Cooperation in Criminal Markets

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Abstract

Using a unique data set on organized crime, we examine for the first time the interplay between domestic and foreign criminal organizations in Italy. We find that cooperation between Italian and foreign organizations is strongly associated to activities in which foreign organizations are well placed to supply inputs. Interestingly, this association is stronger in regions home to the headquarters of traditional Italian organizations (incumbent regions). To mitigate reverse causality concerns, we use a Propensity Score approach. Once these are taken into account, we find that cooperation is higher when crimes are undertaken in incumbent regions and are such that foreign organizations can more easily supply inputs. Using a simple coalitional model we rationalize our results showing that they are consistent with an economic motive coupled with the threat of violence involved in criminal activities.

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1   Introduction

Since Becker (1968) the economic analysis of crime has mostly focused on the behavior of individual offenders.[1] Much less attention has been devoted to the activities of criminal organizations, especially from an empirical point of view. However, an increasing number of recent empirical works has looked at the causes and the consequences organized crime. For example, Dell (2015) has shown how law enforcement can trigger drug-trade-related violence in Mexico. Bandiera (2003), Dimico et al. (2012) and Buonanno et al. (2015) have instead traced the origins of the Sicilian Mafia from the demand of enforcement and protection.[2] Others, like Pinotti (2015) and Geys and Daniele (2015) have studied how the presence of organized crime can negatively affect the quality of politicians.[3]

An important and often neglected issue in the literature on economics of crime is that criminal organizations are in many respects comparable to corporations. Organizations like the Japanese Yakuza or the Italian 'Ndrangheta are in fact large groups of people involved in complex activities (e.g. drug production, human trafficking, money laundering, etc...). Like corporations, they exploit networks, increasingly structure themselves like "conglomerates of crimes" and cooperate with other groups (Robinson, 2000; Sterling, 1994; Williams, 1994).

Interestingly, this trend also characterizes Italy, a country that is historically known for the presence of strong local (*incumbent*) organizations (i.e. the Cosa Nostra in Sicily, the Camorra in Campania and the 'Ndrangheta in Calabria), that is increasingly attractive also for foreign groups. In the words of the Italian National Anti-Mafia Attorney:

> "...We are used to think of our criminal associations acting in Italy and abroad... But now the reality is partially changed. Next to this phenomenon another equally dangerous reality is also emerging: the presence of foreign organizations operating in our territory, with or without relations with our traditional mafia."[4]

In this paper, we examine cooperation among different criminal organizations, showing that their behavior is shaped by the type of crimes committed and by the strength of local groups in some regions. While plenty of anecdotal evidence is available on the subject, to the best of our knowledge this is the first study to investigate the issue systematically, using a newly collected data set that allows to look at the behavior of local and foreign organizations in the Italian territory. Data contains information on the investigations conducted, between 2007 and 2010, by the Direzione Investigativa Antimafia (DIA), the Italian anti-mafia agency in charge of monitoring the activities of criminal organizations.

We find that local and foreign groups are more likely to cooperate for specific crimes (e.g. human trafficking and enslavement activities). Moreover, the presence of traditional (incumbent) organizations in some regions reduces the probability of cooperating. However, in these areas the same

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[1]See Dills et al. (2010), and Ehrlich (2010) for a review of the literature.

[2]From a theoretical point of view criminal organizations have been shown to influence the way laws are optimally enforced (e.g. Backhaus, 1979; Buchanan, 1973).

[3]Kugler et al. (2005) shows theoretically that the presence of organized crime negatively affects the accountability of the political class.

[4]Report of the Italian National Anti-Mafia Attorney, December 2012.

probability is higher when cooperation takes place for criminal activities in which foreign organizations can play an important role in providing *inputs* (e.g. for counterfeiting activities). One possible explanation could indeed be that in regions where incumbents are strong, foreigners might be forced to cooperate in criminal activities they could normally engage in without a local partner. We rationalize our results with a model suggesting that cooperation is not only driven by an economic motive, but also by the threat of violence involved in criminal activities.

This paper is organized as follows. Section 2 briefly illustrates the context in which the DIA was established. Section 3 describes the data. Section 4 present the results. Section 5 presents a simple theoretical model which rationalizes our empirical findings. Section 6 concludes.

2   The DIA

The Cosa Nostra, the 'Ndrangheta, and the Camorra (we will also call these "traditional organizations") have been operating in Italy at least as far as the country's unification in 1861 (Lupo, 2011). However, it was only in the 80's that Italian laws really acknowledged the peculiarities of "large-scale" organized crime. In response to the expansion of organized crime and to the related escalation of violence that characterized the 1970s and 1980s (especially in Sicily and in Campania), a body of new laws was put in place. In this context, in 1991, a new agency, the DIA, was created as a monofunctional investigative body, composed of specialists in various police corps, with the task of conducting criminal investigations relating exclusively to crimes of criminal associations (art. 3 of Decree 345 - 1991 and art. 108 of Legislative Decree no. 159 - 2011).[5]

Importantly, in conducting investigations, the DIA focuses on criminals rather than individual crimes. As a rule, it does not act on the basis of a *notitia criminis*, i.e. a notice conveyed to a prosecutor that a crime is alleged to have occurred: criminal phenomena are analyzed through the lens of criminal associations, with the aim of identifying their individual components, responsibilities, roles and attitudes. In particular, the DIA systematically monitors criminal associations and individuals suspected of belonging to mafia organizations. Investigations are coordinated by a prosecution judge (the *Pubblico Ministero*) until sufficient elements are available for him to be authorized by another judge to issue warrants against alleged members of criminal organizations. If warrants are authorized, the police will execute them.

3   Data

Twice a year, the DIA illustrates its activities to the Italian Parliament. In these occasions, a detailed summary of the investigations is made available in reports that the DIA publishes on its website. These reports constitute our main source of data.

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[5]The idea of having an agency with the only task of conducting investigations on organized crime was especially put forward by the the judges Falcone and Borsellino, both murdered by the Sicilian Mafia, shortly after the establishment of the DIA, in 1992.

To perform the analysis, we collected information about all the incarceration orders (we will also call them police actions) which, between 2007 and 2010, took place following DIA investigations leading to arrest warrants of alleged criminals accused of having committed one ore more crimes.[6]

3.1 Actions

Per each police action, the DIA reports the offense(s), whether the offenders belonging to the caught organizations were Italians or foreigners (or both), where crimes were allegedly undertaken and the number of people involved (accused). Figure F1 in the Appendix provides an idea of the typical set of information reported by the DIA per each action. Collecting data from DIA files has at least two advantages. First, it allows us to focus on the activities of criminal organizations rather than on the offenses undertaken by individual criminals. Second, we observe when domestic and foreign organizations are caught together, i.e. we observe when they cooperate and for which criminal activity. To the best of our knowledge, the latter feature is unique to our data set.

Over the time span covered in this paper, 1,861 police actions took place following DIA investigations. Each of them led to the imprisonment of alleged criminals accused of having committed one or more crimes. Table 3.1 lists the number of actions in each year of the sample at hand: in 2007 this number is smaller than in the other 3 years.[7]

Table 3.1: Number of Police Actions, by Year

| Year	2007	2008	2009	2010	Total
Actions	308	532	492	538	1,861
%	16.47	28.45	26.31	28.77	100

Source: Authors' elaborations on DIA reports.

3.2 Cooperation

In taking the action i, the police may incur in criminals belonging to three types of organizations: those composed of Italians or foreigners only (*Domestic* and *Foreign*) and the *mixed* ones, i.e. those made by Italians and foreigners (*Cooperation*). Figure 1 shows the number of actions taken against each type of organization: the bulk of them (70.12%) concerns domestic organizations. However, around 30% of the actions are taken to fight organizations composed by foreigners only (17.03%) or by Italians and foreigners (12.85%), showing a non-negligible involvement of foreign groups in organized crime activities in the Italian territory.

