as the number of citizens per area (*population density*), and the inverse of the population (*1/population*). These variables can capture the presence of scale economies or dis-economies in the provision of public goods and congestion effects. The proportion of citizens aged between 0 and 5 (*child)* and the proportion of citizens aged over 65 (*aged*) can account for some specific public needs (e.g., nursery school, nursing homes for the elderly). Regarding the economic and financial controls we include the average per capita income proxied by the personal income tax base (*income*) and the proportion of taxpayers (*taxpayers*). We also control for the total per capita revenue collected by the Municipal Union, given by the sum of its own total revenue and the transfers from higher levels of government.[8] Not including this variable would bias our estimates, since we could not properly separate the effect of being in the Municipal Union from the variation in the financial resources raised by the Municipal Union.[9] Finally, the error term

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[8]This variable varies every year at the Municipal Union level, implying that all municipalities belonging to the same Unions share the same value.

[9]An example can be useful for interpretation. Consider a municipality M that enters in year T in a Municipal Union. M transfers a given amount of money, say 100 euros, to the Union. The total expenditure of M, including the transfer to the Union, for the year T is 900+100=1,000 euros. Then, suppose that the same municipality in year T+1 transfers to the Union a lower amount of money, say 50 euro. This because in year T+1 the Municipal Union has received more transfers from the regional government. Assume that the expenditure of municipality M, net of transfers to the Union, is constant (900) between year T and T+1. Therefore, the total expenditure of municipality M in year T+1 is 950 euro. If we compared the total expenditure of municipality M, between year T and year T+1, we would observe a reduction (from 1000 to 950). However, such a

ε_{it} is assumed to be independent of μ_i and τ_t, and we cluster the standard errors at municipal level. In this framework, γ, is the difference-in-difference estimate of the effect of being in a Municipal Union on expenditure.

5   Results

In Table 2 we show the Diff-in-Diff estimates. In particular, in column 1 we estimate equation 1 in the full sample, including only municipality and year fixed effects. We find that being a member of a Municipal Union decreases the municipalities expenditures by 6.5%, and the effect is significant at 1%. One issue is that there may be municipality characteristics varying across time and space, potentially correlated to participation to a Union and expenditures. We therefore estimate our DiD model controlling for a series of demographic and socio-economics factors described in Section 4. The inclusion of the control variables slightly changes the magnitude of the treatment effect. In fact, looking at column 2 in Table 2, we notice that the coefficient of Municipal Union is still negative (-4.7%) and significant (at 1%), however it drops by 1.8 percentage points compared to the previous estimate in column 1. This implies that it is important to control for differences among municipalities.

We also investigate whether there is evidence of heterogeneity in the effects of the policy. One way of thinking about this is whether the effect of the policy varies with respect to the permanence in Municipal Union. In fact, the models estimated so far do not directly take into account of the length of time spent by each municipality in the Union after joining it. This is an important issue since we are dealing with multiple treatment groups and multiple time periods. We, therefore, estimate a mod-

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reduction, would not be due to efficiency gains resulting from the participation to the Union. On the contrary, this would be due to the reduction in transfers from the municipality to the Municipal Union.

ified version of equation 1, where we add a new variable given by the product of the dummy *Municipal Union* with a continuous variable that measures the permanence (*permanence*) in the Union (from zero to 11 years), and we also include its quadratic term (*permanence square*). In column 3 of Table 2 we notice that permanence in a Union has a concave effect, and one additional year reduces on average the expenditures by 2.2%. To better understand the dynamic of the permanence in a Union, we have disentangled the aggregate effect in annual effects, and reported the results in Table 3. It is interesting to observe that the reduction in expenditures almost doubles after 3 years in a Union (from -3% to -6.4%). The effect is highly significant and strongly increases up to 6 years from the entrance in a Municipal Union, then stabilizes at around -8%. It clearly decreases after 7 years and then disappears.

The estimations carried out so far might, however, suffer of two potential sources of bias, as the effect of entering a Union is not homogeneous but varies according to the characteristics of the municipalities. The first bias, indeed, arises when there are municipalities that enter a Union, but there are no comparable municipalities that enter a Union, that is municipalities in the treatment group are somehow different than those belonging to the the control group. The second source of bias might be due to different distributions, within the treatment and the control groups, in the vector of observable characteristics that affect expenditures.

