

The Spatial Economic Impact of Crime: Evidence from the Construction Sector in Italian Municipalities

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Abstract

Literature has mainly focused on understanding whether organized crime impacts on economic growth, broadly intended. Yet, at the local level, little is known as to how crime may affect economic activities. Using a unique geo-localized dataset on Italian firms, we exploit the strengthening of policy enforcement against corruption to show that when municipalities where the city council is dissolved because of organized-crime infiltration, the construction sector suffers a 7% reduction in the value added of firms located in the same area where the council dissolution occurred. We also find that the effect is larger, the longer the commissioner is present in the municipal council. Taken together our findings suggest that the action of the commissioner depresses the economic activity in the construction sector of the area where the temporary-administered municipality is located, given that it blocks all those relationships with firms related with criminality. This calls for a contemporaneous intervention stimulating public procurements with 'good' firms. (JEL codes: K42, D73, R10 and H32)

Keywords: organized crime, anti-corruption policy, firms' value added, local economy, spatial effects, firms' data, construction sector.

1. Introduction

In the last decade there has been a growing interest in the public debate toward anti-corruption policies, as corruption weakens institutions, the values of democracy and challenges the development and the principle of legality (ONU 2003). This issue is particularly salient in Italy, where—according to the Transparency International's Corruption Index¹ (Figure 1)—the perception of corruption is one of the highest among developed countries.

Criminal organizations in Italy have drained many public resources by interfering in several public contracts (Caneppele and Martocchia 2014). As a response, the central government promoted legislative actions,² including the possibility to dissolve municipal councils for mafia infiltration.

A large body of literature focuses on the role played by organized crime in shaping economic (Méon and Sekkat 2005; Roza 2014; Bologna and Ross 2015; Montoya 2016;

¹ World Economic Forum, *Global competitiveness reports*, 2018.

² Legislation includes Law n. 575/1965, which first inserted special provisions against the mafia into Italian law; Law n. 646/1982, introducing criminal association as illegal act in the Italian penal code, and Law n. 356/1992, which introduced article 41 bis in the Italian prison system, known as the 'hard prison for mafia'.

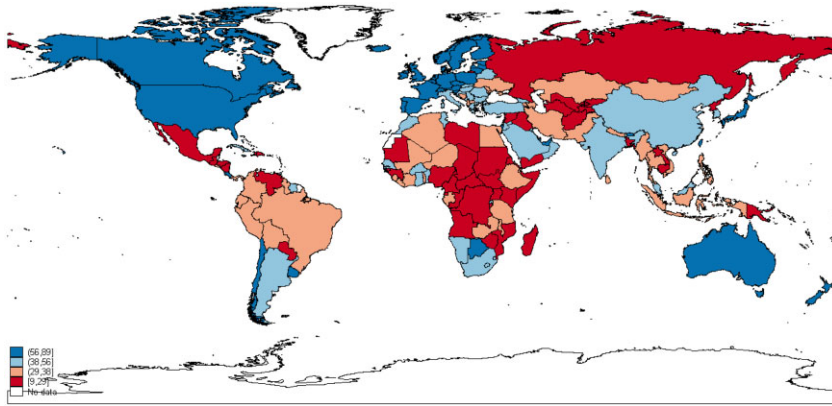


Figure 1. Corruption Perception Index in the world, year 2017.

Fenizia 2018) and political outputs (Hess 1973; Pezzino 1985; Acemoglu et al. 2009; Pinotti 2012; Alesina et al. 2016; Buonanno et al. 2016; Daniele and Dipoppa 2017; De Feo and De Luca 2017; Daniele 2019). In particular, a large amount of literature has sought to identify the deterrent impact of sanctions (Kessler and Levitt 1998; Drago et al. 2009) and the negative effect of police on crime (Corman and Mocan 2000; Di Tella and Schargrodsky 2004). Other studies emphasize the effect of mafia organization on the general government (Gennaioli et al. 2011; Acconcia et al. 2014; Barone and Narciso 2015; Daniele and Geys 2015; Di Cataldo and Mastrococco 2022; Conti et al. 2021) and the channels of diffusion of organized crime (Buonanno and Pazzona 2014).

While many contributions have focused on the direct effects of organized crime, only very few works have analyzed the presence of mafia-related spatial effects on public outcomes. Avis et al. (2016) find that measures of auditing have no effects on the level of corruption in neighboring municipalities. By way of contrast, Silva (2010), using information from an anti-corruption policy in Brazil that randomly assigns cities to be controlled, shows that anti-corruption policy takes time to materialize its effects in the neighboring cities. Yet, Galletta (2017) finds evidence of a reduction of public investments in municipalities close to those that have been dissolved due to the presence of mafia infiltration in southern Italy. Finally, Jauregui et al. (2020) study the impact of corruption on firm births in the formal sector by using information on Mexican states. Interestingly, they show do not only that corruption is positively correlated with the formation of new formal-sector firms but they also find a strong spatial component to new firm creation.

We complement the existing literature by exploring the role of mafia-related spatial effects on local economic activities: a feature that has not yet been addressed in the empirical framework.

