The Institutional Role of the Italian Mafia: Enforcing Contracts When the State Does Not*

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Abstract

Italy has one of the slowest judicial systems in Europe. At the same time, there exists anecdotal evidence suggesting that informal contract enforcement can be provided by organized crime. I present a simple theoretical framework to explain why citizens may turn to the Mafia for contract enforcement when the State is increasingly unable to fulfill this service. I empirically test the main model prediction using a novel database of Mafia-controlled areas across Italy between 2014 and 2019. I obtain confidential yearly data from the Superior Council of the Judiciary about the judge's retirement, which I use as a source of exogenous variation in the State's enforcement capacity. Results indicate that the Mafia expands its control over the territory when the State weakens its contract enforcement capacity.

Keywords: Contract enforcement, Criminal organizations, Mafia, Tribunals
JEL: P16, K40, H11

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"Judge Falcone acknowledged that, owing to the slowness of the courts in resolving litigation, it is common to turn instead to the local man of honor." - Repubblica[1], October 16, 1990

1 Introduction

Italy has one of the slowest judicial systems in Europe. In 2016, the European Commission for the Efficiency of Justice (CEPEJ) reported that the average time[2] needed to solve first-instance civil and commercial cases was 514 days in Italy versus a European average of 233 days. At the same time, there exists anecdotal evidence suggesting that informal contract enforcement can be provided by organized crime. In his seminal work, Gambetta [1993] already narrated that the local man of honor used to settle disputes between entrepreneurs, such as the timing and method of payment[3]. More recently, the Directorate of Anti-mafia Investigation reported some intervention of the police officers against Mafia members that were using violent methods, threats, and extortion, to obtain debt repayments[4].

In this paper, I address the following research question: can the civil tribunals' ineffectiveness in enforcing contracts explain the presence of the Mafia today? First, I provide a simple theoretical framework to explain the rational demand for the Mafia's services when the outside option, the civil tribunals run by the State, becomes less effective. Citizens engage in transactions and need a third party to solve possible controversies. Due to convex costs, the State can not satisfy the totality of the demand for contract enforcement. Even though the Mafia intervention generates negative externality, such as threats or extortion, there is an equilibrium where both the Mafia and the State provide contract enforcement. The main testable prediction is that a decrease in the tribunal's effectiveness increases the share of the population served by the Mafia. The second part of the paper tests the model prediction empirically by regressing the Mafia affiliation share on the tribunals' ineffectiveness. Since Mafia contract enforcement relies on widespread control of the territory (Gambetta [1993]), I use a novel database with the location of active Mafia groups for the years 2014-2019 (Braccioli [2023]). The data are published by the Directorate of Anti-mafia Investigation (DIA [2014-2019]). They identify areas where the Mafia has solid activities, and hence it can acquire all necessary information to provide contract enforcement. Then I compute the share of the population living in Mafia-controlled

[1] *Repubblica* is a national Italian newspaper. The quote is reported in Gambetta [1993].

[2] The Disposition Time estimates the number of days needed to bring pending cases to an end. Together with the Clearance Rate, it is one of the indicators that better describes the judicial system's performance (CEPEJ [2018]).

[3] *"The woodcutters had originally agreed to be paid in logs; but when their work ended, they changed their minds and asked for cash. Colletti promised to settle the dispute, but ultimately the workers were given some money. Apparently, on this occasion, Colletti chose to side with the local workers."* Gambetta [1993]

[4] On 5 July 2018, in Catania and L'Aquila, as part of the "Pizzini" operation, the Guardia di Finanza executed the OCCC n. 3550/2018 RGNR and 2589/2018 RG GIP, issued by the Court of Catania on 29 June 2018, against a leading member of the SANTAPAOLA-ERCOLANO family and three other affiliates were held responsible for extortion aggravated by the mafia method, with violence and threats against debtors (DIA [2014-2019]).

areas at the tribunal district level. I also measure the State contract enforcement ineffectiveness as the number of pending civil cases, that is, the ones that remain unsolved at the end of each calendar year. I use this data to identify the impact of the State's contract enforcement on the presence of the Mafia. To generate exogenous variation in the State enforcement capacity, I use the number of retiring judges by a tribunal, and I rationalize this choice with a simple tribunal production function. The identification relies on the retirements being orthogonal to the presence of the Mafia. I provide some evidence to support this argument.