We attempt to eliminate these biases in the estimations by adopting matching models. The main purpose of matching is to find a group of non-treated municipalities, who are similar to the treated in all relevant pre-treatment characteristics, $\mathbf{x}$, the only remaining difference being that one group enters a Union and another group does not.

In the first stage we therefore estimate the propensity score[10] using a discrete

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[10]The probability of entering a Union conditional on pre-treatment characteristics $\mathbf{x}$, $P(\mathbf{x}) =$

response model of entering a Municipal Union. In particular, we use data from the 2001 Census and run a logit regression, where the dependent variable is given by a dummy variable which takes the value of 1 if a municipality entered in the Municipal Union during the period 2001-2011 and zero otherwise, and the control variables are: a dummy variable equal to 1 if the municipality is located close to the coast and zero otherwise *(coastal zone)*, a dummy variable equal to 1 if the municipality is a rural municipality and zero otherwise (*rural municipality*), surface in km2 of the municipality (*area*) and its square ($area^2$), a categorical variable (*altimetry zone*) equal to 1 if the municipality is located in plain, equal to 2 if the municipality is located in hills, and equal to 3 if the municipality is located in mountains, the municipal unemployment rate (*unemployed*), the number of houses (*houses*), the number of firms (*firms*), an interaction term between the municipal surface and the number of houses (*int_houses*) and an interaction term between the number of firms and the unemployment rate (*int_unemployment)*. The fitted values of the previous logit regression let us define the propensity score variable, which is then used to find the common support. The common support includes municipalities whose propensity scores are greater than the propensity score at the first percentile of the treatment municipalities and municipalities whose propensity score are lower than the propensity score at the 99th percentile of the control municipalities.

Once we have obtained the common support, we estimate equation 1 by using information only on the observations that lie on the common support. This should control for the first source of bias. The results in columns 4, 5 and 6 of Table 2 replicate the previous estimates for the sub sample of matched municipalities and all the results, in terms of both the size and the statistical significance of the estimated coefficients, are fully confirmed. Even the dynamic of the permanence in a Union is

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$Pr(MU = 1|\mathbf{x})$

fully confirmed when the matched sample is used (Table 3, column 2).

However, within the common support, the distribution of **x** might be different between treated and control observations, leading to a bias estimates. Therefore, we control for the second form of bias by using a kernel density weighting approach (Heckman et al., 1998), which allows to estimate a non-parametric DiD matching estimator[11], by re-weighting the expenditure of the control group observations:

$$\gamma^{DiD} = \sum_{i \in MU} \left\{ \left[Y_{it_1} - Y_{it_0} \right] - \sum_{j \in NMU} W_{ij} \left[Y_{jt_1} - Y_{jt_0} \right] \right\} w_i \qquad (2)$$

where t_0 and t_1 are time periods before and after entering a Union. Specifically, MU is formed by municipalities not Municipal Union in t_0 that will join a Union in t_1, NMU is formed by municipalities not Municipal Union in t_0 that will remain out of any Union in t_1. W_{ij} is the weight placed on the jth observation in constructing the counterfactual for the ith treated observation. Y is the expenditure of municipalities and w_i is the re-weighting that reconstructs the outcome distribution for the treated sample. The result of this analysis is reported in the column 7 of Table 2. In order to have a balanced sample between the two comparison groups, we choose the years 2008 and 2010 as pre-treatment and pos-treatment period, respectively. We have already mentioned the important regional reform law approved in Emilia Romagna in 2008, and the subsequent strong increase in the number of municipalities that entered and/or formed a Union (this pattern is clear looking at Figures 3 and 4 and at Table 1). In the treatment group we include only municipalities that join a Municipal Union in 2009, and in the control group municipalities that never joined a Union. We than perform the matching approach as in equation 2, by comparing

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[11]The Kernel matching approach has been performed by using the Stata command *diff* developed by Villa (2012).

expenditure between treated and control municipalities, in 2008 and in 2010. We find that being in a Municipal Union reduces the expenditure by around 6%: such an effect is significant at 1% and in line with the previous results.

