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# Cohesion Policy Funds and local government autonomy: evidence from Italian municipalities

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## Abstract

In this article we investigate the effect of the European Union (EU) Cohesion Policy funds dedicated to administrative capacity building on the local government autonomy for the Italian case focusing on municipalities taking part to the programming cycle 2007-13. From an empirical perspective, the causal impact is estimated using a Difference-in-Differences (DiD) design with continuous treatment combined with a Propensity Score Matching approach. We exploit a unique database developed by the open government initiative on cohesion policies in Italy (OpenCoesione), which collects detailed information at municipality level on financed EU projects. Our results show that the specific Cohesion Policy funds have a positive and significant effect on the local government autonomy measured in terms of taxation autonomy.

*Keywords:* EU funds; Cohesion policy; Taxation autonomy; Difference-in-Differences; Italian municipalities

*JEL classification:* O43, O52, R8

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## 1. Introduction

European Union (EU) has been long developing a consistent Cohesion Policy through the use of specific centralized instruments, such as the structural funds, with the stated aim of offsetting the imbalances that could benefit some regions in the core of the continent at the expense of regions at its periphery (Krugman, 1991). However, despite the existence of such imbalance in terms prosperity and opportunities between and within EU member states and regions (Farole et al., 2011), over time this policy has attracted both supporters and opponents. Among the first group are those who believe that Cohesion Policy is necessary to compensate the most backward regions for the negative effects that the reduction in barriers has had on their economies and to reduce the level of euro-skepticism (Crescenzi et al., 2020, López-Bazo, 2021). In the second group are those who, on the other hand, are convinced that the policy represents an enormous waste of resources, with high costs in terms of efficiency and, consequently, of economic growth (Kline, 2010).

These two opposite positions have generated a considerable amount of empirical work aimed at evaluating the effectiveness of such intervention at various levels. Although in most cases this policy seems to have an objective impact on growth, the direction, size and significance of the results appear to be highly heterogeneous, according for example to the time frame and the level of spatial disaggregation taken into account (see, for example, Rodríguez-Pose and Fratesi (2004), Mohl and Hagen (2010), and Becker et al. (2010)). Moreover, the methodological approaches used in most of these works were not accurate enough to allow to estimate causal effects. Only recently a new wave of studies has more directly addressed the problem of assessing the impacts of the policy against a suitable counterfactual scenario by adopting treatment effect methods. In this respect, noticeable references are represented by Giua (2017), who focuses on the Italian Mezzogiorno, estimating positive effects of the EU regional policy on regional employment; by Becker et al. (2018), who illustrate that the program's effects largely worked through an increase in publicly-funded investments and wages as well as compensation but not through private investment or employment growth; by Fattorini et al. (2020), who test the effects of the EU policy on the performance of a large set of European manufacturing firms, finding that the financing aimed at direct investments in research and development correlates with an firm productivity improvements while funding for general business support correlates with negative productivity growth rates; and by

Albanese et al. (2021) who show that European Regional Development Fund did not have a significant impact on local Total Factor Productivity growth.

Following this new strand of literature, our goal with this work is to focus on the role that EU Cohesion Policy had in terms of improving administrative and local government capacity on Italian municipalities during 2007-13 programming cycle. In particular, we investigate the potential effect of the Cohesion Policy on the degree of taxation autonomy with the corresponding result of pursuing local fiscal decentralization. To this aim, and in line with the existing literature, we consider the taxation autonomy as proxy of the local government capacity (Ladner et al., 2016).

We believe this work is important for at least three reasons. First of all, evaluating projects aimed at strengthening institutional capacities by improving the development of good policies and programs, is paramount.<sup>2</sup> Increasing the quality of the public sector is a widespread goal of policy makers, this trend being evident in ‘The Europe 2020 strategy’ document (EU growth strategy for this decade), which underlines the importance of efficient, effective and transparent public administrations (European Commission, 2010). As highlighted in the seminal work of Oates (1972), economists have recognized a number of benefits associated to a fiscal organization where local governments have more freedom to make their own spending decisions.<sup>3</sup> For this reason we investigate the potential effect of the Cohesion Policy funds on the degree of taxation autonomy at municipal level with the corresponding result of pursuing local fiscal decentralization.

This leads to the second reason for which, despite the general attitude to evaluate the impacts of regional policies at aggregated levels, the increasing availability of detailed municipality-level data allows a more in-depth investigation of the direct impact of these policies on their immediate beneficiaries in treated and non-treated areas (see, among others, Ciani and De Blasio

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<sup>2</sup>Indeed, it is well recognized that an effective public sector is one of the most important factors for development (World Bank, 1997). Government creates the environment in which the companies can gain competitive advantage, provides the basic national infrastructure, holds the critical responsibilities for healthcare and education, can stimulate and upgrade domestic demand (Porter, 1990).

<sup>3</sup>This is a key aspect also because strong local governments are indicative of self-governance, which could foster the strengthening of the EU democratization processes (Charasz and Vogler, 2021). Unless potential spatial externalities or economies of scale, public goods would be provided more efficiently if they were provided by the lowest level of government (Dougherty et al., 2019).

(2015)). Local-level evidence can reveal evidence that are unobservable at the aggregate level, thus providing important information to both national and local policymakers.

Finally, the third reason concerns the role that Italy plays within the recipients of the funds made available by the Cohesion Policy programs. With almost € 29 billion of European funds, Italy has been the third largest beneficiary of the EU's Cohesion Policy after Poland and Spain. Furthermore, the country has historically suffered from evident dysfunctions in terms of administrative capacity and bureaucratic performance, partly due by the unresolved social-economic dualism between northern and southern regions, partly by the presence of large fiscal imbalances among the different orders of government and territories (Lagravinese et al., 2018, Greco et al., 2018, Patrizii and Resce, 2015).

Our empirical analysis is based on data coming from the open government initiative on cohesion policies in Italy (OpenCoesione). Thanks to these data we adopt a Propensity Score in Difference-in-Differences (DiD) design with continuous treatment, exploiting the high heterogeneity in the intensity of the received treatment. Our empirical findings suggest that the analyzed Cohesion Policy program had a positive and significant effect on the autonomy of the beneficiary municipalities, this result being robust to the inclusion of a large set of control variables and to different specifications.

The remainder of the paper is structured as follows. Section 2 briefly describes the institutional setting and introduces the conceptual framework while Section 3 describes the data at our disposal. Section 4 outlines the empirical strategy and Section 5 presents the main results with a discussion on the robustness of the findings. Finally, our conclusions are offered in Section 6.