Results show that retirement causes a severe increase in pending cases and a 2% increase in Mafia affiliation share for an increase of around 42'040 pending cases. In 2019, there were 2'645'342 pending cases in Italy, and new ones were 2'447'018, meaning that cases that had been pending for longer than one year amount to a minimum[5] of 200'000. Bringing this number to zero would imply a reduction of Mafia affiliation share of about 10%[6]. In 2019, 16 million individuals were living in Mafia-controlled areas. Reducing this number by 10% equals taking away a city of 1.6 million inhabitants from organized crime. Given the incredibly high persistence of the phenomenon[7] over centuries; the result mentioned above would be a successful one.

The contribution of this paper is threefold. First, a small theoretical literature of lawlessness and economics (Gambetta [1993], Greif [2000] and Dixit [2004]) studies nongovernmental alternatives to contract enforcement when the State is absent. I add to this literature by providing a simple theoretical framework where the State is present but ineffective, and there is interaction with a private alternative, the Mafia. Second, a strand of literature on organized crime explains the origins of the Mafia with its ability to substitute the State in one or more dimensions of the State capacity, as defined by Besley and Persson [2011], precisely because the State is highly ineffective. Some authors (Bandiera [2003], Buonanno et al. [2015], Acemoglu et al. [2020]) focus on legitimate violence and property rights, some others (Fiorentini and Peltzman [1997]) on the fiscal capacity and the provision of public goods. One dimension of the State capacity that has not been studied before in this context is contract enforcement. My contribution to this literature is twofold. First, I use both theory and empirics to provide evidence linking the Mafia's presence to the judicial system's ineffectiveness in enforcing contracts. Second, while the existing literature aims at explaining the origin of the Mafia, this paper is the first to apply the institutional approach to the presence of the Mafia in present times. Finally, a growing body of literature documenting the effects of ineffective civil courts on economic

[5] This is a rough approximation since it assumes that all cases last longer than one year.

[6] 200'000 divided 42'040 pending cases (the variation needed to generate 2% increase in Mafia-affiliation share) and multiplied by 2%.

[7] The only available estimation concerns the presence of the Paesant Fasci in 1893. They make a municipality 69% more likely to register the presence of the Mafia in 1900. In 2019 this probability is still 53% (Acemoglu et al. [2001], Braccioli [2023])

outcomes. Among the cross-country studies (Porta et al. [1998], Djankov et al. [2003], Nunn [2007]), the most relevant from my analysis is Acemoglu and Johnson [2005]. They found that, after controlling for legal institutions, contracting matters for the form of financial intermediation but less for economic growth. As a possible explanation, the authors suggest that contracting institutions are easier to replace than legal ones. In line with this reasoning, I contribute to the literature by showing that an alternative source of contract enforcement - the Mafia - flourishes more when formal contracting institutions are ineffective. Further, the literature on within-country comparison has been investigating mainly the effect of ineffective courts on the credit markets and firms' performance (Rajan and Zingales [1998], Jappelli et al. [2005], Chemin [2009a], Chemin [2009b], Visaria [2009], Lilienfeld-Toal et al. [2012], Chemin [2012], Ponticelli and Alencar [2016], Amirapu [2021]). In particular, Rao [2019] already documented that judges' vacancies, including temporary ones, decrease the tribunals' productivity in India. My contribution is to study the impact of courts' ineffectiveness on another important outcome, namely the alternative provision of contract enforcement by organized crime.