The results presented so far show that inter-municipal cooperation leads to an increase in the efficiency of the single municipality, as the municipal expenditure reduces once a municipality enters a Municipal Union. However, such a reduction might not be the result of a gain in efficiency, but, instead, it could be a consequence of a cut in the level or in the quality of public services. Testing for for changes in the level of public services is not an easy task, as it is difficult to measure quantity or quality of all local provision of public services, but we mange to test whether local services were affected by inter-municipal cooperation by relying on four variables which can be seen as proxies of the level of public services. In particular, drawing from the literature [Blesse and Baskaran, 2016; Reingewertz, 2012], we use the per-capita birth rate (*birth rate*), the net migration (*net migration*) to the municipality, the per capita class size of primary school (*class size of primary school*) and the per capita number of road accidents (*road accidents*). If local services decline we would expect an increase of the migration rate and a decrease of the birth rates, as a result of a lower attractiveness of the municipality. Moreover, a decrease in current expenditure would imply a reduction in the quality of education, and hence we would expect a decrease in the per capita class size of primary school. Finally, a decrease in current expenditure would also lead to reduction in the quality of the maintenance of roads, bridges, resulting in a (potentially) increase of car accident: the worse the roads are, the greater the probability of road accidents.

Turning to the estimations, Table 4 (Panel A) shows that inter-municipal cooperation has no effect on any of our service variables. The same picture emerges if we run regressions using only the observations laying on the common support, (Ta-

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ble 4 - Panel B), with the only exception being the negative and significant effect (10%) found for *road accidents.* These results indicate that the participation in the inter-municipal cooperation is not associated to a reduction in the service of public service, thus suggesting that the Municipal Union is a tool that allows municipalities to gain efficiency, in terms of a reduction in public expenditure.

6   Robustness Checks

The key identification assumption of difference-in-differences models is that the secular time trends, in the control and the treatment municipalities, were the same in the per-intervention periods. In fact, if the secular trends are the same in the per-policy periods, then it is likely that they would have been the same in the post treatment period, if the treated municipalities had not joined or formed a Union. Figure 4 already suggests that the trends of the (log) per-capita current expenditure in treated and control municipalities are similar, before the bulk of municipalities joining a Union occurred.

However, in a model with multiple treatment groups and multiple time periods, like ones displayed in equation 1, one way to evaluate the common trend assumption is to allow for leads and lags of the the treatment. We test whether, conditional on municipality and year fixed effects, past treatment variable MU_{it} predicts Y_{it} while future MU_{it} does not. We estimate a modified version of equation 1

$$Y_{it} = \mu_i + \tau_t + \sum_{j=0}^{m} \gamma_{-j} \, MU_{i,t-j} + \sum_{j=1}^{n} \gamma_{+j} \, MU_{i,t+j} + \beta \mathbf{x_{it}} + \varepsilon_{\mathbf{it}} \qquad (3)$$

where the sum of γ_{-j} allows for m lags or post-treatment effects and the sum of γ_{+j} allows for n leads or anticipatory effects. A test of the difference in differences

assumption is $\gamma_{+j} = 0$ for each $j = 1 \ldots n$, i.e. the coefficients of all leads of the treatment should be zero. If MU_{it} causes Y_{it} but not vice versa, then dummies for future treatment change should not matter in equation 3. Furthermore, the pattern of lagged effects may be of interest as well as γ_{-j} may not be identical and, for example, if the effect of treatment is growing over time γ_{-j} increases in j.

To assess the validity of the common trend assumptions we estimate equation 3 both in the full sample and in the matched sample (Tab. 5). In particular, in col. 1 we use the full sample and we include only the leads[12] of the treatment finding, as expected, that the coefficients of the leads are always not significant up to 3 years, while the main effect of the Municipal Union is, instead, negative (around -4.4%), statistically significant at 1% and in line with the previous results. The same results are found for the sample of matched municipalities (col. 3, Tab. 5).

Then, in col. 2 - where we use the full sample - we report the estimates including the lagged treatments. The leads remain not statistically significant, and the coefficients of the lags are not identical, suggesting that the negative effect of the Municipal Union on expenditure is growing over time. Also in this case the results are confirmed when we use the sample of matched municipalities (col. 4, Tab. 5). The results of this test reassure on the validity of the common trend assumption.