The aim of this paper is to fill this gap in the literature, by studying the effect of an anti-corruption policy on the level of economic activities of neighboring areas. In particular, we rely on the Orbis—Bureau van Dijk database to collect financial information concerning the budget of over 500,000 firms. Then, we match each firm to a specific municipality via geo-localization.

We concentrate on 1350 municipalities belonging to three Italian southern regions, the ones most affected by mafia infiltration (Sicily, Calabria, and Campania). We exploit the law enforcement against corruption in local governments, that is the municipal council dissolution that occurred for mafia infiltration over the period 2010–2016. Once controlling for firms and years fixed effects, our results suggest that the dissolution of the municipal council is associated with a 7% reduction in the value added generated by firms in the

construction sector belonging to neighboring municipalities. To provide a causal interpretation of our results, it is crucial to show that the timing of the council dissolution in neighboring municipalities is random. To test for this hypothesis, we show that the unobservable—taken to be several combinations of fixed effects—does not matter in the estimates. In addition—and to complement this analysis—we perform a series of placebo test that allows for anticipatory effects to be excluded. Therefore, we provide evidence that council dissolution for mafia infiltration is likely to be a causal explanation for the observed reduction in the local economy. Finally, we use alternative definitions of council dissolution, namely the average number of neighboring council dissolutions and the average number of days of council dissolution, which allow us to measure the intensity of the treatment. This analysis indicates that the decrease of the value added is larger, the longer the presence of the organized crime is in the municipal council.

Taken together, our findings suggest that the presence of anti-corruption policies have a repercussion on the local economy, especially in the construction sector where the probability of mafia infiltration is very high (Sciarrone 1998; Varese 2011), and where the corrupt practices are widespread (Mauro 1997). Our findings are coherent with the fact that the construction sector has been assessed as the most corrupted sector worldwide by the Transparency International's Bribe Payers Index since 1999 (Transparency International 2011). Notice, moreover, that there are several features of the construction sector that make it particularly susceptible to corruption. The size of construction projects is usually large, and it is easier to hide large bribes in large projects than it is in small projects (Transparency International 2005). Construction projects normally involve a large number of participants in a complex contractual and sub contractual structure, and this makes controls between the public administration and contractors much more difficult (Charles et al. 2022).

Moreover, in Italy, there are anecdotal evidence and studies confirming the consequent link of mafia with the construction sector. To begin with, Salvatore Lima, the mayor of Palermo between 1958 and 1963, was considered responsible for the so-called 'Sacco di Palermo', a dramatic urbanization of the territory, by explicitly favoring construction firms linked to Cosa Nostra. Yet, Tano Badalamenti, head of the Sicilian mafia, was arrested because he was able to corrupt politicians so as to participate in the bribe for the construction of the local airport using his own construction company.³ Mafia interest was also found in the post-earthquake reconstruction works in L'Aquila (Özderem and Rufini 2013), and in the modernization of the most important highway in the southern Italy: the Salerno-Reggio Calabria (Parliamentary Commission of inquiry on the Mafia phenomena).⁴ A recent analysis conducted on the province of Crotona in the region Calabria (Riccardi et al. 2016), finds that construction is one of the most mafia infiltrated economic sectors. In addition, according to the Anti-mafia Investigative Direction (DIA) report, which analyzes firms sequestered by the Italian government for mafia activity over the period 1983–2012, it turns out that many of them were related to the construction sector. Finally, based on Openregio,⁵ a dataset built by the Ministry of the Interior, in 2016 it turns out that among the 712 firms confiscated from the mafia by the Italian Government, over 35% refers to the construction sector.

Notice that Dreher et al. (2007) find that the consumption of cement, usually related to infrastructure projects of construction firms, has a positive effect on corruption. And interestingly Della Porta and Vannucci (1997) show that per capita cement consumption in Italy

³ Furthermore, in 1982, the judge Giovanni Falcone wrote: 'the mafia organizations completely control the building sector in Palermo, from the quarries for the production of aggregates, the excavation firms and the concrete factories, to the iron deposits for building, ... entrepreneurs are either in the mafia or have to undergo the impositions of mafia organizations'.

⁴ The report is available here: <http://www.senato.it/service/PDF/PDFServer/BGT/1066861.pdf>

⁵ https://openregio.it/statistiche/visualizza/beni_destinati/aziende

is double with respect to USA and triple with respect to UK and Germany. This should imply that corruption in the construction sector in Italy is particularly relevant. This idea is corroborated by the fact that according to the ANAC dataset,⁶ municipal public contracts in the construction sector goes from 52% of the total tenders before the dissolution for mafia infiltration to 42% after the dissolution.

The rest of the work is organized as follows. Section 2 describes the anti-corruption policy and describes the institutional framework. Section 3 illustrates the dataset. The empirical analysis, the results and the robustness checks are in Section 4. Section 5 concludes.

2. Institutional Setting

In 1991, in order to fight corruption in local public administrations, the Italian parliament approved a Law (D.L. n. 164/1991) which allows the Central Government to dissolve the municipal council if there are potential links with the mafia.⁷ Because of this legislative act, the mayor of the city is replaced by a group of commissioners, who is in charge of the overall governance and functioning of the municipality in which they intervene. The dissolution of municipal councils can take place for other reasons than organized-crime infiltration⁸ and it usually follows a process which is slightly different from the one used for the mafia.