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[6]Unfortunately, DIA reports do not provide any information concerning the unsuccessful investigations, i.e. those that did not lead to arrests. Moreover, While data before 2007 could also be collected, the way DIA reports are compiled makes the combination of pre-2007 and 2007-onwards data inappropriate. Finally, we exclude arrests of fugitives for which warrants were issued in the context of other investigations and those of individuals caught in the act of committing a crime outside an ongoing investigation.

[7]The smaller number of actions reported in 2007 is not related to a different way of reporting the DIA activities. Moreover, excluding 2007 actions from the sample does not change the results discussed in the next sections

Figure 1: Type of Organization
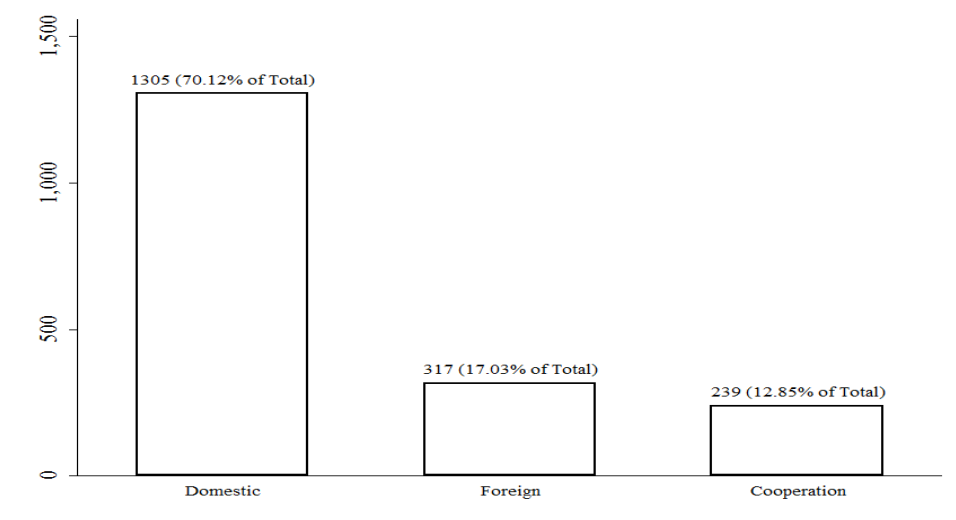
Note: The figure shows the number of actions taken by the police during 2007-2010. It distinguishes between actions taken against organizations composed of Italians or foreigners only (*Domestic* and *Foreign*) and those constituted by Italians and foreigners (*Cooperation*).

To study cooperation between Italian and foreign organizations we define the dependent variable, C_{ijt}, as a dummy equal to 1 if in taking the action i, the police arrests members of an organization of Italians and foreigners, in province j, at time t. Descriptive statistics for the variable C_{ijt}, reflecting the numbers shown in Figure 1, are reported in Table 3.2.

Table 3.2: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	Observations
C_{ijt}	0.129	0.335	0	1	1,861
Inp_{ijt}	0.114	0.318	0	1	1,861
Inc_r	0.482	0.5	0	1	1,861
$Inc_{r,[HQ\ only]}$	0.363	0.481	0	1	1,861
$Inc_{r,[HQ\ and\ outside]}$	0.089	0.285	0	1	1,861
GDP_{jt}	9.815	0.301	9.384	10.605	1,861
$Permits_{jt}$	-4.195	0.779	-5.816	-2.141	1,861
$Density_{jt}$	12.053	1.633	5.511	14.775	1,861
$\sum_{i=1}^{N} P^{ijt}$	11.5	15.967	1	173	1,795
$\sum_{i=1}^{N} O^{ijt}$	1.788	1.234	1	14	1,861

3.3   Criminal Activities

Each police action follows an arrest warrant issued against alleged criminal accused to have undertaken one or more crimes.[8] Figure 2 shows the occurrence of the different types of criminal activities, from the most (*Drugs*) to the least frequent (*Smuggling*).

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[8]Table A1 in the Appendix shows summary statistics per each criminal activity.

Figure 2: Police Actions, by Crime
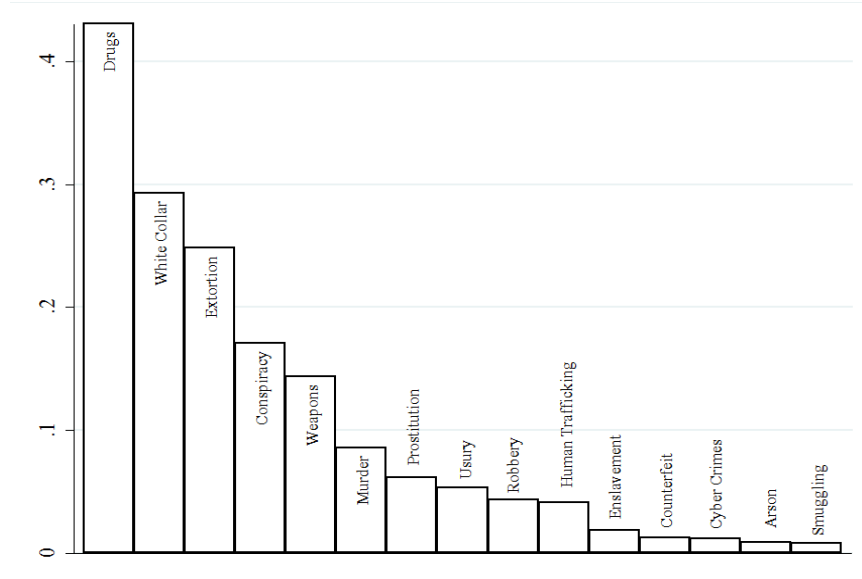
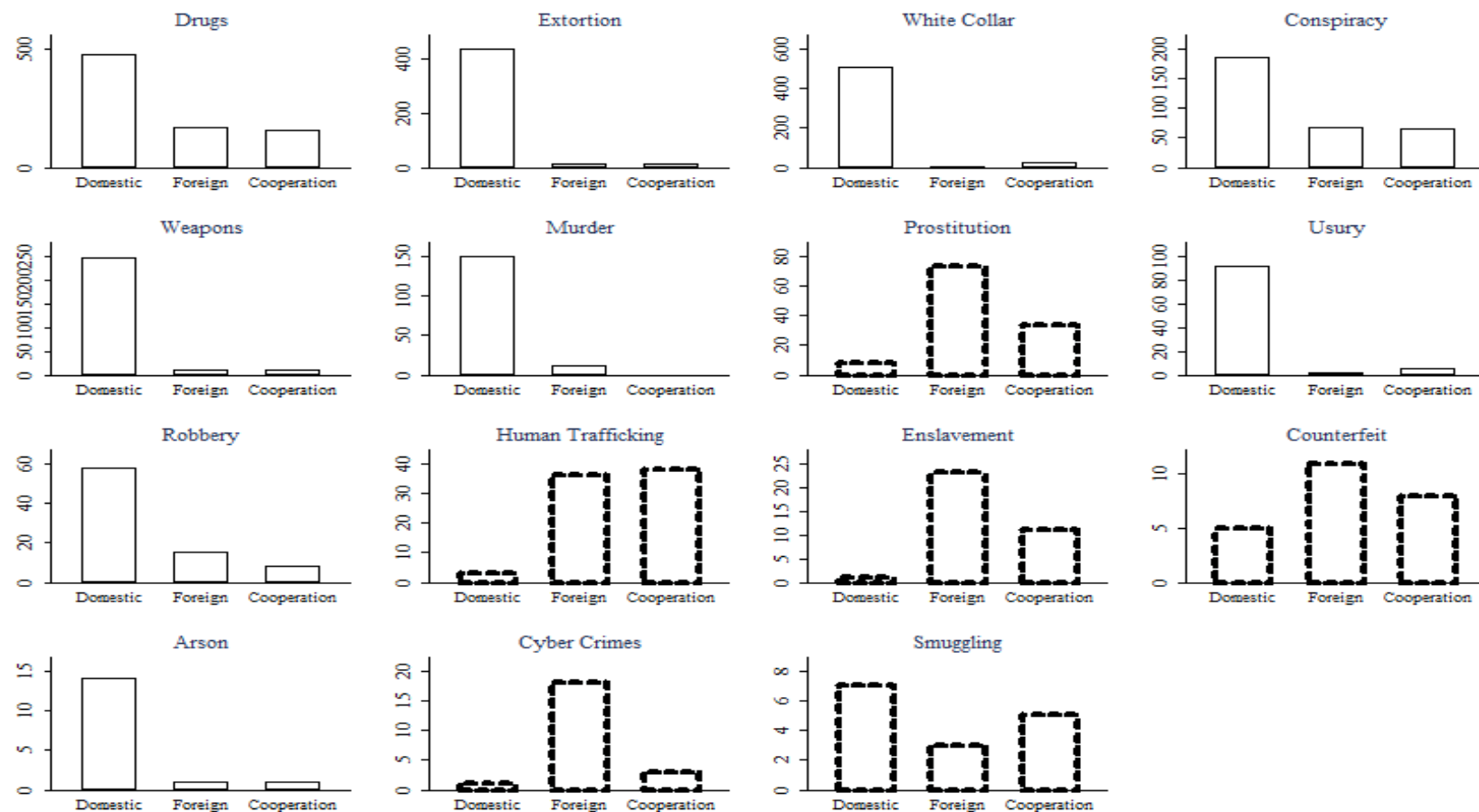*Note*: The figure shows the ratio between number of actions taken by the police against a given crime and the total number of actions, for the period 2007-2010. *White Collar* includes *Mafia Association*, *Bid Rigging*, *Unfair Competition*, *Fraud*, and *Money Laundering*. For detailed definitions of those crimes, please see Table A1 in the Appendix.