Another important assumption in our model is the absence of reverse causality, that is we exclude any direct effect of expenditure on the decision to join a Municipal Union. In order to test this assumption we estimate the conditional probability to

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[12]In order to build the leads variables we have collected information about the participation of the single municipality in the Municipal Union for the years 2012, 2013 and 2014. For example, the lead variable for municipality i in year 2011 implies to know wether municipality i will join a Municipal Union in 2012.

enter a Union for a municipality i at time t, given that the event has not yet occurred

$$h_{it} = P[T_i = t | T > t - 1, Y_{it}, \mathbf{x_{it}}] \tag{4}$$

where T is the time in years before joining a Union and $\mathbf{x_{it}}$ is a vector of observed explanatory variables, which can be time-variant and time-invariant, and Y_{it} is log expenditure. Following Jenkins [1995] we specify the form of the hazard function as a complementary log-log hazard rate and we use a piecewise-constant baseline hazard by including dummy variables for each year. Thus, within each time interval the duration dependence is assumed constant. This represents a semi-parametric, discrete-time, hazard model which can be written as

$$h_{it} = 1 - \exp(-\exp(\alpha \mathbf{d_{it}} + \beta \, \mathbf{x_{it}} + \eta \, Y_{it})) \tag{5}$$

We also generalize this model to account for any unobserved municipality-specific effects by including a random intercept q_i, which is uncorrelated with all the covariates, [Narendranathan and Stewart, 1993]. Our hypothesis is that the coefficient η of log expenditures is not significant, i.e. there is no reverse causality. This test is reported in Table 6, where we show the effect of log expenditures in the discrete-time hazard model in equation 5, which also includes a full set of municipality characteristics. We report the estimates for the homogeneous and heterogeneous models. However, unobserved heterogeneity does not appear to be an issue, indeed the coefficient of log expenditure is identical for both models. This is also clear looking at the high p-value of the likelihood ratio test of the hypothesis of zero unobserved heterogeneity. For ease of interpretation we have expressed the estimated coefficient of the log expenditure variable as a hazard ratio. Looking at these results it is evident that

there is no reverse causality, because the effect of expenditure on the conditional probability to enter and/or form a Union is not significant.

As final robustness check we estimate our DiD model using a more homogeneous definition of the control group. Firstly, we restrict the sample to the years 2001-2008, then we define, as the control group, those municipalities that enter a Union between 2009 and 2011 (future treated) together with all the municipalities observed in the years before entrance (within the period 2001-2008) and, finally, we exclude municipalities never treated. This is important because it means that we include in the control group municipalities that are simply further down the 'queue' for participation in the policy.

We estimate equation 1 in the full sample (col. 1, Table 7) and in the matched sample of municipalities (col. 2, Table 7), finding that the effect of being in a Municipal Union is associated with a 7% reduction in the municipality expenditures, statistical significant at 1% and consistent with our previous findings.

7   Conclusion

Inter-municipal cooperation is a widespread phenomenon among local governments, and it is used by municipalities in order to provide local public services. However, we still know very little about its efficiency. In this study we investigated whether this local form of coordination has an impact on the level of per-capita expenditure of the single municipalities. Each cooperating municipality can exploit economies of scale and internalize externalities, and we test whether there are efficiency gains in terms of local expenditure reduction.

In particular, we analyzed the Italian experience of Municipal Unions, using a unique administrative data on the municipalities belonging to the Emilia Romagna

region. In the period considered, 2001-2011, almost half of the municipalities decided to enter or form Municipal Unions. We employed a difference-in-differences approach combined with matching models to estimate the causal effect of being member of a Municipal Union on local expenditures. We found that participation to a Union reduces the total current per-capita expenditures by around 5-6%, compared to municipalities not in a Union. The effect is persistent and increases up to nine years from the participation in a Municipal Union. Moreover, we showed that entering the Municipal Unions do not decrease the quality of serviced provided to the resident, letting us to conclude that the Municipal Union can be an efficient tool that allows municipalities to gain efficiency, in terms of a reduction in public expenditure, while maintaining unchanged the level of public services.

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Figure 1: Emilia Romagna municipalities – 2001

Note: municipalities and Municipal Unions in year 2001. Municipalities belonging to the same Municipal Union share the same color.