The commissioners are chosen from officials who already have experience in the management of municipalities and typically are from a different geographic area than that of the municipality put under commissioner (Fenizia 2018). Furthermore, the commissioners are empowered to revise the budgetary choices and the decisions of the municipal council. Such decisions often coincide with the resolution of public procurement contracts stipulated with firms associated with the criminal organization, regardless the state-of-the-play of the contract (Ministry of the Interior 2016).

Finally, there are special obligations foreseen by the mafia code (D.Lgs. n. 159/2011), which impose municipalities that have been dissolved for organized-crime infiltration to acquire anti-mafia information for any contracts during the five years following the dissolution—a sort of internal communication within bodies of the Public Administration that certifies whether a firm can be procured or not. Once the period finishes for the commissioner, there are local elections, and the commissioners are then replaced by the elected mayor and the elected municipal council.

3. Dataset

The empirical analysis is based on a dataset on both municipalities and firms in the regions of Campania, Calabria and Sicily, for the period 2010–2016.⁹ We collect this information from a combination of different archives, available from the Italian Ministry of the Interior, the Italian Statistical Office (ISTAT), the National Association of Italian municipalities (ANCI), and Orbis—Bureau van Dijk.

⁶ <https://dati.anticorruzione.it/opensdata/dataset>

⁷ According to Art. 143 D. Lgs. n.267/2000 municipal councils are dissolved when: ‘concrete, univocal and significant elements emerge relating to direct or indirect links with organized crime, so as to determine an alteration of the process of formation of the willingness of the elective and administrative bodies and to expose the good performance or impartiality of the municipal administrations as well as the regular functioning of the services entrusted to them, or factors that cause serious and lasting prejudice to the state of public safety’.

⁸ The dissolution may take place for the accomplishment of acts contrary to the constitution or for serious and persistent violations of the law, as well as for serious reasons relating to public order or for the impossibility of ensuring the normal functioning of the organs and services, e.g. the resignation of the mayor or more than half of municipal councilors (TUEL).

⁹ We also collect data for the years 2008 and 2009 and then proceed with the robustness check.

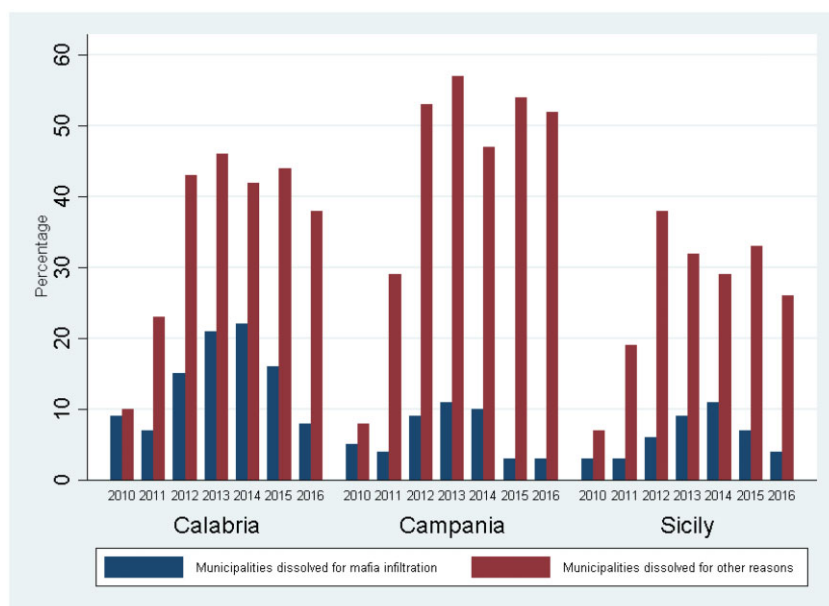


Figure 2. Distribution of council dissolution for mafia infiltration and for another reason, by region and year.

3.1 Municipal data

Municipal information on council dissolution, and its length, have been collected by complementing the data available at the Ministry of the Interior with the Ancitel database, from ANCI, which provides detailed information on the causes of municipal dissolution.¹⁰ According to our sample, 730 councils were dissolved over the period 2010–2016, corresponding to approximately 16% of municipalities in the three considered regions. Among these, 186 municipalities were dissolved for mafia infiltration, with the yearly distribution being more pronounced in Calabria (Figure 2).

To build our main variable of interest we use both the start and the end date of the taking office of the commissioner. Thus, for each municipality, we build the variable *mafia council dissolution* that takes on the value of 1 if the municipal council has been put under the control of a commissioner for a mafia-related issue, and zero otherwise. In the same way, the variable *council dissolution for another reason* accounts for any reason for a council dissolution other than mafia, and it is equal to 1 if the municipality has been put under the control of a commissioner for no mafia-related issue, and zero otherwise.

These variables are then used to create neighboring values. We build the *neighboring council dissolution* variable, which equals to 1 when, in a given year, a commissioner for dissolution is appointed due to mafia infiltration in a nearby municipality and zero otherwise.¹¹ Figure 3 depicts the geographical distribution of both the *mafia council dissolution* and *neighboring council dissolution* variables, suggesting that it is quite uniform within each region, though less marked for Campania.