Figure 3 shows instead the distribution of those crimes across the three types of organizations illustrated in the previous subsection. An interesting fact emerges: foreigners, both when caught alone or in cooperation with Italians, seem to specialize in specific crimes, like prostitution and counterfeiting activities, human trafficking, enslavement practices, and smuggling (dashed bars in Figure 3). This suggests that foreign organizations are more likely to be involved in criminal activities where could be well placed to provide certain inputs. For example, in the case of prostitution and enslavement activities, or human trafficking, foreign organizations could procure people more easily in their, often distressed, countries of origin.

The DIA has indeed underlined how foreign organization tend to wangle people with the promise of a better life if they migrate (DIA, 2010). However, once in Italy, these people are often exploited, enslaved, and blackmailed by criminals who can threaten immigrants' relatives in their home countries. Foreign organizations (especially Chinese ones) are also active in counterfeiting markets where they are likely to have a competitive advantage in importing illegal product to be sold in cooperation with local organizations (notable examples of this type of activities are the agreements among Chinese groups and the Neapolitan Camorra). In this sense, foreign organizations are possibly better placed than local ones to supply inputs for criminal activities, i.e. people to be exploited or illegal goods to be sold at very competitive prices. The same types of activities are likely to be more costly for Italian organizations.

Figure 3: Type of Organization - Number of Police Actions (by Crime)

Note: The figure shows the number of actions taken by the police during 2007-2010, by criminal activity. It distinguishes among actions taken against organizations composed of Italians or foreigners only (*Domestic* and *Foreign*) and those made by Italians and foreigners (*Cooperation*). *White Collar* includes *Mafia Association*, *Bid Rigging*, *Unfair Competition*, *Fraud*, and *Money Laundering*. For detailed definitions of those crimes, please see Table A1 in the Appendix.

3.3.1 Inputs

To capture the fact that foreigners are more involved in some crimes than in others, we classify as inputs those crimes for which the share of police actions in which foreigners were caught are more than half of the total amount of actions taken for the same crime, between 2007 and 2010, that is:

$$Inp_{ijt} = \begin{cases} 1 \text{ if } \sum\limits_{i=1}^{N} O^{i,F} \left[\sum\limits_{i=1}^{N} O^{i,All} \right]^{-1} > \frac{1}{2} \\ 0 \text{ otherwise.} \end{cases} \tag{1}$$

where $(O^{i,F})$ $O^{i,All}$ indicates the offense(s) of which alleged (foreign) criminals were accused in the context of action i in province j at time t. In other words, a criminal activity is classified as input if foreigners are responsible for more than half of it, i.e. if the number of times foreigners are caught to commit a given crime is above the median. Table 3.2 shows that inputs concern 11.4% of the police actions. With this criterion *Prostitution, Human Trafficking, Enslavement, Counterfeit, Cyber Crimes* and *Smuggling* are classified as inputs.

3.4 Incumbent Regions

As mentioned earlier, Italy is home to some of the oldest criminal organizations in the World. In particular, the presence of the Cosa Nostra in Sicily, the Camorra in Campania and the 'Ndrangheta in Calabria dates back at least to the second half of the XIX century. These organizations have traditionally exerted the monopoly of violence and a pervasive control of the territory, both through criminal activities and influence on local institutions (see e.g. Pinotti, 2015). It is thus hard to imagine that foreign criminal organizations undertake criminal activities, in those regions, without interacting with traditional ones.

In this sense, Calabria, Campania and Sicily are different from other Italian regions, i.e. they are characterized by the presence of *incumbents*. The peculiarity of these three regions also emerges from our data: 83% of the actions taken there by the police in incumbent regions target traditional organizations, confirming their strong presence in those markets. To capture this peculiarity, we define incumbency in two ways, as described in Figure 4. First, by constructing the dummy Inc_r which is equal to 1 if crimes are allegedly undertaken in at least one of the incumbent regions (i.e. Calabria, Campania and Sicily). The subscript r indicates that these are region-level variables. Second, by distinguishing between actions targeting criminals exclusively in incumbent regions and those which concern both incumbent and non-incumbent regions. In the former (latter) case, the variable $Inc_{r,[HQ\ only]}$ $(Inc_{r,[HQ\ and\ outside]})$ will be equal 1. Table 3.2 shows that almost half of the actions target incumbent regions (45%). Of these around 75% concern incumbent regions only, while 25% target alleged criminals in at least two regions, of which one is incumbent.

We will adopt Inc_r as the main variable to capture incumbency in our analysis. However, in Section 4, we will instead use $Inc_{r,[HQ\ only]}$ and $Inc_{r,[HQ\ and\ outside]}$ to show that whether crimes are committed solely in headquarter regions impacts the behavior of criminal organizations, i.e. it has an effect of the probability of cooperating.