Figure 2: Emilia Romagna municipalities – 2011
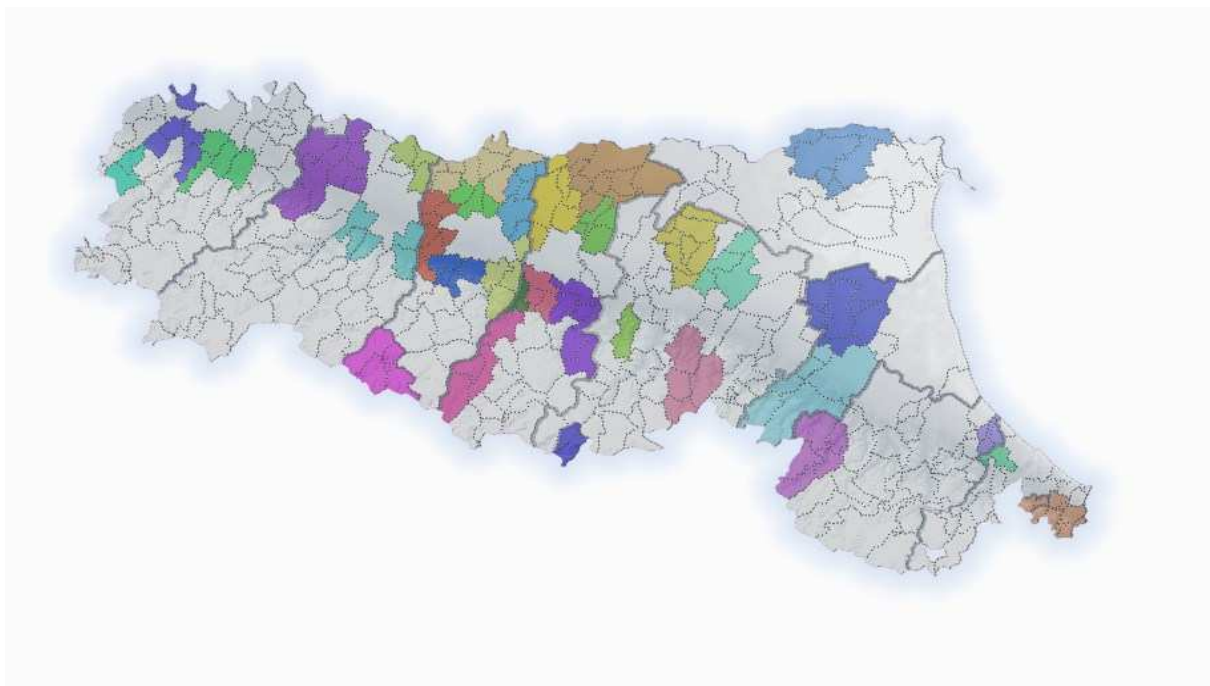
Note: municipalities and Municipal Unions in year 2011. Municipalities belonging to the same Municipal Union share the same color.