## **2. Fiscal decentralization and the EU Cohesion Policy role**

Municipalities' revenues in Italy come from two main sources: transfers from the upper levels of government (mainly the central government) and from own revenues (taxes and fees). The presence of transfers from central government is justified by its willingness to solve territorial redistribution problems and to insure local governments against shocks (Persson and Tabellini, 1994, Boadway, 2004, Lockwood, 1999). Unfortunately, as shown by a large body of literature, intergovernmental transfers potentially undermines the autonomy and accountability of decentralized decision-making,

and usually generates fiscal illusion, a phenomenon which arises when the link between taxes and benefits is distorted and voters are less likely to sanction inefficient behaviors of politicians (Rodden, 2004, Bird, 1999).

To attenuate such problems, over the years several governments have moved in a direction of fiscal decentralization, which could be defined as the process that transfers decision-making powers to sub-national governments (Martínez-Vázquez et al., 2017). However, decentralization is a multifaceted phenomenon which encompasses political, administrative, and fiscal dimensions.<sup>4</sup> Among the different types of decentralization, fiscal decentralization has represented a key element of the recent public sector reforms (Manor, 1999, OECD and KIPF, 2016) also because it has been actively promoted as a development strategy by international organizations (Barankay and Lockwood, 2007). The general idea is that the transfer of powers and responsibilities to lower tiers of government allows a better match between citizens' preferences and public policies, rooted in the implicit assumption of welfare improving mobility (Tiebout, 1956). In particular, a decentralized structure of government is claimed to improve service provision efficiency by reducing information asymmetries, by enhancing accountability of locally elected policy makers, by promoting community participation, by fostering competition among jurisdictions, and by encouraging innovation in government policies and diffusion of best practices (Weingast, 2009).

In the case of Italy, before 2009 (when an important decentralization reform was passed), most of municipal revenues came from central grants composed by two parts, one with common elements for all municipalities (based on a historical expenditure criterion allocation), and one with an additional *ad-hoc* part, which often followed political, rather than efficiency and equity criteria (Bracco et al., 2015, 2019a). In 2009 the law n.42 provided for the first time the basic framework of the local finance system, defining the

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<sup>4</sup>Although these dimensions are often interacting each other, three main categories of decentralization have been identified: *i*) the policy decentralization, which involves the transfer of policy decisions to lower levels of government, *ii*) the political decentralization, engaging the process by which the local officials are chosen locally and have the right to make final decisions on important policy issues, and *iii*) the fiscal decentralization, which consists on the transfer of expenditure and revenue power (Rodden, 2004). According to Garman et al. (2001) and Hooghe et al. (2010), over the last decades between 70% and 80% of both developing and developed countries around the globe have been undergoing some form of devolution of powers to sub-national governments.

revenue structure of local authorities, identifying the principles of coordination of public finance and the tax system, and establishing a mechanisms of equalisation for the development of backward areas (Corte dei Conti, 2019, De Simone and Liberati, 2020).<sup>5</sup>

The new structure of financial relations between the central and the local governments was aimed at overcoming the historical expenditure criterion in favor of a resource allocation system based on the identification of standard needs for the financing of the essential levels of civil and social rights benefits, as well as the basic functions of the institutions. For this purpose, the fundamental revenue structure for each level of territorial government was explicitly defined. The adoption of Legislative Decree n.23/2011 ('Federalismo Municipale'), represented the first stage on the road to reform, pursuing the intent of a transition from a system of derived finance to an autonomous municipal taxation system. As a result, a new revenue structure has been implemented, in which, gradually, the traditional municipal revenues are complemented by new sources of financing.

Within this new decentralized fiscal framework the EU Cohesion Policy for the 2007-13 cycle came into action carrying a wide range of interventions in different sectors (transportation, employment, environment, culture and tourism, cities and rural areas, child and elderly care, research and innovation, education, social inclusion, energy, digital agenda, business competitiveness and administrative capacity) and involved many types of beneficiaries.<sup>6</sup> Among them some interventions, which received around the 3% of the total funding, were devoted to strengthen institutional capacities ('Administrative capacity') at the national, regional and local levels, including mechanisms to improve the development of good policies and programs along with their implementation.

In what follows we discuss the data available and our identification strategy that allowed to understand the role that a specific line of action of the EU Cohesion program issued during the programming cycle 2007-13 had on the taxation autonomy of local governments, which we use as proxy to measure the the autonomy of the beneficiary municipalities.

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<sup>5</sup>The principles of this reform can be traced back to the constitutional reform made in 2001, which introduced the direct proportionality with the aim of moving closer the areas where taxes are collected and the areas where revenues are benefited.

<sup>6</sup>For more information on the EU Cohesion Policy program see Appendix A.



### 3. Data

The main source of data for this analysis is represented by OpenCoesione<sup>7</sup>, which is the open government initiative on Italian Cohesion Policy, managed by the Department for Cohesion Policy at the Presidency of the Council of Ministers. This archive collects all the information concerning projects (also partially) financed within the Administrative Capacity line of action within the EU structural funds starting from the 2007-13 programming cycle, which includes also funds coming from co-financing from both the Italian central government and local authorities.<sup>8</sup>

As we can see from Table A3, the total number of projects available on the OpenCoesione website is equal to 712. In order to obtain a coherent and meaningful sample suitable for our empirical analysis, we have cleaned the raw data using specific criteria. First of all, we have discarded all those projects whose funds are shared by multiple beneficiaries, i.e by more municipalities or by a municipality and other administrative entities (n=9), those who have never started during our period of investigation although they have been awarded (n=104) and those for which an exact starting or ending date cannot be precisely determined (n=20). As further selection criteria we have considered that the date of 31 December 2013, which formally corresponds to the end of the program cycle (2007-13), does not coincide with the actual deadline for completing projects. In fact, the time window for implementing the projects (based on the existing “ $n + 2$ ” implementation rules for the EU budget) continues until 31 December 2015, which is the last date on which the payments actually incurred by the beneficiaries for projects/operations can be charged to the EU budget.<sup>9</sup> In the special case of the Financial Engineering Instruments, the final date for payment to the final recipients is 31 March 2017, which corresponds to the date considered for the end of our reference period. Based on this deadline arrangements, we have removed from the initial sample another 16 projects with ending date exceeding this threshold. Furthermore, we noticed that in some cases the project end date had not been

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<sup>7</sup>The OpenCoesione data can be accessed at the following web address: [www.opencoesione.gov.it](http://www.opencoesione.gov.it).

<sup>8</sup>At the time the analysis was completed, the last available release of the data referred to December 31<sup>st</sup> 2020. Subsequent releases have not been considered.