¹⁰ See the following link for detailed information concerning municipal dissolution http://www.interno.gov.it/sites/default/files/relazione_ministro_enti_sciolti_2015_2016t_0.pdf.

¹¹ The measure of proximity between municipalities was constructed using data from ISTAT (<http://www.istat.it/it/archivio/157423>). We choose that neighbors of municipality i are municipalities that share a border with it.

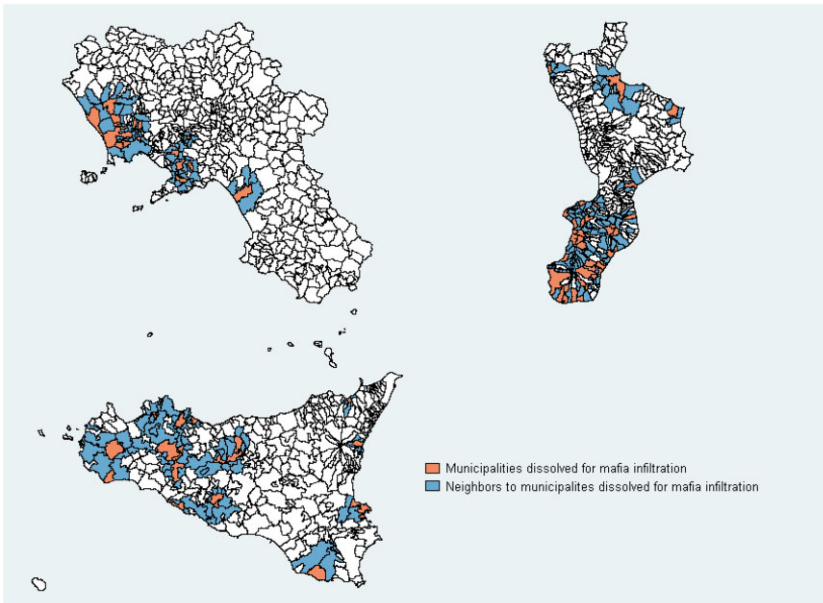


Figure 3. Municipalities dissolved for mafia infiltration and relative neighbors (2010–2016).

In a similar vein, we define the variable *neighboring council dissolution for another reason* as being equal to 1 when in a nearby municipality, each year, the commissioner is in charge because of council dissolution for reasons other than mafia.

To analyze possible heterogeneous effects, we built two different variables. The *average number of days of council dissolution* variable is equal to the ratio between the total number of days of council dissolution in neighboring municipalities due to mafia infiltration and the number of neighboring municipalities times 365. When the variable is 0 it means that neighboring municipalities have experienced zero days of a commissioner over a year and when it is 1, it implies that on average, neighboring municipalities have been put under the control of a commissioner for the entire year (365 days). It follows that a value of this variable corresponding to 0.30 is associated with 110 days of a commissioner.¹²

The variable *average number of neighboring council dissolution* is equal to the ratio between the number of neighboring municipalities dissolved because of mafia infiltration and the number of neighboring municipalities.

3.2 Firms data

Information concerning firms was taken from the Bureau van Dijk database (Orbis). This database contains financial and commercial information on over 500,000 equity companies operating in Italy. As our main variable of interest, we used the *value added*, computed by subtracting the total costs from the total revenues.¹³ The definition of total costs includes costs for gross purchases, costs for several services/changes in inventories of materials, goods purchased without transformation and other operating costs. On the revenue side, we included the value of gross sales, the change in inventories of finished products, semi-

¹² $365 \text{ days} \times 0.30 = 110 \text{ days}$.

¹³ While in principle it is possible to rely on a definition of the valued added per employees, in practice this solution turns out to be not feasible as the number of employees (full time equivalent) for 25% of the firms is equal to 0.

Table 1. Summary statistics

	N of observation	Average	Std. Dev.	Min	Max
Value added	701,288	337.36	3,499.08	0.001	1,181,223
Neighboring council dissolution	701,288	0.225	0.418	0	1
Neighboring council dissolution for another reason	701,288	0.321	0.467	0	1
Average number of neighboring council dissolution	698,960	0.034	0.08	0	1
Average number of days of council dissolution	698,960	0.035	0.077	0	0.904
Mafia council dissolution	701,288	0.03	0.172	0	1
Council dissolution for another reason	701,288	0.123	0.329	0	1
Firm aging	701,288	11.25	10.364	1	155
Revenue class	680,822	0.697	1.25	0	9

finished goods and work in progress, and the revenues of management accessories are items included for calculating revenues.

In addition, we collected information on the number of years since the beginning of the activity of the firm and the class of revenue.¹⁴ We then built the variable *number of years* of the firm accounting for the maturity of the firm measured by the number of years since its foundation. The *revenue class* variable captures the size of the company in financial terms. Furthermore, we gather information on the activity of the firm by relying on its economic sector (ATECO¹⁵). Each municipality is divided in areas and in each of this area it is possible associate to a particular zip-code. Moreover, ISTAT release a classification of zip-codes by municipalities which let us identify the municipality where each firm is based. Hence, we are finally able to match the firm's dataset with the dataset of the socio-economic and political characteristics of the municipalities.