Figure 3: Percentage of municipalities in Union

Figure 4: Evolution of municipal expenditure – 2001-2011

Table 1: Municipalities in Unions in Emilia Romagna 2001-2011

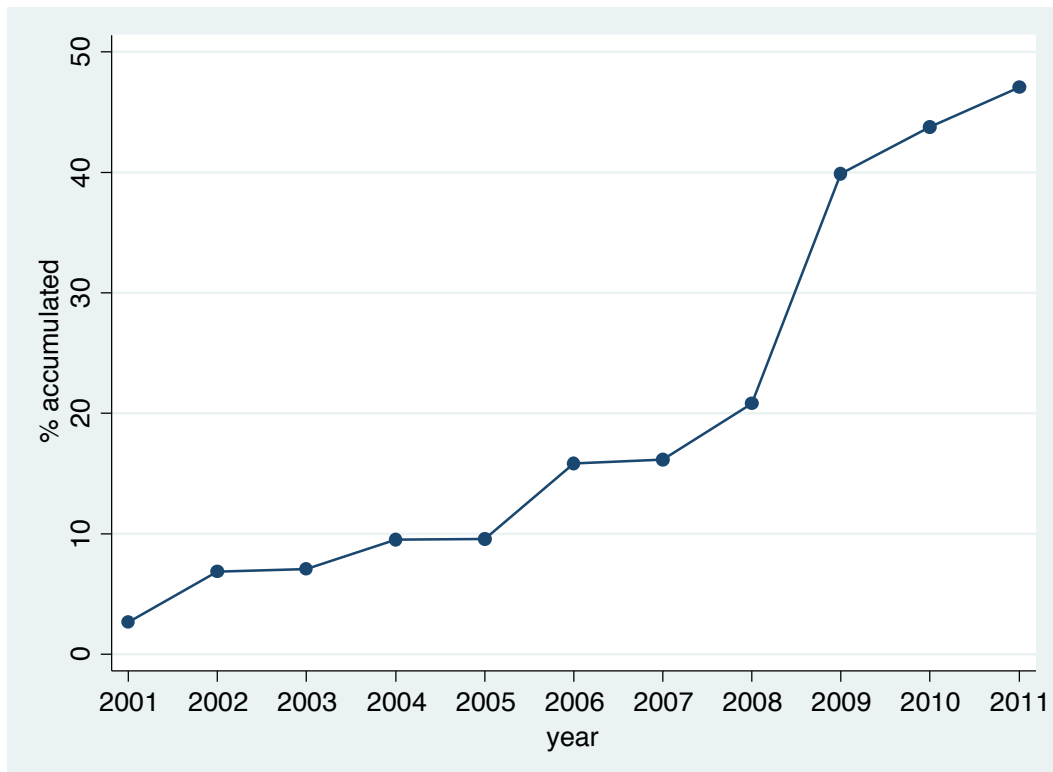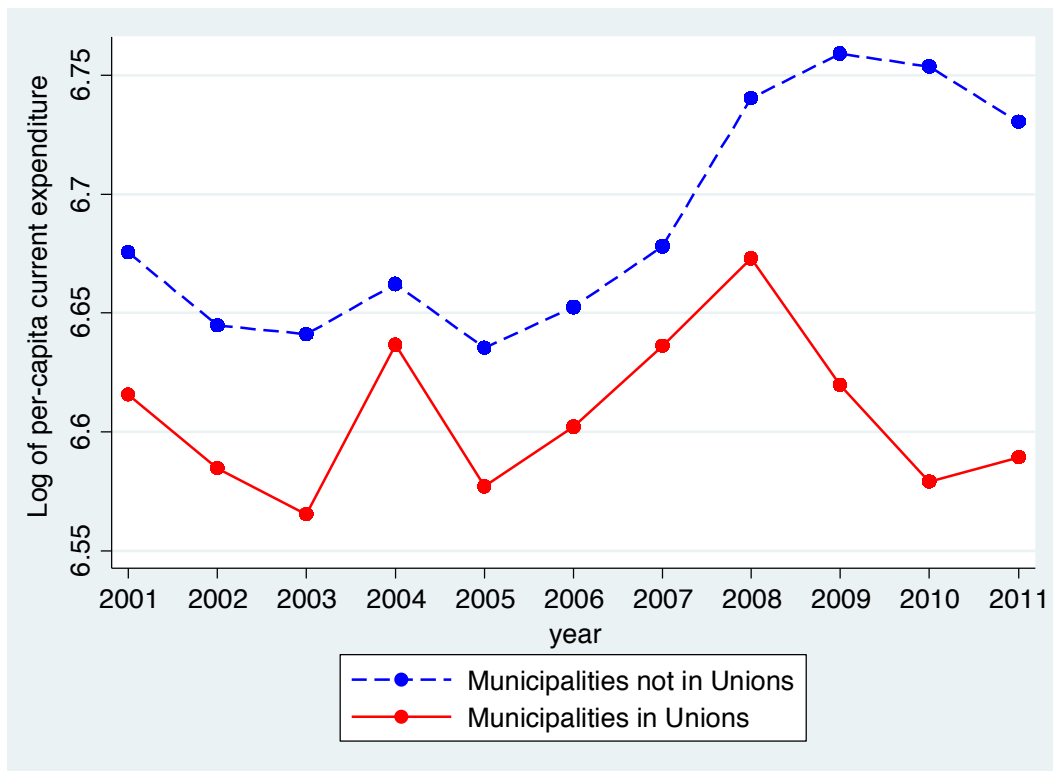| Year	Municipal Unions	Municipalities not in Unions	Municipalities in Unions	% of municipalities in Unions	Total municipalities
2001	1	328	9	2.67	337
2002	5	314	23	6.82	337
2003	5	303	23	7.06	326
2004	6	305	32	9.50	337
2005	6	303	32	9.55	335
2006	10	277	52	15.81	329
2007	10	281	54	16.12	335
2008	13	266	70	20.83	336
2009	25	199	132	39.88	331
2010	29	193	150	43.73	343
2011	31	180	160	47.06	340