<sup>9</sup>EU financing rules implied that, for each  $n$  year of the cycle 2007-13, the annual Cohesion Policy funds had to be spent by the end of the second year after its allocation ( $n + 2$ ). See Regulation (2008) for more details.

loaded in the monitoring system even if the project has been completed.<sup>10</sup> For this reason, whenever a project is not formally completed, we determine the state of execution by looking at the ratio between payments received and the total funding allocated, requiring settlements above the threshold of 95%. Based on this rule we have discarded 43 projects whose ratio between payments and total allocated funding was below the 95% threshold. Finally, to avoid extreme measurement error, we have further removed all projects assigned to provincial and regional capitals (n=68). After all this filtering the final dataset is made up of 452 projects allocated to 169 municipalities for a total about € 8.9 million directly received by municipalities to strengthen their public administrations.<sup>11</sup>

Table 1: Distribution of municipalities EU funded projects between Italian regions (Years 2007-17)

Region	Regions		Provinces			Municipalities		
	Num. projects	Received funds	Num. beneficiaries	Num. projects	Received funds	Num. beneficiaries	Num. projects	Received funds
Abruzzo	66	21,845,487	3	5	755,851	0	0	0
Basilicata	288	52,192,817	2	3	405,145	104	383	5,298,110
Calabria	443	89,105,706	0	0	0	14	15	155,680
Campania	54	55,148,564	4	10	5,881,102	9	10	1,184,975
Emilia-Romagna	44	45,346,361	9	63	3,150,000	0	0	0
Friuli-Venezia-Giulia	16	9,607,508	0	0	0	0	0	0
Lazio	6	432,181	3	14	459,140	9	10	1,186,978
Liguria	7	85,916	4	28	4,730,759	1	1	144,329
Lombardia	43	5,439,667	0	0	0	0	0	0
Marche	554	21,192,583	7	447	4,555,634	0	0	0
Molise	53	12,313,906	0	0	0	0	0	0
Piemonte	146	48,794,340	8	88	2,030,946	0	0	0
Puglia	146	120,855,780	1	5	426,377	12	12	137,672
Sardinia	91	33,344,327	0	0	0	0	0	0
Sicily	186	33,502,610	1	1	90,000	16	17	716,525
Tuscany	661	56,738,708	9	198	8,729,887	1	1	13,021
Umbria	252	14,899,484	1	4	219,900	0	0	0
Valle D'Aosta	70	2,722,683	0	0	0	3	3	66,462
Veneto	141	39,883,269	0	0	0	0	0	0
Total	3,267	663,451,897	52	866	31,434,741	169	452	8,903,752

Authors' elaborations on OpenCoesione data.

Table 1 reports the distribution of projects awarded to municipalities across regions. As we can see, funds have been allocated to 169 municipalities belonging to the regions of Basilicata, Calabria, Campania, Lazio, Liguria,

<sup>10</sup>This can happen because it is not mandatory to transmit this type of information to the Unitary Monitoring System.

<sup>11</sup>The largest amount of EU funds is allocated to regions (€ 663 million) and provinces (€ 31.4 million), which are in turn recognized as the direct beneficiaries of 3,267 and 866 projects, respectively.

Puglia, Sicily, Tuscany and Valle D'Aosta.<sup>12</sup> The allocation at the local level displays a significant degree of heterogeneity, ranging from a minimum of € 13,021 in Tuscany to a maximum of € 5,298,110 in Basilicata. Indeed, despite being the third-smallest region in Italy, boasting 383 projects assigned to 104 local beneficiaries, Basilicata takes the first position in terms of number of winning municipalities and assigned projects, distancing by far the second best region, Lazio, with only 10 projects and 9 local entities.<sup>13</sup>

As already mentioned, the date of 31 December 2013 does not correspond with the actual deadline experienced by municipalities for implementing all projects, being possible to delay until 31 December 2015, or even 31 March 2017 in special cases. Indeed, only about 10% of projects started between 2007 and 2013, while 87% within the period 2014-2016. This is due to two main reasons. First, the so-called 'overlapping effect' due to the conclusion of the previous EU programming period which forced most of the municipalities involved to spend the last few resources to ignore the start of the new cycle and, second, the presence of specific measures taken to encourage late spending in addition to the reduction in national co-financing rates accorded by the Commission.<sup>14</sup> Despite all attempts, almost 93% of projects were closed after the end of 2013.

From these information we have then derived our treatment variable, *Municipal financing (Funds)*, defined as the sum of revenues coming from the following sources: *a)* EU transfers for financing EU-funded projects; *b)* co-financing quotes from the central government; and *c)* reimbursements for already incurred costs of EU-funded projects.<sup>15</sup> Finally, besides our treat-

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<sup>12</sup>The list of beneficiary municipalities is reported in Table A4 in Appendix C.

<sup>13</sup>Basilicata is a case study. Since 1998, the government has emphasized the role of monitoring and evaluation to support policy making. The regional level has a Public Investment Evaluation Unit (NVVIP) under the Department for structural funds, which is responsible for monitoring and evaluating all public investments in the region and for checking the consistency of strategic projects with respect to the regional development plan and the annual financial plan. The unit also performs impact evaluations of public investment projects on employment and production. Basilicata has invested heavily in monitoring and evaluation to support decision makers; compared to other regions, NVVIP is extremely active (Venanzi et al., 2012).

<sup>14</sup>In 2015, a recovery plan to avoid de-commitments in Campania, Calabria and Sicily was agreed by the national authorities and the Commission.

<sup>15</sup>More information about these data and their sources are available in Table A5 in Appendix C.

ment variable obtained from the OpenCoesione web page, our dataset has been complemented by information gathered from other official sources. In particular, we collected information on regional, provincial and municipal yearly population (used to compute per-capita annual fund), plus a series of indicators useful as measures of local governments capacity from the Italian National Statistical Institute (ISTAT) and from the Department of Finance of the Italian Ministry of Economy and Finance. Furthermore, we collected data on financial indicators that may affect the local degree of taxation autonomy: rigidity of expenditure (incidence of employees expenses) and share of loans repayment; the amount of cohesion funds received by the region and the province to which the municipality belongs; on the socio-economic side we have included the municipal average income from tax declarations, the regional unemployment rate, the regional share of NEET (Neither in Employment or in Education or Training), and the provincial real-estate income given by the average annual figurative income of buildings assigned by the Inland Revenue Agency and used as the basis for the property tax payment. Table 2 provides the main descriptive statistics for the variables used in the empirical model. All variables relative to payments are expressed in euro per-capita terms, using the yearly population as the denominator.