The rest of the paper is organized as follows. Section 2 develops the theoretical framework and discusses all the related assumptions. Section 3 presents the data. Section 4 builds the bridge between theory and empiric, discusses the identification strategy, and presents the results. Section 5 concludes.

2 Theoretical Framework

> *"The market is therefore rational, in the sense that there are people who find it in their individual interest to buy mafia protection. [...]"*[8]

This section develops a simple theoretical framework to explain the rational demand for the Mafia's services when the outside option, the civil tribunals run by the State, become less effective. Throughout the section, I will refer to the State instead of the civil tribunals as the decision on the tribunals' resources, hence on their effectiveness, is taken at the central level. When the State is ineffective in enforcing contracts, there exists an equilibrium where both the State and the Mafia operate. The model generates three main predictions: i. an increase in the State ineffectiveness increases the Mafia supply; ii. an increase in civil controversies determines a decrease (increase) in the State (Mafia) supply; iii. an increase in violence determines an increase in both the State and the Mafia supply. The model relies on a set of simplifying assumptions that I discuss in Subsection 2.2. Note that this model does not aim at explaining the origin[9] of the Mafia,

[8] Gambetta [1993], Introduction.

[9] To understand the origin of the Mafia and why is located in some areas and not in others, refer to Bandiera [2003], Buonanno, Durante, Prarolo, and Vanin [2012], Dimico, Isopi, and Olsson [2017], Acemoglu, De Feo, and De Luca [2020].

rather it considers the phenomena as *latent* or ready to expand (shrink) according to the demand of contract enforcement. Appendix B summarizes the results in a scenario with the State only or the Mafia only.

2.1 General Setting

I model the market of contract enforcement as a three players sequential game of perfect and complete information with Nature and continuous payoffs. The formalization of the game follows Fudenberg and Tirole [1991] and Alós-Ferrer et al. [2016].

The economy is populated by a finite number I of citizens, each engaging in a fixed number $t \in T$ of bilateral economic transactions with their fellow citizens. Each transaction has a fixed probability of generating a controversy. They randomly choose their business partner and know nothing about them. Citizens are ex-ante identical but ex-post some of them will be affiliated with the Mafia while others won't. Mafia affiliation is unknown to business partners and is disclosed only if a controversy arises. Further, in this model probabilities can be interpreted as the frequency an event occurs over the total number of transactions T. Since all citizens are assumed to initiate an equal number of transactions t, they all face the same probabilities. Figure 1 illustrates the extensive form game that takes place before the transactions. The timing is the following. First, the Mafia observes the controversy rate and the level of violence drawn by Nature and decides the number of contracts to sell, namely the number of citizens it is ready to protect in case a controversy arises. The price *pizzo* remains identified. Second, the State acts as a follower in the Stackelberg model and sets the effectiveness of the judicial system, that is the probability that a controversy is solved given that a controversy arises. Third, the citizens observe the controversy rate, the level of violence, the State's effectiveness, and the price for Mafia contract enforcement. They are able to compute their expected payoffs and they choose whether they want to buy the Mafia contract enforcement. Note that at this stage they observe the probability that a controversy arises but they do not know whether a controversy will actually arise in their transaction or not. Finally, they undertake economic transactions; the Mafia and the State intervene where needed and the real payoffs are realized.

The game First, Nature (N) draws the exogenous parameters, the controversy rate $\delta \in [0, 1]$ and the level of violence $\eta \in [0, +\infty]$. The controversy rate δ is the probability that a transaction incurs a dispute that can not be solved by the two business partners. In other words, it represents the demand for contract enforcement that requires a third-party intervention. For example, a businessman can not repay a vendor due to a negative shock on the supply chain. The violence η represents the negative externality, or the technology, associated with the contract enforcement provided by the Mafia. For instance, it can be thought of as the disutility from threats, or extorsions.