(a) $Inc_r = 1$
$Inc_{r,[HQ \ only]} = 1$
$Inc_{r,[HQ \ and \ outside]} = 0$

(b) $Inc_r = 1$
$Inc_{r,[HQ \ only]} = 0$
$Inc_{r,[HQ \ and \ outside]} = 1$
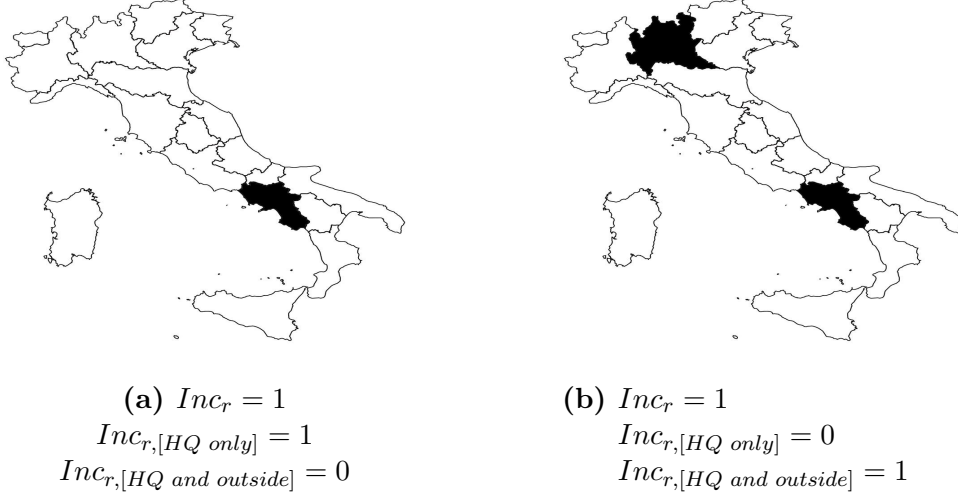
3.5 Additional Variables

Our data also contain information on the number of persons targeted by the police actions. To exclude that cooperation is purely driven by the larger amount of people needed to perform a given criminal activity, in each regression, we control for the by-action number people reached by the arrest warrants ($\sum_{i=1}^{N} P^{ijt}$, where P stands for persons, i indexes the action, j the province and t time). At the same time, cooperation could also be determined by the number of crimes to be committed. To control for this, we always include the number of crimes at the action level ($\sum_{i=1}^{N} O^{ijt}$, where O stands for offense, i indexes the action, j the province and t time. Table 3.2 shows that the average number of persons (crimes) per police action is 11.5 (less than 2).

The literature on economics of crime has shown that economic and demographic factors are important determinants of crime.[9] To account for these factors, in some specifications, we will include the GDP and two demographic controls. GDP_{jt} is real GDP per capita in province j in year t. $Permits_{jt}$ are residence permits over the total province j's population at time t, as of December 31 of each year. $Density_{jt}$ is the population density in province j at time t.[10]

4 Cooperation, Inputs, and Headquarter Regions

In the previous sections, we presented descriptive evidence that mixed organizations seem to specialize in specific crimes. In this section, we will show that this pattern is robust to controlling for

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[9]See for instance Dills et al. (2010) for a review of the empirical literature on the determinants of crime.

[10]When an action involves more than one province, controls are obtained as follows. GDP per capita is computed as the sum of the GDP in the different provinces divided by the sum of the population in same provinces. Analogously, $Permits_{jt}$ is constructed as sum resident permits (for citizens coming from countries which feature a criminal organization tracked by the DIA) divided by the sum of the population in the same provinces. Moreover, in 2009 three new provinces where created (Monza e Brianza, Fermo e Barletta-Andria-Trani). To ensure consistency of our series, we attribute their post-2009 data to the corresponding pre-2009 province.

observed and unobserved characteristics of the areas where crimes are undertaken and action-specific controls, and it varies between incumbent and non-incumbent regions. We estimate the probability of cooperating using probit and logit models of the general form:

$$Pr[C_{ijt} = 1] = \Omega[\beta_0 + \beta_1 Inc_r + \beta_2 Inp_{ijt} + \beta_3 Inp_{ijt} \times Inc_r + \beta_4 \mathbf{\Delta}_{ijt} + \beta_5 \mathbf{\Xi}_{jt} + \zeta_r + \varphi_t] \qquad (2)$$

C_{ijt} captures cooperation and it is equal to 1 if in taking the action i, the police arrests members of an organization of Italians and foreigners, in province j, at time t. Ω is the cumulative normal function when probit models are estimated and the cumulative logistic function when logit models are estimated. Inp_{ijt} is a dummy taking value 1 if among the crimes that caught people are accused of as consequence of action i, in province j at time t, there is at least one which is functional to provide inputs. Inc_r indicates whether criminal activities have been undertaken in incumbent regions. $\mathbf{\Delta}_{ijt}$ is a matrix of action-level controls, including the number of people reached by the police warrant ($\sum_{i=1}^{N} P^{ijt}$) and the number of crimes they are accused of ($\sum_{i=1}^{N} O^{ijt}$). $\mathbf{\Xi}_{jt}$ is a matrix of time-varying controls at the province level containing per-capita GDP in province j at time t (GDP_{jt}), the ratio of residence permits over the total province j's population at time t, as of December 31 of each year ($Permits_{jt}$) and the population density in province j at time t ($Density_{jt}$). ζ_r and φ_t are regional dummies and time fixed-effects, respectively. [11] Table 3.3 collects the results.

In columns (1) and (6) we report the estimates of probit and logit regressions where the only regressor of interest is Inc_r. In columns (2) and (7) we add the variable Inp_{ijt}. In columns (4) and (9) we interact Inp_{ijt} and Inc_r to capture how cooperation is associated to crimes that involve inputs and are undertaken in incumbent regions. In each specification of Table 3.3, we include GDP_{jt}, $Permits_{jt}$, $Density$, $\sum_{i=1}^{N} P^{ijt}$, $\sum_{i=1}^{N} O^{ijt}$ and year fixed effects. In columns (3), (5), (8) and (10) we also include regional dummies.[12]

Irrespective of specification and the methodology used, the estimated coefficients on Inp_{ijt} are positive and strongly significant, confirming what emerges from Figure 3: cooperation is higher when foreign organizations are likely to provide inputs more efficiently for the undertaken criminal activities. Moreover, the estimated coefficient for the variable Inc_r tend to be negative (and significant in 4 cases out of 6), indicating that cooperation is less likely to happen in incumbent regions.

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[11]Regional dummies allow to control for time-invariant unobserved characteristics of the region(s) where crimes are allegedly committed. Year fixed effect, which control for constant within-periods characteristics of the geographical areas where crimes are committed, are always included. Notice that in Italy, a province is equivalent to a NUTS3 region, i.e. an area whose population ranges from 150,000 and 800,000 inhabitants. Regions are generally equivalent to NUTS2 regions, i.e. areas with a population between 800,000 and 3 millions of inhabitants. However, these thresholds are used as guidelines for establishing the regions, but are not applied rigidly by the Eurostat, i.e. some NUTS2 regions have more than 3 millions of inhabitants.

[12]Notice that in all the other columns of Table 3.3 Inc_r is such that a region is either always or never an incumbent one. Consequently, region dummies are not included.

Table 3.3: The Pro-Cooperation Effect of Inputs and Incumbents: Regression Results

C_{ijt}	Probit					Logit				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Inc_r	-0.040**	-0.033*		-0.018		-0.047**	-0.037**		-0.023	
	(0.017)	(0.017)		(0.018)		(0.018)	(0.018)		(0.018)	
Inp_{ijt}		0.121***	0.104***	0.219***	0.112***		0.113***	0.094***	0.217***	0.105***
		(0.020)	(0.019)	(0.040)	(0.018)		(0.020)	(0.020)	(0.040)	(0.017)
ME of Inp_{ijt} at $Inc_r = 0$				0.106***	0.057***				0.100***	0.049**
				(0.035)	(0.021)				(0.034)	(0.019)
ME of Inp_{ijt} at $Inc_r = 1$				0.356***	0.223***				0.362***	0.221***
				(0.071)	(0.029)				(0.072)	(0.025)
GDP_{jt}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$Permits_{jt}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$Density_{jt}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	No	No	Yes	No	Yes	No	No	Yes	No	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\sum_{i=1}^{N} P^{ijt}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\sum_{i=1}^{N} O^{ijt}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795	1,795
Pseudo R^2	0.1436	0.1793	0.2399	0.1909	0.2533	0.1436	0.1717	0.2383	0.1851	0.2545

The table reports marginal effects of probit and logit regressions. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are in parentheses. Inc_r is a dummy equal to 1 if crimes are allegedly undertaken in at least one of the incumbent regions. Inp_{ijt} is a dummy taking value 1 if among the crimes that caught people are accused of as consequence of action i, in province j at time t, there is at least one for which a foreign input is necessary. $\sum_{i=1}^{N} P^{ijt}$ is the number of persons against whom the warrant was issued as consequence of action i, in province j at time t. $\sum_{i=1}^{N} O^{ijt}$ is the number of crimes these persons are accused of. GDP_{jt} is the GDP per-capita in province j at time t. $Permits_{jt}$ is the ratio of residence permits over the total province j's population at time t, as of December 31 of each year. $Density_{jt}$ is the population density in province j at time t.