Table 2: Descriptive statistics of the variables used in the empirical model (Years 2007-17)

Variable	Mean	St. Dev.	Min	Max
Degree of taxation autonomy	0.53	0.21	0.01	0.96
Municipal financing (Funds)	0.19	3.45	0	261,00
Provincial financing	0.46	2.21	0.00	22.00
Regional financing	6.24	12.54	0.00	90.00
Rigidity of expenditure	0.35	0.18	0.00	2.92
Share of loans repayment	0.08	0.14	0.00	2.73
Average income	20,716	3,339	9,824	61,861
Unemployment rate	0.09	0.05	0.03	0.22
Real estate income	555.07	160.25	227.00	1,126.00
Share of NEET	0.21	0.09	0.10	0.41

*Note:* Financings, Average income and Real estate income are expressed in Euro per-capita.

#### 4. The identification strategy and the empirical model

To estimate the causal relationship between the EU funds received to improve their Public Administrations and the outcomes in terms of taxation autonomy of the local municipalities, we employ a Difference-in-Differences (DiD) approach. To account for the existence of heterogeneity in the volume of funds invested in the different projects across municipalities, we use a version of DiD with continuous treatment (Card, 1992), where our variable of interest is the cumulative per-capita local EU funds received, which proxies the intensity of treatment. This strategy allows to better account for the granular information about the policy that is included in our database.

The empirical model is specified according to the following generalized DiD with continuous treatment (Bertrand et al., 2004, Hansen, 2007) recently employed, among others, by Carrieri et al. (2019):

$$Y_{it} = \theta_i + \lambda_t + \beta \mathbf{X}_{it} + \gamma Funds_{it} + \varepsilon_{it}, \quad (1)$$

where  $i$  refers to municipality and  $t$  to the year spanning the period from 2007 to 2017 and

- $Y_{it}$  is the outcome of interest given by the degree of taxation autonomy computed as the ratio of local fiscal revenues over total revenues including transfers from the central government;
- $\theta_i$  is the municipal-level fixed effect,
- $\lambda_t$  is the time fixed effect,
- $\mathbf{X}_{it}$  is a vector of time-varying covariates with corresponding  $\beta$  parameters to be estimated (see Section 3);
- $\gamma$  represents the parameter of interest capturing the effect of the continuous treatment  $Funds_{it}$  given by the logarithm of the per-capita cumulative EU funding the municipality  $i$  has received during the 2007-17 time interval.<sup>16</sup>

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<sup>16</sup>As robustness check we have also estimated the same model where the continuous variable  $Funds_{it}$  is specified as a dummy variable  $Treat_{it}$  equal to 1 if the municipality  $i$  is exposed to the treatment in the 2007-17 time interval, and 0 otherwise.

A major concern in observational studies is that treatment selection is often influenced by subject characteristics. In particular, within the DiD framework, the identification of the effect of  $Funds_{it}$  assumes that the assignment of  $Funds_{it}$  is exogenous with respect to the municipal financial outcomes (Besley and Case, 2000, Heckman, 2000). Of course, the assumption of the exogenous assignment of the  $Funds_{it}$  may be too strong as there may be a selection bias: the fact that a municipality wins an EU project can depend on a number of features that are likely to affect also the trend in the public sector results and, consequently, the estimated difference between treatment and control groups (i.e.  $\gamma$ ). As a consequence, baseline characteristics of municipalities exposed to the treatment may differ systematically from those of untreated and these differences may be correlated with their taxation capacity. Propensity score methods are commonly used to handle this type of confounding to minimize the potential bias (Rosenbaum and Rubin, 1983) and for this reason we consider a propensity score matching approach to define the untreated reference groups. A brief introduction to the propensity score techniques and the relevant framework here adopted for the empirical analysis is provided in the Appendix B.

Covariates included in the propensity score estimates are all referring to the 2007, before the assignment of  $Funds_{it}$ , selected among those likely to affect both the winning of EU projects and the trend in the municipal performance. Institutional features included in this step are: Average age of council’s members, Years in charge of council members, Age of the mayor, and Education of the mayor. We include institutional features since the participation and consequent winning of EU projects of a municipality can be due to institutional factors such as political incentives, and the literature has shown that institutional features are also associated with the financial management of local government. Regarding the age of the mayor and councillors, Alesina et al. (2019) noted the tendency of younger politicians to behave strategically and obtaining more transfers from higher levels of government. The years in charge of council members are included to take into account a differential in the political incentives in years closer to elections which can affect both the application for EU funds and the financial management (Brollo and Nannicini, 2012, Bracco et al., 2019b). In addition to institutional features, we also included regional fixed effects, geographical and demographic variables (see Table A1). The performance of the propensity score is shown in Table A2.

## 5. Results

In this section we present the results obtained from the estimation of the model in Eq. 1 discussed in Section 4. We start presenting the estimates of  $\gamma$  shown in Table 3 obtained using different samples. In particular, in the first column we have the results obtained based on the original dataset, while moving from columns (2) to (4) we present the results with different versions of the data after the PSM balancing.<sup>17</sup> Furthermore, in panel *A* we report the estimates of  $\gamma$  obtained from a parsimonious model specified with fixed effects and without the set of control variables, while in panel *B* we include also the set of control variables.

Focusing on panel *A*, in all estimated models the coefficient is positive and statistically significant, independently of the untreated reference group considered, suggesting that the cohesion funds have a positive impact.<sup>18</sup> In other words, receiving the EU funding for projects aimed at reinforcing the municipality administrative capacity seems to increase the degree of the municipality's autonomy proxied by its taxation capacity.

Once we include our set of control variables (see panel *B*) the  $\gamma$  coefficients are still positive and statistically significant except for the one-to-one matching (PSM 1:1) case. This result might be partially due to the small number of observations combined with the higher number of variables included in this model. Overall, these results confirm a positive and significant effect of the funds coming from the EU Cohesion Policy on taxation autonomy even after controlling for additional financial and socioeconomic variables.

Regarding the controls, it is worth noting that some variables are statistically significantly associated to the degree of taxation autonomy only before weighting for the propensity scores, thus suggesting that the matching matters into the distribution of relevant features across the different samples. On the other hand, the coefficient associated to the real estate income, even if collected at provincial level, is always positive and significant, thus corrob-

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<sup>17</sup>In Table 3 the label PSM 1:1 refers to a balancing obtained with a one-to-one matching, meaning that each single treated unit has been matched to a single untreated unit who has the most similar estimated propensity score. Similar reasoning applies for PSM 1:2 and a PSM 1:3, where each treated unit is matched to two and three untreated units, respectively.