Table 2: Effect of the Municipal Union on Log Expenditures

Dependent variable:				Log Expenditure			
		Full Sample			Matched Sample		Matching Diff-in -Diff
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Municipal Union	-0.065***	-0.047***	-0.030**	-0.063***	-0.048***	-0.030**	-0.057***
	(0.012)	(0.015)	(0.015)	(0.013)	(0.016)	(0.015)	(0.020)
Permanence			-0.022***			-0.021***	
			(0.006)			(0.006)	
Permanence Square			0.002***			0.002***	
			(0.000)			(0.000)	
Union							
Observations	3,686	3,586	3,586	3,411	3,311	3,311	432
Year FE	YES	YES	YES	YES	YES	YES	
Municipality FE	YES	YES	YES	YES	YES	YES	
Municpality controlos	NO	YES	YES	NO	YES	YES	
R-squared	0.065	0.126	0.132	0.062	0.121	0.127	

Notes: period 2001-2011. In col. (2) and (5) we control for the following variables: population, population density, 1/population, child, aged, income, taxpayers and revenue of Municipal Unions. Standard errors clustered at municipal level are shown in parenthesis. In col. (7) we perform the kernel difference-in-difference matching estimator, using the years 2008 and 2010. The control group is given by those municipalities never in Municipal Union and the treatment group is given by those municipalities that joined a Municipal Union in 2009. Significance levels: *** 1%; ** 5%; * 10%.

Table 3: Permanence in the Municipal Union

Dependent variable:	Log Expenditure	
	Full Sample	Matched Sample
	(1)	(2)
1 year	-0.030**	-0.030**
	(0.015)	(0.015)
2 years	-0.049***	-0.049***
	(0.016)	(0.016)
3 years	-0.064***	-0.064***
	(0.018)	(0.018)
4 years	-0.075***	-0.074***
	(0.020)	(0.021)
5 years	-0.081***	-0.079***
	(0.023)	(0.024)
6 years	-0.082***	-0.080***
	(0.026)	(0.027)
7 years	-0.080***	-0.077***
	(0.029)	(0.029)
8 years	-0.072**	-0.069**
	(0.032)	(0.032)
9 years	-0.061*	-0.057
	(0.034)	(0.035)
10 years	-0.044	-0.040
	(0.037)	(0.038)
11 years	-0.024	-0.018
	(0.040)	(0.041)

Notes: Standard errors clustered at municipal level are shown in parenthesis. Significance levels: *** 1%; ** 5%; * 10%.

Table 4: Effect of the Municipal Union on local public services

		Panel A: Full Sample		
Dependent variable:	Birth rate	Class size of primary school	Net migration	road accidents
	(1)	(2)	(3)	(4)
Municipal Union	0.0000	0.0001	-6.2561	-0.0002
	(0.0001)	(0.0003)	(7.6661)	(0.0001)
Observations	3,613	2,320	3,613	3,524
		Panel B: Matched sample		
Dependent variable:	Birth rate	Class size of primary school	Net migration	road accidents
	(1)	(2)	(3)	(4)
Municipal Union	0.0000	0.0001	-4.4142	-0.0002*
	(0.0001)	(0.0003)	(6.9843)	(0.0001)
Observations	3,311	2,120	3,311	3,231

Notes: period 2001-2011. In each column we control for both municipal and year fixed effects and also for the following variables: population, population density, 1/population, child, aged, income, taxpayers and revenue of Municipal Unions. Standard errors clustered at municipal level are shown in parenthesis. Significance levels: *** 1%; ** 5%; * 10%.

Table 5: Testing the common trend assumption

Dependent variable:	Log Expenditure			
	Full Sample		Matched Sample	
	(1)	(2)	(3)	(4)
Municpal Union	-0.044***	-0.018*	-0.043***	-0.017*
	(0.011)	(0.009)	(0.011)	(0.009)
Municpal Union $_{t+1}$	0.006	0.004	0.007	0.005
	(0.010)	(0.010)	(0.010)	(0.010)
Municpal Union $_{t+2}$	-0.010	-0.009	-0.013	-0.013
	(0.011)	(0.011)	(0.011)	(0.011)
Municpal Union $_{t+3}$	0.013	0.008	0.015	0.010
	(0.009)	(0.010)	(0.009)	(0.010)
Municpal Union $_{t-1}$		-0.025**		-0.025**
		(0.010)		(0.010)
Municpal Union $_{t-2}$		-0.022*		-0.021
		(0.013)		(0.013)
Observations	3,631	3,631	3,356	3,356
Year FE	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES
Municpality controlos	YES	YES	YES	YES
R-squared	0.124	0.127	0.122	0.124

Notes: period 2001-2011. In each column we control for both municipal and year fixed effects and also for the following variables: population, population density, 1/population, child, aged, income and taxpayers. Standard errors clustered at municipal level are shown in parenthesis. Significance levels: *** 1%; ** 5%; * 10%.