Summary statistics of all variables used in the analysis are reported in [Table 1](#).

[Figure 4](#) plots the distribution of firms, valued added and revenue for all economic sectors. Accordingly, in Panel A, it emerges that almost 60% of firms are distributed across three sectors: wholesale trade (26%), construction (18%) and manufacturing (12%). A similar picture is depicted in Panel B, where the sector distribution of value added, and revenue is shown. Indeed, the lion's part of the value added, and revenue generated by companies is concentrated among the manufacturing, wholesale, construction and transport sectors. What this simply suggests is that construction is among one of the most relevant sectors in the local economy of the three regions ([Figure 4](#)).

4. Empirical Analysis

4.1 Econometric specification

Our analysis focuses on the effects of the commissioner for mafia infiltration on the value added of firms in bordering municipalities. We are interested in analyzing the impact of spatial effects, due to the anti-corruption policy, on the local economy surrounding the municipality whose council has been dissolved for mafia infiltration.

To begin with, we use the following model:

¹⁴ Following the definition provided by ISTAT, we grouped firms in 9 revenue classes (see [Table A1](#)).

¹⁵ The ATECO codes used in the analysis are reported in the [Appendix, Table A2](#).

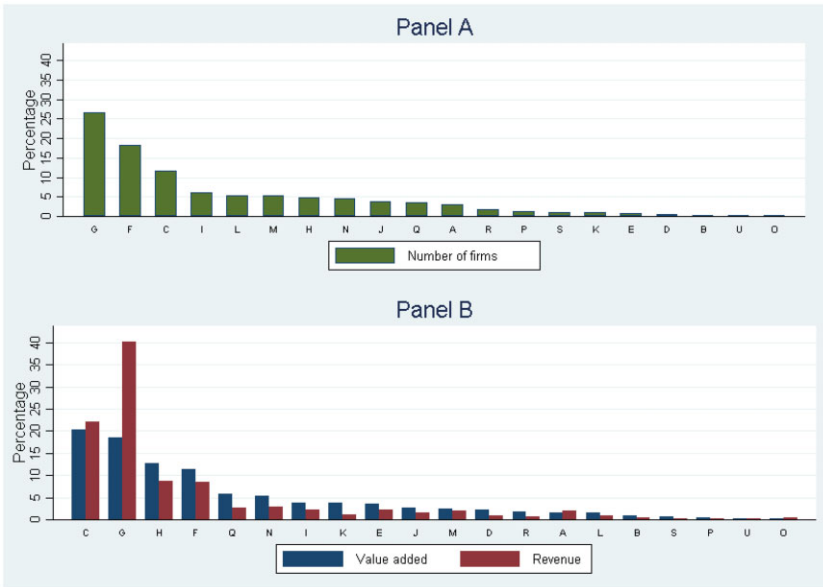


Figure 4. Distribution of firms, value added and revenue by economic sectors. *Note:* Panel A: percentage distribution of the firms (green) by ATECO code (see Table A2); Panel B: percentage distribution of valued added (blue) and revenue (red) by ATECO code.

$$Y_{ict} = \alpha + \beta \text{neighboring mafia council dissolution}_{ct} + \gamma \text{mafia council dissolution}_{ct} + \delta \text{council dissolution}_{ct} + \rho X_{it} + \tau_i + \mu_t + \varphi_{pt} + \epsilon_{ict} \tag{1}$$

where i denotes the firm, c the municipality where the firm is located and t the year. Y_{ict} is the logarithm of the value added, opportunely deflated.¹⁶ The *neighboring mafia council dissolution*_{ct} variable is a dichotomous variable that is equal to 1 when the firm is in a municipality bordering a municipality which is dissolved for mafia infiltration and 0 otherwise. We also include two indicators accounting for the presence of commissioners in the municipal administration: *mafia council dissolution*_{ct} and *council dissolution*_{ct}, with the former capturing the presence of mafia-related commissioners and the latter accounting for the presence of other commissioners for reasons other than mafia. X_{it} is a set of time-varying variables at the level of the firm, such as *number of years* and *revenue class*. τ_i denotes the firm’s fixed effects,¹⁷ μ_t is the year’s fixed effects and φ_{pt} is a set of province-by-year fixed effects, the aim of which is that of capturing any pattern of unobserved economic shock within the same province. Finally, ϵ_{ict} is the idiosyncratic error term, clustered at the municipal level.

The coefficient β captures the impact on the value added of municipalities neighboring a municipality whose council has been dissolved for mafia infiltration. To investigate whether this impact is particularly due to the construction sector, we interact the neighbors’ mafia council dissolution with a dummy variable accounting for it. In particular, we estimate a modified version of equation (1) where we allow the spatial effect in the construction sector to be separated:

¹⁶ Data deflated by the national consumer price index for the entire community, excluding energy (ISTAT).
¹⁷ We did not include municipality or province fixed effects because firm’s fixed effects are a linear combination of them.

$$Y_{ict} = \alpha + (\beta + \lambda \text{construction}_i) \times \text{neighboring mafia council dissolution}_{ct} + \gamma \text{mafia council dissolution}_{ct} + \delta \text{council dissolution}_{ct} + \rho X_{it} + \tau_i + \mu_t + \varphi_{pt} + \epsilon_{ict} \quad (2)$$

In a way that differs from equation (1), equation (2) includes the additional term $\text{neighboring mafia council dissolution}_{ct} \times \text{construction}_i$. This identifies the specific impact of the neighbors' mafia council dissolution on the construction sector. In fact, construction_i is a dummy variable that is equal to one when firm i belongs to the construction sector and zero otherwise. The impact of being a firm in the construction belonging to a neighbors' mafia council dissolution on its own value added can be calculated as $\beta + \lambda \text{construction}_i$, where λ provides the differential impact on the value added of being a construction firm.