<sup>18</sup>The stability of the results across different levels of sample balancing suggest that any unobservable factors related to contextual conditions that might change at the municipality level does not play a significant role.

orating the predominant role of this voice on the municipality budget and, specifically, on the local degree of taxation autonomy. Finally, consistently across all specifications, the local degree of taxation autonomy appears to be positively correlated with the EU funds assigned at the regional level. This result highlights the main role of the ‘regional’ part of the EU funds in affecting the municipalities’ financial result much faster than the corresponding municipal component.

Although referring to different outcomes, our results are in line with previous literature providing convincing evidence of a positive effect of the EU cohesion’s policies (Giua, 2017, Becker et al., 2018, Fattorini et al., 2020). It has been argued that the decentralization can promote more efficient markets, increasing participation, transparency, and accountability in policy-making (Martínez-Vázquez et al., 2017). Higher taxation autonomy has the potential to improve the public sector efficiency, reduce the budget deficit, and promote economic growth (Rodríguez-Pose and Krøijer, 2009, Gemmill et al., 2013). In this perspective, our results show that EU funds dedicated to administrative capacity building bring higher taxation autonomy which, in turn, could have the potential to foster economic development. Our results differ from what has been observed by Ciani and De Blasio (2015), who noted a limited impact of the EU structural funds (programming period 2007–2013) on local development. This differentiation may be partially due to the difference in the time span considered: Ciani and De Blasio (2015) mainly focus on average growth until 2013, while our study considers taxation autonomy until 2017. The larger time span in our analysis allows capturing longer-run effects of the policy which could not be captured by the empirical analysis conducted only on the six years of the programming period by Ciani and De Blasio (2015).

Finally, in an attempt to further evaluate the robustness of our results, we specify our treatment variable as a dummy taking the value one when the municipality has received at least one EU project in the 2007-17 period, and zero otherwise. As expected, results reported in Table 4 highlight that the effect of the EU funds on the degree of taxation autonomy remains highly significant, while the magnitude is halved.

## 6. Conclusions

This paper analyzed the role of a specific EU Cohesion program issued during the programming cycle 2007-13 on the taxation autonomy of local gov-



Table 3: Effect of EU Cohesion Policy Funds on Municipalities' taxation autonomy (Years 2007–17)

	<i>Panel A</i>			
	All	PSM (1:1)	PSM (1:2)	PSM (1:3)
Funds	2.195*** (0.379)	1.753*** (0.437)	1.834*** (0.399)	1.879*** (0.387)
	<i>Panel B</i>			
Funds	1.618*** (0.412)	0.695 (0.468)	0.752* (0.436)	0.846** (0.426)
Rigidity of expenditure	0.092*** (0.022)	-0.049 (0.107)	0.045 (0.085)	-0.013 (0.071)
Share of loans repayment	-0.078*** (0.024)	0.067 (0.117)	-0.039 (0.094)	0.021 (0.076)
Provincial financing	-1.153** (0.571)	-7.599 (16.373)	-7.423 (13.192)	-2.067 (11.328)
Regional financing	0.532*** (0.142)	1.082** (0.473)	0.991*** (0.337)	1.001*** (0.287)
Average income	0.025 (0.034)	-0.066 (0.227)	-0.157 (0.163)	-0.199 (0.140)
Regional unemployment rate	1.008*** (0.084)	-0.076 (0.505)	0.026 (0.348)	0.172 (0.291)
Real estate income	0.347*** (0.056)	0.780* (0.411)	0.935*** (0.283)	0.850*** (0.236)
Share of NEET	-0.573*** (0.121)	-1.892 (1.256)	-1.008 (0.928)	-0.562 (0.786)
Observations	14,452	676	1,014	1,352

All specifications include municipality and time fixed effects.

'Funds', 'Provincial financing', 'Regional financing', 'Average income', 'Real estate income' are expressed in log Euro per-capita.

Legend of significance levels is \*p<0.1; \*\*p<0.05; \*\*\*p<0.01.

Table 4: Effect of EU Cohesion Policy Funds on Municipalities' taxation autonomy (Years 2007–17) with treatment as a dummy variable

	<i>Panel A</i>			
	All	PSM (1:1)	PSM (1:2)	PSM (1:3)
Treat	0.081*** (0.011)	0.082*** (0.017)	0.075*** (0.014)	0.073*** (0.013)
<i>Panel B</i>				
Treat	0.052*** (0.014)	0.039** (0.019)	0.035** (0.016)	0.037** (0.015)
Rigidity of expenditure	0.093*** (0.022)	-0.043 (0.107)	0.054 (0.085)	-0.004 (0.070)
Share of loans repayment	-0.078*** (0.024)	0.061 (0.116)	-0.047 (0.094)	0.012 (0.076)
Provincial financing	-1.144** (0.571)	-7.752 (16.312)	-8.141 (13.180)	-2.897 (11.329)
Regional financing	0.443*** (0.154)	1.057** (0.470)	0.983*** (0.335)	0.981*** (0.287)
Average income	0.027 (0.034)	-0.050 (0.227)	-0.139 (0.163)	-0.184 (0.140)
Regional unemployment rate	1.012*** (0.084)	-0.007 (0.505)	0.129 (0.355)	0.279 (0.299)
Real estate income	0.349*** (0.056)	0.734* (0.410)	0.880*** (0.284)	0.799*** (0.238)
Share of NEET	-0.547*** (0.122)	-1.841 (1.252)	-0.980 (0.926)	-0.563 (0.784)
Observations	14,452	676	1,014	1,352

All specifications include municipality and time fixed effects.

'Treat' is equal to 1 if the municipality is exposed to the treatment in the 2007-17 time interval, and 0 otherwise. 'Provincial financing', 'Regional financing', 'Average income', 'Real estate income' are expressed in log Euro per-capita.

Legend of significance levels is \*p<0.1; \*\*p<0.05; \*\*\*p<0.01.

ernments. From an empirical perspective, a Difference-in-Differences study design with continuous treatment is combined with Propensity Score Matching on a panel of 7,174 Italian municipalities monitored during the programming cycle years. Municipalities beneficiaries of EU Cohesion funds dedicated to administrative capacity building are compared with municipalities not receiving funds. Results suggest that the EU structural funds disbursed across the Italian municipalities in order to enhance their public administrations between 2007 and 2017 had a positive impact on their degree of taxation autonomy. These results support the idea that EU cohesion policies can build administrative capacities at the local level, improving the development of good policies and good practices.