Table 6: Estimates of the effect of the expenditures on the probability to join the Municipal Union

	Homogenous				Heterogenous				
	Coeff	s.e.	Hazard Ratio	Log L	Coeff	s.e.	Hazard Ratio	Log L	P-val
Log Expenditure	-0.317	(0.241)	0.728	-473.537	-0.317	(0.330)	0.728	-473.537	0.496

Notes: LR test of model with normal distributed heterogeneity against model without controlling for heterogeneity. All models control for population, population density, 1/population, child, aged, income, taxpayers and revenue of Municipal Unions. Significance levels: *** 1%; ** 5%; * 10%.

Table 7: More homogenous control groups

Dependent variable:	Log Expenditure	
	Full Sample	Matched Sample
	(1)	(2)
Municpal Union	-0.069***	-0.070***
	(0.021)	(0.021)
Observations	1,161	1,145
Year FE	YES	YES
Municipality FE	YES	YES
Municpality controlos	YES	YES
R-squared	0.088	0.095

Notes: period 2001-2008. Control municipalities are those that will join a Municipal Union during the period 2009-2011 and treatment municipalities are those that joined a Municipal Union during the period 2001-2008. Municipalities never in the municipal Union are excluded. In each column we control for both municipal and year fixed effects and also for the following variables: population, population density, 1/population, child, aged, income, taxpayers and revenue of Municipal Unions. Standard errors clustered at municipal level are shown in parenthesis. Significance levels: *** 1%; ** 5%; * 10%.

Table A1: Summary Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Log expenditure	3686	6.663	0.287	5.733	8.329
Municipal Union	3784	0.196	0.397	0.000	1.000
Population	3686	11419.580	23150.210	91.000	186690.000
Child	3686	0.051	0.013	0.000	0.083
Aged	3686	0.238	0.066	0.120	0.638
Income	3686	13223.430	2086.341	5425.244	20525.250
Population density	3686	0.017	0.025	0.000	0.275
Taxpayers	3686	0.706	0.099	0.324	1.083
1/population	3686	0.000	0.001	0.000	0.011
Revenue of Municipal Unions	3684	11.198	37.796	0.000	321.683
Permanence	3784	0.587	1.812	0.000	15.000
Permanence square	3784	3.627	16.803	0.000	225.000
Birth rate	3686	0.009	0.003	0.000	0.027
Class size of primary school	2351	0.024	0.007	0.000	0.061
Net migration	3784	41.461	121.474	-1773.000	1366.000
Road accidents	3592	0.004	0.003	0.000	0.024

Table A2: Descriptive Statistics

Variable	Definition and measure	Available from-to	Source
Log expenditure	Log of current expenditure per resident; 2011 Euros	2001-2011	Italian Ministry of Interior
Municipal Union	Dummy variable that takes on the value one if municipality i at time t belongs to a Municipal Union and zero otherwise.	2001-2011	Italian Ministry of Interior
Birth rate	birth rate per capita	2001-2011	ISTAT
Class size of primary school	Number of children enrolled in infant school (per-capita)	2004-2011	ISTAT
Net migration	Difference between new registered members and unregistered members	2002-2010	ISTAT
Road accidents	Number of accidents within the municipal roads	2001-2011	ISTAT
Taxpayers	share of the taxpayers of the municipality	2001-2011	Italian Ministry of Economy, Department of Finance
population	Population of the municipality	2001-2011	ISTAT
child	Share of the population aged between 0-5	2001-2011	ISTAT
old	Share of the population over the age of 65	2001-2011	ISTAT
population density	Numbers of citizens per area	2001-2011	Our computation
income	Real personal income tax base per resident; 2011 Euros	2001-2011	Italian Ministry of Economy, Department of Finance
1/population	inverse of the population	2001-2011	Our computation
Revenue of Municipal Unions	Sum of the revenue from fees and charges and transfers from other level of governments per resident; 2011 Euros	2001-2011	Italian Ministry of Interior
Permanence	Number of years joining the Municipal Union	2001-2011	Our computation
Permanence square	Square of number of years joining the Municipal Union	2001-2011	Our computation