4.2 Baseline results

In Table 2, we show our estimates. We first estimate equation (1), without including controls variable (col. 1) and then in column (2) we replicate the analysis including the firm's controls. Results indicate that the neighboring council dissolution for mafia triggered a reduction of the level of the value added; nevertheless, the estimated effects are not statistically different from zero in both specifications. While these results seem to suggest that, on average, there is no effect associated with the anti-corruption policy, it might be the case that some sectors, such as construction, have been strongly affected.

To explore whether construction firms are affected by the policy, we estimate model (2). Results of this analysis are shown in column 3 of Table 3 and indicate that the value added of firms in the construction sector reduces by approximately, $6.5\% = (0.5-7.1)$, as the coefficient of the interaction term, $\text{neighbors mafia council dismissal}_{ct} \times \text{construction}_i$, turns out to be negative and statistically significant at 1%. A very similar effect is obtained when we repeat the analysis with the inclusion of control variables (Table 2, col. 4).

Finally, in columns (5), (6), (7) and (8) we replicate the previous regressions by adopting a different definition of the council dissolution variable. In detail, we create a measure for the intensity of a commissioner, which is given by the number of days over a year in which neighboring municipalities are put under the control of a commissioner for mafia infiltration.¹⁸ In this case too, we observe a negative and statistically significant effect of the neighbors' council dissolution on the value added of firms in the construction sector, both in the case when control variables are excluded (Table 2, col. 7), and in the case when, instead, controls are included (Table 2, col. 8). To see the magnitude of the effect, take a low level of intensity, say the one corresponding to the 25th percentile of its distribution (0.09, corresponding to approximately 33 days). The effect of neighboring council experiencing a dissolution then implies a decrease in the value added of firms in the construction sectors of $-0.007 \times 0.09 - 0.248 \times 0.09 = -2.29\%$ (statistically significant at 1%). Take then a high level of commissioner intensity, say the one corresponding to the 75th percentile of its distribution (0.19, corresponding to approximately 69 days). In this case, neighboring council dissolution leads to a decrease in the value added of firms operating in the construction sectors of $-0.007 \times 0.19 - 0.248 \times 0.19 = -4.84\%$ (statistically significant at 1% level). Note that the difference of these two effects is statistically significant ($-4.84 + 2.29 = 2.55\%$; $p = 0.006$), implying that the effect is larger the longer the commissioner is present in the municipal council.

¹⁸ To test for the robustness of our results we also use a third definition of neighboring council dissolution. In particular, we define average number of neighboring council dissolution as the ratio between the number of neighboring municipalities put under the control of a commissioner and the total number of municipalities. Results do not change and are available in Appendix, Table A3.

Table 2. Value added and neighbors council dissolution for mafia infiltration

Dependent variable: Value added	Dummy neighbors council dissolution				Average number of days of council dissolution			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Neighboring mafia council dissolution	-0.008 (0.005)	-0.005 (0.005)	0.005 (0.005)	0.006 (0.005)	-0.085*** (0.028)	-0.062** (0.027)	-0.017 (0.028)	-0.007 (0.029)
Neighboring mafia council dissolution × construction			-0.071*** (0.018)	-0.060*** (0.016)			-0.316** (0.125)	-0.248** (0.102)
Mafia council dissolution	-0.025 (0.015)	-0.015 (0.013)	-0.023 (0.015)	-0.013 (0.013)	-0.021 (0.015)	-0.012 (0.013)	-0.019 (0.015)	-0.011 (0.013)
Council dissolution for another reason	-0.001 (0.006)	-0.003 (0.005)	-0.001 (0.006)	-0.003 (0.005)	-0.001 (0.005)	-0.002 (0.005)	-0.001 (0.006)	-0.002 (0.005)
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Province × year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Other firm controls	NO	YES	NO	YES	NO	YES	NO	YES
Observations	676,728	653,777	676,728	653,777	674,473	651,564	674,473	651,564
R-squared	0.833	0.849	0.833	0.849	0.833	0.850	0.833	0.850

Notes: Robust standard errors, clustered at the municipal level, are shown in parentheses.

*** Significant at 1%.

** Significant at 5%.

* Significant at 10%. Other firms' controls include the number of years of the firm and revenue class.