Interestingly though, the interaction between Inc_r and Inp_{ijt} is always positive and significant, suggesting a pro-cooperation effect of inputs in incumbent regions. The marginal effect (ME) of Inp_{ijt} when $Inc_r = 1$, i.e. when crimes are committed in incumbent regions, is systematically larger than the ME Inp_{ijt} when crimes are undertaken in non-incumbent regions (i.e., at $Inc_r = 0$).[13]

Although clearly pointing to a pro-cooperation effect of $Inc_r \times Inp_{ijt}$, results could suffer from the presence of reverse causality arising from the fact that while the nature of the crimes undertaken could determine whether they are committed in cooperation, existing mixed organizations could better placed to do some activities, leading cooperation to cause the kind of crime undertaken and not the other way around.

We attempt to reduce this simultaneity by using a PSM approach (see Becker et al., 2002; Imbens and Wooldridge, 2009). We first compute the propensity scores using a logit model where the treatment is the interaction $Inc_r \times Inp_{ijt}$ (the scores are shown in Figure F2 and indicate that the propensity tend to be higher for the treated than for the untreated). The sample is split in 5 blocks to ensure that the balancing property is satisfied, i.e. that in each block the average propensity score is not different for treated and untreated. We then estimate the Average Treatment Effect (ATE) of being at the same time in an incumbent region and undertake crimes that involve inputs on the probability of cooperating, using the interaction $Inc_r \times Inp_{ijt}$ as treatment and $\sum_{i=1}^{N} P^{ijt}$, $\sum_{i=1}^{N} O^{ijt}$, GDP_{jt}, $Permits_{ij}$ and $Density_{jt}$ as covariates, always controlling for year fixed-effects and regional dummies. We use three different techniques: Nearest Neighbor Matching (NNM), Radius Matching (RM), and Kernel Matching (KM). Results are reported in Table 3.4.

Columns (1), (2), and (3) show the ATEs on the the treated using NNM, RM, and KM. Columns (4), (5), and (6) collect the ATEs obtained using the same methods while trimming units at the 5th centile: whatever the matching procedure used, the ATE on the treated is always positive and strongly significant, confirming the results that emerged from the regression analysis. In other words, undertaking criminal activities that involve a foreign input in an incumbent region increases the probability of cooperation among domestic and foreign organizations. [14]

In Section 5, we will also show that these results are in line with a model in which the strong power of incumbent organization can result in violence forcing foreign criminals to cooperate with local groups.

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[13]To assess the robustness of our results, we have performed a series of additional estimations, focusing on alternative definitions of our key regressors, Inc_r and Inp_{ijt}. The results of these checks, not reported here, are available upon request. First, we have checked what happens to our results when we change the definition of Inc_r. In particular, we have re-defined Inc_r as being equal to one for Campania only when the provinces of Caserta and Napoli are targeted by an action, rather than any province in the region. This is because there is evidence (see e.g. Pinotti (2015)) that crime intensity varies a lot across the five provinces of region. This is confirmed in our data where the latter is involved in 356 actions. Of these, almost 90% took place in the provinces of Caserta and Napoli. Second, we have re-defined the variable Inp_{ijt} in two more ways. In one case Inp_{ijt} equals 1 if the criminal activities are committed against humans (*Human Trafficking*, *Enslavement* and *Prostitution*). In the other, Inp_{ijt} is equal to 1 when the same set of inputs is not undertaken against humans (*Cyber Crimes*, *Smuggling* and *Counterfeit*). Our results hold in all these cases.

[14]Notice that results are robust to changes in the radius in RM and to increasing the number of repetitions for the computation of standard errors.

Table 3.4: The Pro-Cooperation Effect of Inputs and Incumbents: PSM Results

C_{ijt}	Untrimmed			Trimmed		
	(1)	(2)	(3)	(4)	(5)	(6)
ATE^{NN}	0.349***			0.407***		
	(0.091)			(0.090)		
ATE^{R}		0.333***			0.381***	
		(0.111)			(0.141)	
ATE^{K}			0.328***			0.371***
			(0.083)			(0.080)
GDP_{jt}	Yes	Yes	Yes	Yes	Yes	Yes
$Permits_{jt}$	Yes	Yes	Yes	Yes	Yes	Yes
$Density_{jt}$	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
$\sum_{i=1}^{N} P^{ijt}$	Yes	Yes	Yes	Yes	Yes	Yes
$\sum_{i=1}^{N} O^{ijt}$	Yes	Yes	Yes	Yes	Yes	Yes
# of treated	43	24	43	27	21	27
# of untreated	50	76	886	30	51	392

The table reports ATEs on the treated using NNM ((column(1) and (4)), RM ((column (2) and (5), with a radius of 0.0001) and KM (column (3) and (6)). Columns (1)-(3) ((4)-(6)) collect untrimmed (trimmed) results. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Propensity scores are obtained on a common support for treated and untreated. Bootstrapped standard obtained after 100 repetitions are in parentheses. In the NNM control units are not forced to match 1:1, i.e. replacement is allowed. In column (4)-(6) observations are trimmed at the 5th centile. $\sum_{i=1}^{N} P^{ijt}$ is the number of persons against whom the warrant was issued as consequence of action i, in province j at time t. $\sum_{i=1}^{N} O^{ijt}$ is the number of crimes these persons are accused of. GDP_{jt} is the GDP per-capita in province j at time t. $Permits_{jt}$ is the ratio of residence permits over the total province j's population at time t, as of December 31 of each year. $Density_{jt}$ is the population density in province j at time t.

4.1 Cooperation Inside and Outside Headquarter Regions

In this section we further extend our empirical analysis by using a more fine-grained definition of incumbency which will be captured by the dummies $Inc_{r,[HQ\ only]}$ and $Inc_{r,[HQ\ and\ outside]}$ defined in Section 4.1.

As shown in Table 3.2 almost half of the actions target incumbent regions (45%). Of these around 75% target crimes undertaken incumbent regions only, while 25% involve alleged criminals in at least two regions, of which one is incumbent. Importantly, as mentioned earlier, 83% of the actions taken by the police in incumbent regions target traditional organization. By refining our incumbency measure

we aim at exploiting this feature of the data to look at the behavior of traditional organizations when criminal activities go beyond the headquarter territories. Results are collected in 3.5.