From a policy perspective, this study confirms the effectiveness of Cohesion Policy financed by the structural funds at the European level to improve the public sector performances. As it is well recognized that an efficient public sector can support local development, the evidence provides support for cohesion policies aimed at avoiding the fiscal illusion, facilitating the discovering of opportunistic behaviors, and fostering the accountability of policy makers. Over the last decades, such policies in EU have been mainly implemented by spending review and fiscal rules, i.e., post-Maastricht reforms (Bonfatti and Forni, 2019). Our results call for a different strategy which, in addition to economic incentives and fiscal rules, mobilizes resources to boost investments in the public sector.

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## A. The 2007-13 EU Cohesion Policy in Italy

The EU Cohesion Policy is a crucial element to allow a common European space and represents a pillar of European integration. Starting with the 2000-06 cycle, many programming periods of EU Cohesion Policy have succeeded each other, all lasting for seven years and covering a large portion of the Member States. Our attention is devoted to the 2007-13 programming cycle, analyzing the potential related effects on the Italian public sector performance.

The 2007-13 programming cycle had two objectives. The first is the ‘Convergence’ Objective which was intended to accelerate the convergence of States and regions that were lagging behind by favoring the improvement of growth and employment conditions.<sup>19</sup> For Italy, the included regions were Calabria, Campania, Puglia, Sicily and Basilicata.<sup>20</sup> The second is the ‘Regional competitiveness and employment’ Objective, which was aimed at strengthening the competitiveness and employment of regions other than those lagging behind, with an allocation of resources amounting to over € 49 billion, approximately 16% of the total amount. The Italian areas interested by the interventions of this objective are those located in the Center-North, plus Abruzzo, Molise and Sardinia.

Italy is one of the largest beneficiaries of the EU Cohesion Policy. Overall, the resources allocated across the different levels of the Italian territory amounted to approximately € 60.1 billion, financed both with EU structural funds, i.e. the European Regional Development Fund (Fondo Europeo di Sviluppo Regionale - FESR) and the European Social Fund (Fondo Sociale Europeo - FSE), and national co-financing resources.

The FESR supported programs focusing on regional development, improving competitiveness and investing in research and sustainable development, as well as European Territorial Cooperation (ETC) projects. The

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<sup>19</sup>Over the 81.5% of the total allocation of resources, equivalent to about € 251.2 billion, was devoted to it and for this reason it represents the main objective. The region eligible for funding from the structural funds under the Convergence Objective were the less developed European areas, corresponding to NUTS II level, whose GDP per inhabitant was, on average, less than 75% than the EU-25 average.

<sup>20</sup>Basilicata benefited from the transitional support regime (decision of the EU Commission no. 595/2006) in favor of those regions whose GDP per inhabitant would have been less than 75% of the Community average if calculated on 15 Member States, but which exceeded this threshold due to the enlargement of the EU to 25 States.

FESR funded 28 Operational Programs (OPs): 21 regional and 7 national. Among the € 21 billion allocated, over 80% went to OPs under the Convergence Objective, while the remainder went to the OPs under the Competitiveness Objective.

FSE was modeled on the European strategy for employment and focused on social inclusion and access to a labour market free of gender discrimination. Italy benefited of € 7 billion coming from the FSE during the 2007-13 programming policy.

As for the co-financing resources, national funds were drawn from the Development and Cohesion Fund (Fondo per lo Sviluppo e la Coesione - FSC) and the Cohesion Action Plan (Piano d’Azione per la Coesione - PAC). The former was supposed to finance special State initiatives and the disbursement of special grants for infrastructure and intangible assets of national, inter-regional and regional importance, implemented through major projects or investments structured into functionally connected individual initiatives. The resources of the FSC were 80% directed to the Southern regions and 20% to the Center-North. Finally, the PAC programme was launched in 2011 as a measure to accelerate the implementation of projects co-financed by the structural funds and boost the effectiveness of the interventions. PAC was funded with national resources generated by the reduction of the rate of national co-financing of the OPs and by resources reprogrammed through the internal replanning of those projects.

## **B. Propensity Score Matching (PSM)**

To address the self-selection bias in our DiD (heterogeneity in treatment propensity that is related to the variables of outcomes), we resort to the matching on the propensity score (PS). Propensity score techniques are commonly used to reduce selection bias in non-experimental studies. First introduced by Rosenbaum and Rubin (1983), propensity score is defined as the conditional probability of treatment assignment given some pre-specified covariates, and is commonly estimated using logistic regression models. In other words, propensity scores are used to ‘balance’ treatment and comparison groups on a set of observed baseline characteristics.

Three main benefits of using propensity score methods are noticeably recognized: *i*) they reduce extrapolation and subsequent dependence on the outcome model specification (Ho et al., 2007) leading to more robust inferences, *ii*) they condense the full set of covariates (potentially a large number)

into a scalar summary, making those balancing approaches more feasible, and *iii*) they are applied without use of the outcome variable, thereby separating the ‘design’ of the study from the ‘analysis’ and reducing the potential for bias (Rosenbaum et al., 2010).

In the present case, the propensity score matching is expressed by the following equation:

$$P(Z_t) = Pr(Treat_{k \geq t} = 1 | Z_t) = E(Treat_{k \geq t} | Z_t) \quad (2)$$

where  $P(Z_t)$  is the abbreviation for propensity score: the conditional probability of receiving EU funds ( $Treat_{k \geq t} = 1$ ) in the 2007-17 interval given the characteristics  $Z_t$  observed in the reference year 2007.

For each individual in the pseudo-population, the propensity score is estimated from a logit model in which the treatment variable is regressed on the covariates ( $Z$ ) listed in Table A1.

They are selected among those available in the ISTAT archives for the year 2007 in order to account for confounders belonging to the following macro-areas:

- geographical location of the municipality;
- characteristics of the population;
- characteristics of the Mayor and the municipal council.

The estimated  $P(Z_t)$  is used to obtain the group of controls by selecting *Untreated* municipalities with the same  $P(Z_t)$  of the *Treated* so that the probability of receiving the treatment at the beginning of the cycle is the same for both groups.