Table 3. Value added and neighbors council dissolution for mafia infiltration, falsifying the commissioner's entry to 1 year or 2 years before

Dependent variable: Value added	(1)	(2)	(3)	(4)
Neighboring mafia council dissolution _{t+1}	-0.006 (0.006)	-0.003 (0.005)		
Neighboring mafia council dissolution _{t+1} × construction	-0.025 (0.025)	-0.011 (0.018)		
Neighboring mafia council dissolution _{t+2}			-0.009 (0.007)	-0.008 (0.006)
Neighboring mafia council dissolution _{t+2} × construction			0.007 (0.020)	0.021 (0.016)
Mafia council dissolution	-0.022 (0.016)	-0.013 (0.012)	0.010 (0.018)	0.016 (0.014)
Council dissolution for another reason	-0.002 (0.005)	-0.000 (0.005)	-0.007 (0.006)	-0.003 (0.006)
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Province × year fixed effects	YES	YES	YES	YES
Other firm controls	NO	YES	NO	YES
Observations	554,137	535,261	465,616	450,197
R-squared	0.852	0.868	0.859	0.875

Notes: Robust standard errors, clustered at the municipal level, are shown in parentheses.

*** Significant at 1%.

** Significant at 5%.

* Significant at 10%. Other firms' controls include the number of years of the firm and revenue class.

Finally, it can be noticed that neither the inclusion of control variables, nor the adoption of different measures of council dissolution change the magnitude of the assets, implying that firms may not appear to be significantly different in terms of observables and that the effect is not driven by the definition of the neighboring council dissolution variable.

Taken together, these results suggest that the presence of an anti-corruption policy leads to a reduction of the value added of firms in the construction sector of the geographical area where the affected municipality is situated, suggesting that there are crime-related links between private firms and local officials (with such an effect being more pronounced the longer the commissioner is present). Interestingly this effect holds for firms located in municipalities neighboring the municipality where the dissolution has taken place, but not for firms located in the corrupted municipality. However, it should be noted that this could be due to the endogeneity of the dissolution, given that the higher the value added, the more the criminal activity and so the more likely that the city council of the municipality is dissolved.

4.3 Robustness test

In this section, we assess the validity of the previous results by performing a set of robustness tests.

First of all, we run checks to detect anticipatory behavior by including leads, up to two years, for the *neighboring mafia council dissolution_{ct}* and *neighboring mafia council dissolution_{ct} × construction_i* variables with regard to the fully controlled regressions. Results of this analysis are reported in Table 3 and indicate that there is no evidence of anticipatory effects on the value added associated with the city council dissolution for mafia infiltrations.

Second, there might be some unobservable characteristics linked to council dissolution which bias our results. To tackle this issue, we compare point estimates, and confidence

Table 4. Value added and neighbors council dissolution for mafia infiltration, with different fixed effects

Dependent variable: Value added	(1)	(2)	(3)
Neighboring mafia council dissolution	0.013*** (0.005)	0.006 (0.005)	-195,057 (466,281)
Neighboring mafia council dissolution × construction	-0.060*** (0.017)	-0.060*** (0.016)	-0.061*** (0.016)
Mafia council dissolution	-0.012 (0.012)	-0.013 (0.013)	-160,268 (411,873)
Council dissolution for another reason	-0.001 (0.005)	-0.003 (0.005)	-132,481 (159,284)
Firm fixed effects	YES	YES	YES
Year fixed effects	YES	YES	YES
Province × year fixed effects	NO	YES	NO
Municipal × year fixed effects	NO	NO	YES
Other firm controls	YES	YES	YES
95% Conf. interval			
Neighboring council dissolution × construction	[-0.0928; -0.0263]	[-0.0921; -0.0285]	[-0.0933; -0.0288]
Observations	653,777	653,777	653,159
R-squared	0.849	0.849	0.852

Notes: Robust standard errors, clustered at the municipal level, are shown in parentheses.

*** Significant at 1%.

** Significant at 5%.

* Significant at 10%. Other firms' controls include the number of years of the firm and revenue class.

intervals relating to our main variable of interest, *neighboring mafia council dissolution*_{ct} × *construction*_i using three different combinations of fixed effects: (i) model with controls, firms and years fixed effects; (ii) model with controls, firms and years fixed effects as well as the interaction between year fixed effects and the province fixed effects; (iii) model with controls, firms and years fixed effects and the interaction between year fixed effects and municipal fixed effects. Our results, shown in Table 4, suggest that point estimates are consistent among the three models and thus we find no plausible explanation that stand up as an argument against a causal interpretation of the identified relationship.

Third, to better strengthen the evidence pointed out so far and in the spirit of a placebo exercise, we investigate whether using the council dissolution for reasons other than mafia leads to the same conclusion. Indeed, were it the case, it would imply that the effects detected for firms operating in the construction sector are not due to mafia, but—more generally—to the status of commissioner, thereby undermining the crime-related links between private firms and local officials. The results of this analysis (Table 5) and suggest that being surrounded by municipalities dissolved for reasons that are not mafia related brings no effects on the value added of firms, as the interaction term *neighboring council dissolution for another reason*_{ct} × *construction*_i is not statistically significant in any specification.

5. Conclusion

We examined the impact on economic activity at a local level of a strong anti-corruption policy used in Italy, as the introduction of a municipal commissioner for mafia infiltration.

Following the theoretical reasoning of Sah (1991), anti-corruption policies affect activities of criminal organizations, even in neighboring municipalities and by not letting mafia controlling economic activities linked to municipal administrations.