Table 3.5: Cooperation Inside and Outside Headquarter Regions

C_{ijt}	*Probit*			*Logit*		
	(1)	(2)	(3)	(4)	(5)	(6)
$Inc_{r,[HQ]}$	-0.068***	-0.040**		-0.083***	-0.049**	
	(0.021)	(0.019)		(0.024)	(0.020)	
$Inc_{r,[HQ\ and\ outside]}$	-0.003	0.014		-0.007	0.013	
	(0.024)	(0.025)		(0.024)	(0.025)	
Inp_{ijt}		0.227***	0.112***		0.226***	0.104***
		(0.040)	(0.018)		(0.041)	(0.017)
ME of Inp_{ijt} at $Inc_{r,[HQ]}$=1		0.402***	0.250***		0.409***	0.244***
		(0.084)	(0.031)		(0.083)	(0.027)
ME of Inp_{ijt} at $Inc_{r,[HQ\ and\ outside]} = 1$		0.392***	0.219***		0.401***	0.224***
		(0.142)	(0.061)		(0.151)	(0.050)
GDP_{jt}	Yes	Yes	Yes	Yes	Yes	Yes
$Permits_{jt}$	Yes	Yes	Yes	Yes	Yes	Yes
$Density_{jt}$	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	No	No	Yes	No	No	Yes
Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
$\sum_{i=1}^{N} P^{ijt}$	Yes	Yes	Yes	Yes	Yes	Yes
$\sum_{i=1}^{N} O^{ijt}$	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,795	1,795	1,795	1,795	1,795	1,795
Pseudo R^2	0.1517	0.1965	0.2540	0.1480	0.1920	0.2551

The table reports marginal effects of probit and logit regressions. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors are in parentheses. Inc_r is a dummy equal to 1 if crimes are allegedly undertaken in at least one of the incumbent regions. $Input_{ijt}$ is a dummy taking value 1 if among the crimes that caught people are accused of as consequence of action i, in province j at time t, there is at least one for which a foreign input is necessary. ($Inc_{r,[HQ\ and\ outside]}$) $Inc_{r,[HQ\ only]}$ equals 1 if crimes are allegedly undertaken (not) exclusively in an incumbent region. $\sum_{i=1}^{N} P^{ijt}$ is the number of persons against whom the warrant was issued as consequence of action i, in province j at time t. $\sum_{i=1}^{N} O^{ijt}$ is the number of crimes these persons are accused of. GDP_{jt} is the GDP per-capita in province j at time t. $Permits_{jt}$ is the ratio of residence permits over the total province j's population at time t, as of December 31 of each year. $Density_{jt}$ is the population density in province j at time t.

The ME on $Inc_{r,[HQ\ only]}$ is always negative and significant. The one on $Inc_{r,[HQ\ and\ outside]}$ is instead never different from zero: cooperation is less likely when criminal activities are undertaken only in incumbent regions. In line with the results discussed previously, Inp_{ijt} is always positive and significant, indicating that organizations are more likely to cooperate for specific crimes. Interestingly, the MEs of Inp_{ijt} at $Inc_{r,[HQ]}$=1 and at $Inc_{r,[HQ\ and\ outside]} = 1$ are always positive and significant showing that the type of crime committed is a key driver of cooperation. Importantly, the ME is higher when crimes are take place in incumbent regions, confirming that undertaking criminal

activities that involve a foreign input in an incumbent region increases the probability of cooperation among domestic and foreign organizations.

5   Model

In this section we construct a simple theoretical model to make sense of our empirical findings. The model uses a standard solution concept from coalitional game theory, the Nash bargaining solution (Mas-Colell et al., 1995). The choice of a model allowing us to abstract from procedural details is dictated by scarce existing knowledge, even anecdotal, on the process by which criminal organizations approach each other and negotiate their dealings.

In the model the decision to cooperate is motivated by the payoffs obtainable with or without cooperating. We treat criminal groups as if they were legal enterprises, whose sole concern is profit maximization. We identify assumptions on payoffs necessary for theoretical results to match those from our empirical analysis. We discuss these assumptions in relation to the need for Domestic groups to control the territory close to their headquarters.

5.1   A Coalitional Model of Mafia Cooperation

We assume that a criminal operation stems from a business opportunity, from which benefits can be extracted to different extents by different groups. Illicit business opportunities have several characteristics represented by a realization θ of a random vector Θ. The value v which can be extracted from an opportunity does not only depend on the vector θ but also on the group g operating it. We consider three possibilities. A Domestic Group ($g = D$), a Foreign Group ($g = F$), or a mixed one ($g = C$). Cooperation will be efficient if

$$v_C(\theta) > v_D(\theta) + v_F(\theta) \tag{3}$$

We can also think of the latter two values as the outside options of organizations which do not cooperate. An organization will want to cooperate if the share it receives of the joint venture profits is larger than its outside option. α is the share of the Domestic group, and $(1 - \alpha)$ is the share of the Foreign Group. Cooperation will happen if it is Incentive Compatible for both parties:

$$\alpha v_C(\theta) > v_D(\theta) \tag{4}$$

$$(1 - \alpha) v_C(\theta) > v_F(\theta) \tag{5}$$

Assuming surplus is shared through Nash Bargaining, we have that

$$\alpha v_C(y) = \frac{1}{2} v_C(\theta) + \frac{v_D(\theta) - v_F(\theta)}{2}$$

$$(1 - \alpha) v_C(\theta) = \frac{1}{2} v_C(\theta) + \frac{v_F(\theta) - v_D(\theta)}{2}$$

With the resulting division of surplus, the conditions for Domestic and Foreign organizations to cooperate (4 and 5) boil down to 3, which suggest that cooperation will happen whenever it is efficient: The probability of observing a cooperation is then the probability of Θ taking values such that 3 is satisfied. The probability of observing cooperation is an increasing function of the difference $v_C - (v_F + v_D)$, and, through these three addends, of the operation characteristics θ. We will now specifically look at the two main variables from our estimated model. We are going to make assumptions on how payoffs are influenced by the opportunity involving operations in an "incumbent" province ($Incumbent_{ijt} = 1$, Inc hereafter) and by the presence of a foreign input ($Input_{ijt} = 1$, Inp hereafter). Since Θ includes Inc and Inp with all remaining characteristics, we will denote the remaining components with Γ, so that $\Theta = (\Gamma, Inc, Inp)$

We first make two simplifying assumptions. First, that the way other characteristics affect the value of the operation is not influenced by the value of Inc and Inp. The second one is that these two inputs affect the value in case of Cooperation, less than they do for stand-alone organizations. This seems natural as in a Cooperation all the "best" options are available (eg: political cover supplied by Italians, prostitutes supplied by foreigners), so that the effect of Inc and Inp on value should be weaker for a Cooperation group than it is for stand-alone groups.

Assumption 1. $\forall$ g, γ, γ', Inc, Inc', Inp, Inp'

$$v_g\left(Inc, Inp, \gamma\right) - v_g\left(Inc, Inp, \gamma'\right) = v_g\left(Inc, Inp', \gamma\right) - v_g\left(Inc', Inp', \gamma'\right)$$

Assumption 2. $\forall$ g, γ, γ', Inc, Inc', Inp, Inp'

$$\left|v_C\left(Inc, Inp, \gamma\right) - v_C\left(Inc', Inp', \gamma\right)\right| <$$
$$\left|\left[v_D\left(Inc, Inp, \gamma\right) - v_D\left(Inc', Inp', \gamma\right)\right] + \left[v_F\left(Inc, Inp, \gamma\right) - v_F\left(Inc', Inp', \gamma\right)\right]\right|^{[15]}$$

Lemma 1. *The probability of cooperation is a decreasing function of $v_F + v_D$*

We will assume that Inc (Inp) being equal to one implies a disadvantage for a Foreign (Domestic) group versus a Domestic (Foreign) one, and hence a bargaining advantage for a Domestic organization. The idea is that an Italian organization would not be able to efficiently source the foreign inputs characterizing crimes for which $Inp = 1$, and a foreign organization would be unable to operate efficiently in a province home to a "traditional" Domestic organization ($Inc = 1$) .