To match the data we adopted the Nearest Neighbor technique (Rubin, 1973) with one-to-one matching (PSM 1:1), meaning that each single treated unit is matched to a single untreated unit who has the most similar estimated propensity score. We further perform a one-to-two (PSM 1:2) and a one-to-three matching (PSM 1:3), so that each treated unit is matched in turn to two and three untreated units. These matching processes create balance between treated and untreated participants on the propensity score and they are expected to create balance on the covariates used to estimate it. Indeed, Table A2 reports the descriptive statistics of the covariates between treatment and control groups before weighting (i.e. all) and after weighting for the propensity score (PSM 1:1, PSM 1:2, PSM 1:3). The assessment of

Table A1: Propensity Score variables

Variable	Type	Source	Level
Region	Categorical	ISTAT	Local
Population density	Continuous	ISTAT	Local
Average age of population	Continuous	ISTAT	Provincial
(Average age of population) <sup>2</sup>	Continuous	ISTAT	Provincial
Altitude	Continuous	ISTAT	Local
(Altitude) <sup>2</sup>	Continuous	ISTAT	Local
Littoral zone	Binary	ISTAT	Local
Insular zone	Binary	ISTAT	Local
Number of per-capita residential buildings	Continuous	ISTAT	Local
Number of new inflows	Continuous	ISTAT	Provincial
Birth rate	Continuous	ISTAT	Provincial
Death rate	Continuous	ISTAT	Provincial
Migratory balance	Continuous	ISTAT	Provincial
Average age of council members	Continuous	ISTAT	Local
Years in charge of council members	Continuous	ISTAT	Local
Age of the Mayor	Continuous	ISTAT	Local
(Age of the Mayor) <sup>2</sup>	Continuous	ISTAT	Local
Education of the Mayor (University degree)	Binary	ISTAT	Local
Incidence of municipal employees expenses	Continuous	ISTAT	Local

the balance among obtained groups is performed through comparison of the average values of the covariates along with their values of Variance Ratio (VR). The latter measure is computed as the mean ratio of the variance of a covariate in treated subjects to the variance of the covariate in control subjects, so that better balance is defined by values close to 1. Furthermore, Rubin (2001) suggested that variables are out of balance if the VR is greater than 2 or less than 0.5.<sup>21</sup>

Moving from the left to the right-hand side of Table A2, by inspection of columns two and three there is a clear evidence of the great difference between the treated group and the untreated represented by the full original sample of not EU-funded municipalities (i.e. All). On average, treated municipalities are more likely to be littoral zones, to have a higher population density, lower migratory balances and younger and more educated Mayors than not funded entities. These differences are considerably reduced after

<sup>21</sup>Because the variance of a binary variable is a function only of its proportion, the variance ratio of a binary variable in two groups contains no more information than the simple difference in proportion. Therefore, variance ratio is computed only for continuous variables to avoid misleading results.

nearest neighbour matching, with much closer average covariate values and many of the VRs taking on values close to unity for all matching scenarios. At the individual covariate level, only Population density’s VR persistently falls beyond the threshold, remaining above 2 in all the matching. This is explained by consistently higher variances in the control groups for this variable which, in turn, is driven by the much larger ranges of values among controls compared to those in the treated group. None of the other covariates’ VR falls outside of the range (0.5, 2), indicating that, on average, all solutions provide good covariate balance.

Table A2: Comparisons of EU-funded and not EU-funded municipalities (Year 2007)

	Untreated reference group				
	Treated Obs=169	All Obs= 7174	PSM (1:1) Obs=169	PSM (1:2) Obs=338	PSM (1:3) Obs=507
Population density	14,100	4,825 (9.124)	16,645 (2.340)	12,454 (3.140)	10,518 (3.799)
Average age of population	42.080	43.515 (0.263)	41.713 (0.642)	41.717 (0.619)	41.694 (0.641)
(Average age of population) <sup>2</sup>	1,771.806	1,897.538 (0.252)	1,741.595 (0.653)	1,742.029 (0.634)	1,739.990 (0.657)
Altitude	486.018	322.037 (1.354)	312.217 (1.061)	336.197 (1.054)	349.222 (1.133)
(Altitude) <sup>2</sup>	317,639.600	163,902.900 (1.597)	173,454.700 (1.238)	189,665.700 (1.219)	193,356.000 (1.343)
Littoral zone	0.207	0.069	0.420	0.376	0.341
Insular zone	0.006	0.004	0.030	0.024	0.018
Number of per-capita residential buildings	0.358	0.431 (0.226)	0.309 (1.464)	0.334 (1.507)	0.355 (1.309)
New inflows	1413	3473 (0.595)	1893 (0.789)	1604 (1.236)	1498 (1.456)
Birth rate	0.087	0.093 (0.608)	0.093 (1.007)	0.094 (1.056)	0.094 (1.083)
Death rate	0.097	0.103 (0.240)	0.095 (0.903)	0.095 (0.943)	0.095 (0.996)
Migratory balance	0.015	0.091 (0.443)	0.036 (1.098)	0.038 (1.022)	0.040 (1.016)
Average age of council members	45.515	46.901 (0.908)	46.914 (1.624)	46.239 (1.292)	46.096 (1.160)
Years in charge of council members	2.892	2.846 (1.608)	2.732 (0.960)	2.717 (0.988)	2.753 (1.039)
Age of the Mayor	49.057	51.460 (0.862)	50.420 (1.211)	50.635 (1.443)	50.729 (1.325)
(Age of the Mayor) <sup>2</sup>	2,489.424	2,741.513 (0.839)	2,611.121 (1.213)	2,623.163 (1.456)	2,637.890 (1.332)
Education of the Mayor (University degree)	0.620	0.409	0.707	0.674	0.636
Incidence of municipal employees expenses	0.348	0.301 (1.011)	0.323 (0.960)	0.319 (1.121)	0.325 (1.105)

The table reports average values and Variance Ratios in brackets of the covariates listed in Table A1. Variance ratios are not computed for binary variables.

## C. Beneficiary municipalities and description of control variables

Table A3: Cleaning process of the row data from OpenCoesione to achieve the set of beneficiary municipalities and assigned projects. The initial number of projects is 712.