Second, the Mafia acts as a monopolist (M) and chooses the optimal quantity of contract enforcement to sell $q_m \in [0,1]$. The monopolist assumption is relaxed in section A.3. Her payoff function is given by the standard profit maximization:

$$\max_{q_m} \quad \Pi_m(q_m, q_s) = p(q_m, q_s)q_m - c(q_m) \tag{1}$$

where $p(q_m, q_s) > 0$ is the price and $c(q_m)$ is a convex cost function with $c'(q_m) > 0$ and $c''(q_m) > 0$. For tractability, I will rely on a specific functional form, that is $c(q_m) = q_m^2$. Convex costs are a distinguishing feature of the Mafia's contract enforcement which relies on the possibility to collect information on all the transactions taking place in the controlled territory. Indeed, *"[...] the Mafioso would find it difficult to police all the transactions he guaranteed thus risking the loss of his reputation if a lemon were to be sold behind his back*[10]*"*. Hence, the Mafia might intentionally leave part of the demand unsatisfied.

Third, the State (S) chooses the optimal quantity of contract enforcement $q_s \in [0,1]$ to provide, that is the share of controversies that will be solved. The State's payoff function is given by the standard aggregated utility maximization:

$$\max_{q_s} \quad V_s(q_s, q_m) = \sum_{j \in \{m,s\}} \alpha_j u_j(q_s, q_m) - \delta^2(1-q_m)^2 c(q_s) \tag{2}$$

where α_j is the share of citizens for each affiliation status j which takes value m if citizens decide to buy the Mafia service becoming affiliates, s otherwise. In particular $\alpha_m = q_m$ and $\alpha_s = 1 - q_m$, with $\alpha_m + \alpha_s = 1$. The State's cost function $c(q_s)$ is convex with $c'(q_s) > 0$ and $c''(q_s) > 0$. This is a key assumption because it is the source of the State's ineffectiveness. For tractability, I will use $c(q_s) = q_s^2$. Note that the term $\delta^2(1-q_m)^2$ multiplies the cost function since it represents the demand of contract enforcement faced by the State after the Mafia has offered hers. Indeed, the State offers enforcement when needed - i.e. a litigious transaction occurs. Rather, the Mafia sells insurance against it. For this reason, $q_m + q_s$ needs not to be equal to 1 - i.e. some Mafia affiliates end up not facing any controversy. Note that the interaction between the Mafia (leader) and the State (follower) is a Stackelberg competition over quantities. Let $r_s(q_m)$ be the State's reaction to the Mafia's action q_m.

Finally, there is a finite number $\mathcal{I}$ of citizens (C) indexed by i who choose their affiliation status $j = \{s, m\}$ given the associated payoffs $u_{ij}(q_m, q_s)$. Since citizens are homogeneous, if j is optimal for one of them, so it is for all i. In particular, $j = m$ is optimal for all i, the actual size of the population who will be offered contract enforcement from the Mafia will be determined by the Mafia herself through the choice of q_m and

[10] Gambetta [1993] Chapter 1, The Market.

might not be 1. I will refer to q_m as the share of the population that is affiliated. Without loss of generality, I normalize the population size to 1. With slight abuse of notation, I will refer to a representative citizen and drop the subscript $i \in \mathcal{I}$. The citizen's payoffs are the following:

$$u_m(q_m, q_s) = w_1 - p(q_m, q_s) \tag{3}$$

$$u_s(q_m, q_s) = (1-\delta)w_1 + \delta(1-q_m)[w_1 q_s + (1-q_s)w_0] + \delta q_m(w_1 - \eta) \tag{4}$$