Assumption 3. $\forall$ g, γ, γ', Inc, Inc', Inp, Inp'

$$v_D\left(Inc, 1\right) - v_D\left(Inc', 0\right) < 0$$
$$v_F\left(1, Inp\right) - v_F\left(0, Inp'\right) < 0$$

It seems natural to assume, that ceteris paribus, Inc and Inp also constitute direct advantages for F and D respectively.

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Assumption 4. $\forall\ Inc,\ Inp$

$$v_F\left(Inc, 1\right) - v_F\left(Inc, 0\right) > 0$$
$$v_D\left(1, Inp\right) - v_D\left(0, Inp\right) > 0$$

Note that Assumption 3 is stronger than Assumption 4, as we are not requiring the value of the other variable (Inc when we consider a Domestic group, Inp when we consider a Foreign group) to be the same for the inequality to hold.

5.2 Results

Assumptions 3 and 4 combined imply that

$$v_D\left(0, 0\right) > v_D\left(1, 1\right)$$
$$v_F\left(0, 0\right) > v_F\left(1, 1\right)$$

and hence

$$v_D\left(0, 0\right) + v_F\left(0, 0\right) > v_D\left(1, 1\right) + v_F\left(1, 1\right)$$

By Lemma 1, this allows to conclude that

$$v_C\left(0, 0\right) - v_F\left(0, 0\right) - v_D\left(0, 0\right) < v_C\left(1, 1\right) - v_F\left(1, 1\right) - v_D\left(1, 1\right)$$

As one would expect, gains from cooperation are higher when both specialized inputs are involved. This allows us to conclude that

Proposition 1. *The probability of cooperation is higher when the operation involves a foreign input and an incumbent province, than it is in a comparable operation in which neither appears.*

$$P(C|Inc = 1, Inp = 1, \Gamma = \gamma) > P(C|Inc = 0, Inp = 0, \Gamma = \gamma)$$

Perhaps unsurprisingly, only a very basic and natural set of assumptions is needed for the probability of cooperation to be higher when both parties need what the other brings to the table. This result is reflected in the predicted probability of our probit and logit models[16] and in our PSM analysis.

We are now going to discuss which other conditions on payoffs are needed to match the most significant statistical findings from our empirical analysis, namely

1. The positive effect of "Inp" on cooperation.

2. The sizable difference between the effect of "Inp" on cooperation inside and outside incumbent provinces ($Inc = 0$)

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[16]In all the specifications of Table 3.3, conditional predicted probabilities satisfy the ranking of Proposition 1.

5.2.1 The Positive Effect of *Input*

For this model's solution to show cooperation will be higher in presence of a foreign input, we need to show that

$$v_C\left(Inc,0\right) - v_F\left(Inc,0\right) - v_D\left(Inc,0\right) < v_C\left(Inc,1\right) - v_F\left(Inc,1\right) - v_D\left(Inc,1\right)$$

By Lemma 1, it is enough that

$$v_D\left(Inc,0\right) - v_D\left(Inc,1\right) > v_F\left(Inc,1\right) - v_F\left(Inc,0\right) \tag{6}$$

Condition 6 amounts to assuming that, the losses for a Domestic organization from using a foreign input when operating alone are larger than the gains a Foreign organization obtains when involved in an operation with a foreign input. Since a Domestic organization may simply lack the connections necessary to supply some inputs, the assumption does not appear controversial.

Proposition 2. *If 6 holds, the probability of cooperation is higher when a foreign input is present*

$$P(C|Inc = 1, Inp = i, \Gamma = \gamma) > P(C|Inc = 0, Inp = i, \Gamma = \gamma), \forall i \in \{0,1\}$$

5.2.2 The Different Effect of *Input* Inside and Outside *Incumbent* Regions.

Our empirical model (in line with the empirical distribution of our sample), not only predicts that the probability of cooperation when a foreign input is present will be higher in incumbent provinces than outside, but in particular that the difference due to the presence of a foreign input will be larger in an incumbent region

$$P(C|Inc = 1, Inp = 1, \Gamma = \gamma) - P(C|Inc = 1, Inp = 0, \Gamma = \gamma) >$$
$$P(C|Inc = 0, Inp = 1, \Gamma = \gamma) - P(C|Inc = 0, Inp = 0, \Gamma = \gamma)$$

This is going to be the case if and only if

$$v_F\left(1,1\right) + v_D\left(1,1\right) - v_F\left(1,0\right) - v_D\left(1,0\right) < v_F\left(0,1\right) + v_D\left(0,1\right) - v_F\left(0,0\right) - v_D\left(0,0\right)$$

It is useful to rewrite the previous condition in terms of the effect of *Inp* on the sum of stand-alone payoffs when *Inc* is equal to 1 or 0.

$$\left[v_D\left(1,1\right) - v_D\left(1,0\right)\right] + \left[v_F\left(1,1\right) - v_F\left(1,0\right)\right] < \left[v_D\left(0,1\right) - v_D\left(0,0\right)\right] + \left[v_F\left(0,1\right) - v_F\left(0,0\right)\right] \tag{7}$$

While both sides of the inequality are smaller than zero by condition 6, determining the sign of the inequality requires some combination of the following:

- The positive effect of *Inp* on the profits of a Foreign group is smaller in Incumbent regions.

- The negative effect of Inp on the profits of a Domestic group is larger in Incumbent regions.

Institutional knowledge -corroborated by our data- suggests that the first effect is dominant, because of the possibility of violent conflict between Domestic and Foreign groups in Incumbent regions usually resolves in sizable losses for the latter (see for example the "Castel Volturno Massacre" of September 2008 or the "Pescopagano Massacre" of April 1990).

Besides anecdotal evidence, our data shows that violence is more prevalent in Incumbent regions (more than two thirds of the total murder warrants in our data pertain to operations involving Incumbent regions. Furthermore while Foreign groups constitute 27.89% of operations outside Incumbent regions, the fraction dramatically drops to 2.74% in Incumbent regions, suggesting that stand-alone operations are either unprofitable or unfeasible in incumbent regions, making cooperation more desirable to Foreign criminals.

These considerations suggest that a Foreign group has to discount profits obtained in Incumbent regions by the probability of surviving a violent conflict, hence dampening the effect of any other variable (including $Input$), resulting in the second addend of the left hand side ($[v_F(1,1) - v_F(1,0)]$) becoming smaller and 7 being verified.

6 Conclusions

This paper exploits a novel data set to study for the first time the interplay among Italian and foreign criminal organizations in the Italian territory. In doing that, we start from the idea the criminal associations share traits with corporations. Several results emerge.

First, cooperation is more concentrated in criminal activities for which foreign groups could be well equipped to provide inputs (e.g. counterfeiting activities or enslavement practices). Second, even if in general cooperation is negatively associated with the presence of incumbent organizations in some regions (i.e. Sicilia, Campania, and Calabria), the probability of cooperating in the same regions is higher for crimes where complementarities among domestic and foreign organizations could make cooperation more convenient. In fact, the different results we obtain for incumbent and non-incumbent regions suggest that "market conditions" play a role in determining which crimes are undertaken in cooperation. One potential explanation could be that in regions where incumbents are strong, the threat of violence might force foreigners to cooperate in criminal activities they could normally engage in without a local partner.

Our findings are consistent with a simple model where cooperation is not only driven by an economic motive, but also by the threat of violence involved in criminal activities.

Our paper should be considered as a first step toward a better understanding of how different (heterogenous) criminal organizations come together to perform single or multiple tasks. It could be that not only firms but also criminal organizations are shifting to a more "horizontal" organizational model as opposed to a more classic hierarchical one.