Motivation	Num. discarded projects
Projects shared by multiple beneficiaries (more municipalities or other administrative levels)	9
Never started financing	104
Not possible to determine an exact beginning or ending date of the projects	20
Final date of the projects exceeding the the final date for payments (31 March 2017)	16
Settlement percentage below the threshold of 95%	43
Projects assigned to provincial and regional capitals	68

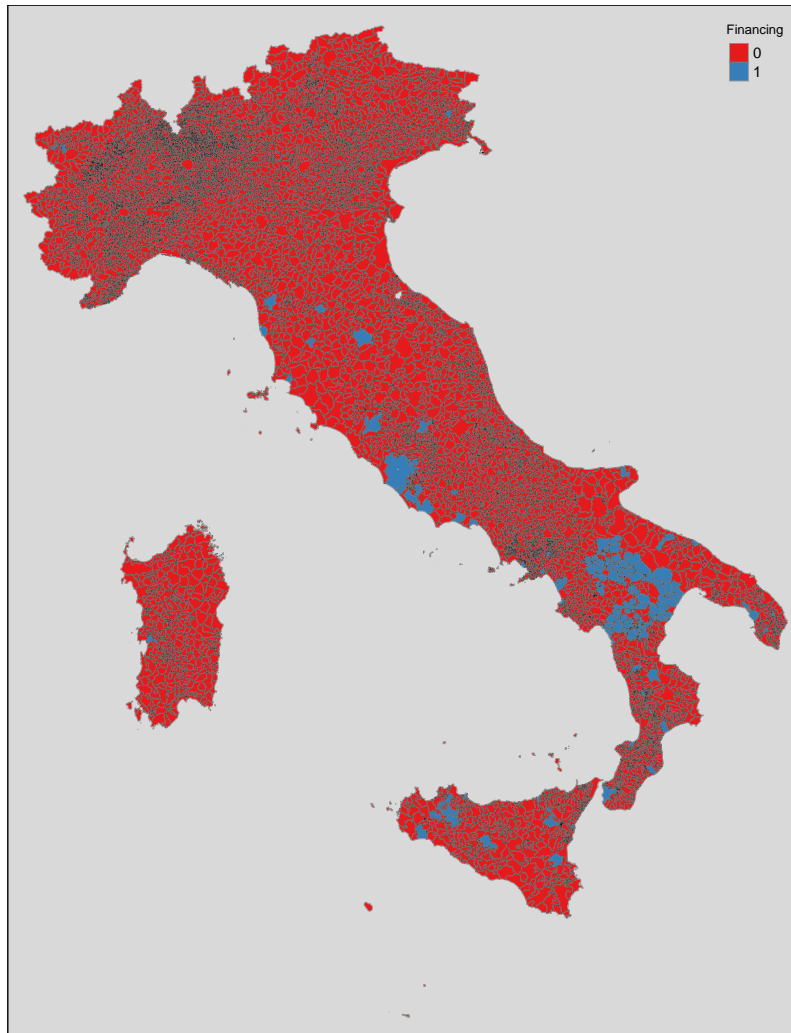
Note: The financing received by regions and provinces are used as control variables in the empirical study.

Table A4: List of beneficiary municipalities

Accettura, Acerenza, Acri, Agropoli, Albano di Lucania, Aliano, Aprilia, Ariano Irpino, Armento, Arvier, Avigliano, Aymavilles, Bagheria, Balvano, Banzi, Baragiano, Barile, Battipaglia, Bella, Bernalda, Bitonto, Brienza, Brindisi Montagna, Bronte, Caltagirone, Calvello, Cancellara, Carbone, Cariati, Casarano, Castelgrande, Castelluccio Inferiore, Castelluccio Superiore, Castelmezzano, Castelsaraceno, Casteltermeni, Castelvetro, Castronuovo di Sant'Andrea, Caulonia, Cava de'Tirreni, Cerignola, Chiaromonte, Cirigliano, Colobraro, Corleone, Eboli, Episcopia, Fardella, Ferrandina, Filiano, Follonica, Fondi, Fonte Nuova, Forenza, Formia, Francavilla in Sinni, Gallicchio, Genzano di Lucania, Giarre, Ginestra, Ginosa, Grassano, Grottole, Grumento Nova, Guardia Perticara, Guidonia Montecelio, Irsina, Lagonegro, Latronico, Lauria, Lavello, Lentini, Manfredonia, Maratea, Marino, Marsala, Marsico Nuovo, Marsicovetere, Martano, Maschito, Mazara del Vallo, Melfi, Melito di Porto Salvo, Mercato San Severino, Miglionico, Missanello, Mola di Bari, Moliterno, Monreale, Montalbano Jonico, Montalto Uffugo, Montemurro, Montesarchio, Montescaglioso, Muro Lucano, Mussomeli, Nardò, Nemoli, Noepoli, Noto, Nova Siri, Oliveto Lucano, Oppido Lucano, Pantelleria, Pescopagano, Picerno, Pietragalla, Pietrapertosa, Pignola, Pisticci, Policoro, Pomarico, Pomezia, Praia a Mare, Rapolla, Rapone, Reggio di Calabria, Rende, Rionero in Vulture, Rivello, Rotonda, Rotondella, Ruoti, Ruvo del Monte, San Cataldo, Sanchirico Nuovo, San Costantino Albanese, San Fele, San Giorgio Lucano, San Marco Argentano, San Marco in Lamis, San Martino d'Agri, San Paolo Albanese, San Severino Lucano, San Severo, Sant'Agata di Militello, Sant'Angelo le Fratte, Sapri, Sarconi, Sarzana, Sasso di castalda, Satriano di Lucania, Savoia di Lucania, Serra San Bruno, Soverato, Soveria Mammelli, Stigliano, Taurianova, Teana, Terranova di Pollino, Tito, Tivoli, Tolve, Torre del Greco, Tramutola, Trecchina, Tricarico, Trivigno, Troia, Tursi, Vaglio Basilicata, Valsinni, Velletri, Venosa, Verrès, Vibo Valentia, Vico del Gargano, Vietri di Potenza, Viggianello
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Note: Municipalities are reported in alphabetic order.

Figure A1: Geographical dislocation of the Italian treated municipalities.



Source: Authors' elaborations on OpenCoesione data.

Note: The map shows the municipalities belonging to the treated group in blue.

Table A5: List and description of control variables used in Eq.(1)

Variable	Description
Rigidity of expenditure	The degree of rigidity of the municipality in taking spending decisions, i.e. the incidence of employees expenses and loan repayments on current revenues.
Share of loans repayment	The amount of medium and long-term debt depreciation operations of the local administration, net of interest, on current revenues.
Provincial financing	The overall amount of cohesion resources referring to the 2007-13 programming cycle allocated to the province to which the municipality belongs.
Regional financing	The overall amount of cohesion resources referring to the 2007-13 programming cycle allocated to the region to which the municipality belongs.
Average income	A measure of the average taxable income relevant for 'Irpef' (Italian Personal Income Tax) at the local level.
Unemployment rate	The annual unemployment rate computed on regional basis.
Real estate income	Average gross income (according to the RDL of 13/04/1939 n. 652 art. 9.) coming from the real estate units at provincial level computed annually by OMI (Osservatorio Mercato Immobiliare).
Share of NEEET	The share of regional people between 15 and 34 years old which is neither in employment nor in education and training.