Moreover, while all firms are potentially subject to a link to organized crime, some of them are in practice, more vulnerable to criminal infiltration than others (Rose-Ackerman 1999), for example, the ones operating in the construction sectors.

Table 5. Value added and neighbors council dissolution for another reason.

Dependent variable: Value added	(1)	(2)	(3)	(4)
Neighboring council dissolution for another reason	-0.000 (0.004)	-0.002 (0.004)	0.004 (0.004)	0.001 (0.004)
Neighboring council dissolution for another reason × construction			-0.023 (0.023)	-0.017 (0.019)
Mafia council dissolution	-0.025 (0.015)	-0.015 (0.013)	-0.025* (0.015)	-0.015 (0.013)
Council dissolution for another reason	-0.001 (0.006)	-0.003 (0.005)	-0.001 (0.006)	-0.003 (0.005)
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Province × year fixed effects	YES	YES	YES	YES
Other firm controls	NO	YES	NO	YES
Observations	676,728	653,777	676,728	653,777
R-squared	0.833	0.849	0.833	0.849

Notes: Robust standard errors, clustered at the municipal level, are shown in parentheses.

*** Significant at 1%.

** Significant at 5%.

* Significant at 10%. Other firms' controls include the number of years of the firm and revenue class.

Indeed, we showed that in the construction sector the effect of having had a municipality dissolved for mafia infiltration close to the headquarters of the firm decreases the value added by 7%. The effect that is found is sensitive to the intensity of treatment, defined by the number of days the commissioner is present. The reason of this result is due the fact that the construction sector is heavily dependent on local procurement and as such, it is 'more' likely to be involved in mafia-related crime (Gambetta and Reuter 1995). One drawback of this conclusion can be at least that part of the lost value added could have been absorbed by the increase in the volume of the shadow economy which, if not discovered, cannot be under the control of the local commissioner. If this would be the case, it would clearly be a failure of the aim behind the dissolution action of the central government. This is why it is extremely important strict a simultaneous (to the dissolution) control of economic activities which are not closely related with political institutions.

Our results states that the action of the commissioner depresses the economic activity, related to the construction sector, of the area where the temporary-administered municipality is located, given that it blocks all those relationships with firms related with criminality. This calls for a contemporaneous intervention stimulating public procurements with appropriate rules preventing infiltration by the criminality. However, commissioners cannot issue new calls for public procurement because when they take office, they usually find a very difficult financial situation, which implies increase in taxes and restriction in expenditure. To tackle this situation, avoiding the risk of depressing the local economy, together with the dissolution of the municipality it should be provided adequate funding from the central government to let the commissioner manage new procurements with transparent procedures avoiding criminal corruption. These are clearly emergence situations, and the central government should treat them with appropriate caution: people should identify the state intervention as a solution to the criminal problem and not as a cause of their increase in poverty and worse socio-economic territorial conditions. Otherwise, it would be difficult to convince people that it is better to live in a world free from criminal groups.

One concern of the analysis may be that it focuses on a single country, and as such, limits the external validity of our results. However, as a matter of fact, the Italian mafia can be considered as the 'prototype' for other criminal organization around the world, such as drug cartels in South America and the Yakuza in Japan (Pinotti 2015). More broadly, it

follows that the evidence pointed out in this work might eventually shed light on the effects of the presence of criminal organizations in public administration and local firms.

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Appendix

Table A1. Revenue classes, EUR

Revenue class	Revenue
0	0–0.499 million
1	0.5–0.999 million
2	1–1.999 million
3	2–4.999 million
4	5–9.999 million
5	10–24.999 million
6	25–49.999 million
7	50–99.999 million
8	100–249.999 million
9	≥250 million

Table A2. Description of ATECO macro-sector

ATECO macro-sector	Description
A	Agriculture
B	Cave
C	Manufacturing
D	Electricity and gas
E	Water supply
F	Construction
G	Wholesale trade
H	Transport
I	Accommodation, catering
J	Communication
K	Finance and insurance
L	Real estate
M	Professionals
N	Rentals and trips
O	Public administration
P	Instruction
Q	Health
R	Art, sport and entertainment
S	Other services
U	International organizations

Table A3. Value added and neighbors council dissolution for mafia infiltration, average number of neighboring council dissolution

Dependent variable: Value added	(1)	(2)	(3)	(4)
Neighboring mafia council dissolution	-0.059** (0.029)	-0.047 (0.029)	-0.001 (0.028)	-0.000 (0.028)
Neighboring mafia council dissolution × construction			-0.257*** (0.073)	-0.201*** (0.065)
Mafia council dissolution	-0.022 (0.015)	-0.013 (0.013)	-0.020 (0.015)	-0.011 (0.013)
Council dissolution for another reason	-0.001 (0.006)	-0.002 (0.005)	-0.001 (0.006)	-0.002 (0.005)
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Province × year fixed effects	YES	YES	YES	YES
Other firm controls	NO	YES	NO	YES
Observations	674,473	651,564	674,473	651,564
R-squared	0.833	0.850	0.833	0.850

Notes: Robust standard errors, clustered at the municipal level, are shown in parentheses.

*** Significant at 1%.

** Significant at 5%.

* Significant at 10%. Other firms' controls include the number of years of the firm and revenue class.