7 Appendix

Figure F1: Example of Police Action

in data 17 marzo 2009, a **Termini Imerese**, **Trabia** e **Sciara**, i Carabinieri del Gruppo di Monreale, nell'ambito dell'operazione *"Camaleonte 2"*, hanno eseguito 15 ordinanze di custodia cautelare in carcere[98] nei confronti di altrettanti soggetti ritenuti responsabili di associazione di tipo mafioso ed estorsione. Le investigazioni, svolte con articolate metodiche tecniche, hanno permesso di ricostruire la struttura e le dinamiche evolutive del mandamento mafioso di TRABIA;

Source: Extract from the 2009 DIA report, second semester.

Table A1: Criminal Activities: Summary Statistics

Activity	Observations	%	Definition
Drugs	802	43.10	Drug-related crimes and includes both trafficking and pushing.
Extortion	462	24.83	Cases in which alleged criminals were accused of having forced somebody, through violence or threat, to do or omit something with objective obtaining unfair profits.
Mafia-type Association	443	23.80	Participants of a criminal association use the intimidating power of the membership and exploit the situation of subjugation and *"omertà"* in order to manage or control, directly or indirectly, economic activities, concessions, authorizations, public contracts or to generate undue profits or advantages for himself or others (art. 416-bis of the Penal Code, law 646/82).
Conspiracy	318	17.09	Groups made of three of more people stably involved in some criminal activity (art. 416 of the Penal Code).
Weapons	267	14.35	Trafficking and the possession of weapons.
Murder	160	8.60	Cases of killing.
Prostitution	115	6.18	Prostitution-related crimes.
Usury	99	5.32	The practice of lending money at excessive interest rates.
Robbery	81	4.35	Theft activities.
Human Trafficking	77	4.14	The trade of humans (e.g. for the purpose of sexual slavery or forced labor).
Money Laundering	78	4.19	The process by which criminals disguise the original ownership and control of the proceeds of criminal activities by making such proceeds appear to have derived from a legitimate source (e.g. investing profits deriving from drug-trafficking activities into catering or construction industries).
Fraud	69	3.73	Deliberate deception to secure unfair or unlawful gain.
Cyber Crimes	22	1.18	Offences that are committed against individuals or groups of individuals with a criminal motive to intentionally cause physical or mental harm, or loss, to the victim directly or indirectly, using modern telecommunication networks.
Enslavement	35	1.88	The act of making people slaves.
Unfair Competition	29	1.56	The illegal behavior aimed at harming competitors.
Counterfeit	24	1.30	Activities intended to illegally produce and market products identical to others protected by trademarks, patents or copyrights.
Bid Rigging	15	0.81	Illegal conspiracies in which competitors join to artificially increase the prices of goods and/or services offered in bids to potential customers or to carve up the potential business between the conspirators.
Arson	16	0.86	The crime of intentionally and maliciously setting fire to properties with the intent to cause damage.
Smuggling	15	0.81	The illegal transportation of objects in violation of applicable laws.

Source: DIA reports. Crime categories are non-mutually exclusive.

Figure F2: Propensity Scores
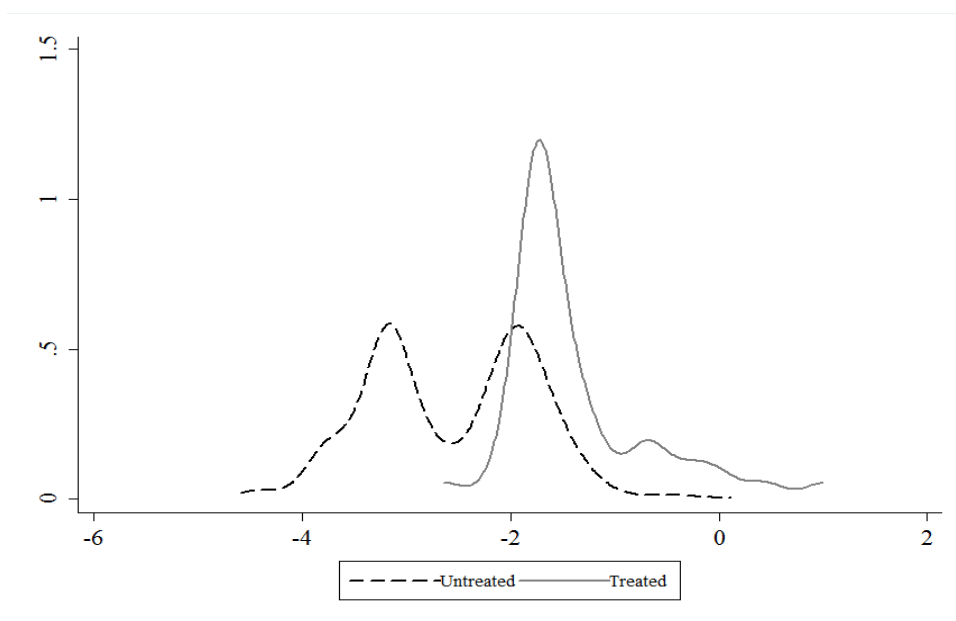
Note: Untreated (Treated) actions are those for which the interaction $Inc_r \times Inp_{ijt}$ is equal to 0 (1). Propensity score are computed on a common support for treated and untreated. The figure shows log of the logit odds of propensity scores.

References

Backhaus, J. (1979). Defending Organized Crime? A Note. *Journal of Legal Studies*, 8:623–631.

Bandiera, O. (2003). Land Reform, The Market for Protection, and The Origins of the Sicilian Mafia: Theory and Evidence. *Journal of Law, Economics, and Organization*, 19(1):218–244.

Becker, G. (1968). Crime and punishment: An economic approach. *Journal of Political Economy*, 2(76):169–217.

Becker, S. O., Ichino, A., et al. (2002). Estimation of average treatment effects based on propensity scores. *The stata journal*, 2(4):358–377.

Buchanan, J. (1973). *A Defense of Organized Crime.*, pages 119–132. Handbook on economics of crime.

Buonanno, P., Durante, R., Prarolo, G., and Vanin, P. (2015). Poor Institutions, Rich Mines: Resource Curse and the Origins of the Sicilian Mafia. *Economic Journal, forthcoming*.

Dell, M. (2015). Trafficking Networks and the Mexican Drug War. *American Economic Review, forthcoming*.

Dills, A., J. A., M., and Summers, G. (2010). *The Economics of Crime: Lessons for and from Latin America*, pages 269–302. NBER Chapters.

Dimico, A., Isopi, A., and Olsson, O. (2012). Origins of the sicilian mafia: The market for lemons. *Working Paper.*

Ehrlich, I. (2010). *The Market Model of Crime: A Short Review and New Directions*, volume 3, pages 3–23. Handbook on economics of crime, Elsevier.

Geys, B. and Daniele, G. (2015). Organized Crime, Institutions and political quality: empirical evidence from Italian municipalities. *Economic Journal, forthcoming.*

Imbens, G. W. and Wooldridge, J. M. (2009). Recent developments in the econometrics of program evaluation. *Journal of economic literature*, 47(1):5–86.

Kugler, M., Verdier, T., and Zenou, Y. (2005). Organized Crime, Corruption and Punishment. *Journal of Public Economics*, 89(9):1639–1663.

Lupo, S. (2011). *History of the Mafia.* Columbia University Press.

Mas-Colell, A., Whinston, M. D., Green, J. R., et al. (1995). *Microeconomic theory*, volume 1. Oxford university press New York.

Pinotti, P. (2015). The Economic Costs of Organized Crime: Evidence from Southern Italy. *Economic Journal, forthcoming.*

Robinson, J. (2000). *The merger: The conglomeration of international organized crime.* Overlook Press Woodstock, NY.

Sterling, C. (1994). *Crime without frontiers: The worldwide expansion of organised crime and the pax mafiosa.* Little, Brown and Company.

Williams, P. (1994). Transnational criminal organisations and international security. *Survival*, 36(1):96–113.