where $w_t = \{0, 1\}$ is the value of a transaction[11]. In particular, a transaction without any controversy or with a solved controversy has a value of $w_1 = 1$. A transaction with an unsolved controversy yields a payoff $w_0 = 0$. The latter happens if a non-affiliated citizen addresses her case to the court which can not solve it in a reasonable amount of time. For example, the vendor that does not get paid by the businessman will address her case to the tribunal and she will wait 514 days on average to receive an answer from the court. Such an event happens with probability $1 - q_s$. Equation 3 represents the utility under $j = m$, that is a successful transaction minus the price of the Mafia contract enforcement. Note that the controversy rate does not enter $u_m(q_m, q_s)$ since the Mafia offers *protection* as an *insurance*. Equation 4 represents the utility under $j = s$, the case of a non-affiliated citizen. The first term represents the case of a transaction that does not encounter any controversy. This event happens with probability $1 - \delta$ and has a value of $w_1 = 1$. The second possible event is a transaction with a non-affiliated that encounters a controversy. This happens with probability $\delta(1 - q_m)$. Conditional on that, with probability q_m the court will solve it and the value will be $w_1 = 1$. With probability q_s the court will not solve the controversy in a reasonable amount of time and the value will be $w_0 = 0$. Finally, with probability δq_m, the transaction with an affiliated will encounter a controversy, which will be solved by the Mafia and will have value $w_1 - \eta$. Note that equations 3 and 4 are citizens' expected payoffs from a number of transactions T.

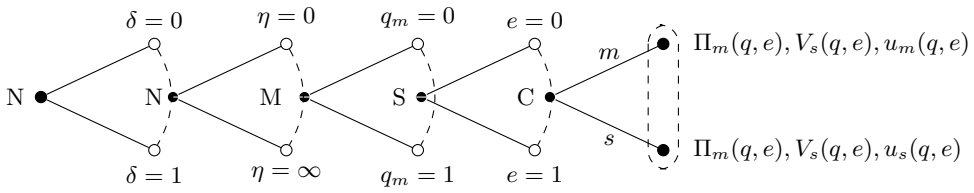

Figure 1: Extensive form

Since the outcomes from Nature's move is common information, the extensive form game in figure 1 can be solved by backward induction. Let $a = \{s, m\}$ be the citizen's action to buy or not the Mafia affiliation. The subgame perfect equilibrium is the strategy profile $(q_m^*, r_s(q_m^*), a^*)$. There are three main predictions

[11] Another underlying assumption is that all transactions yield the same return.

from the model:

Proposition I: An increase in the State effectiveness decreases the Mafia supply. That is:

$$\frac{\partial q_m*}{\partial q_s} < 0$$

Proposition II: An increase in the controversy rate generates a decrease in the State's effectiveness and an increase in the Mafia affiliation. That is:

$$\frac{\partial q_s^*}{\partial \delta} < 0; \qquad \frac{\partial q_m^*}{\partial \delta} > 0$$

Proposition III: An increase in violence generates an increase in both the State's effectiveness and the Mafia affiliation. That is:

$$\frac{\partial q_s^*}{\partial \eta} > 0; \qquad \frac{\partial q_m^*}{\partial \eta} > 0$$

Detailed solutions are presented in appendix A and appendix B develops the model for a situation with the State only or with the Mafia only. Figure 2 plots the equilibrium $(q_m^*, r_s(q_m^*))$ as a function of the exogenous parameters. Panel A plots the equilibrium outcome in a context where the State is the only enforcement institution. Due to convex costs, after a critical threshold, the State is not able to satisfy the entire demand for contract enforcement. Note that the exact value of the threshold depends on the functional form of the cost functions. Panel B displays the equilibrium outcome in a context where the Mafia is the only enforcement institution. The Mafia supply is a positive function of the controversy rate. Panels C and D show the equilibrium with both institutions operating at the same time for different levels of violence $\eta = 0.5$ and $\eta = 1$ respectively. An increase in the controversy rate generates an increase in the presence of the Mafia and a decrease in the effectiveness of the State. Note that by comparing panel B with C or D, it is clear that the Mafia emerges only when there are unsolved controversies. By comparing panels C and D, it is clear that an increase in violence increases both the reaction of the State and of the Mafia.

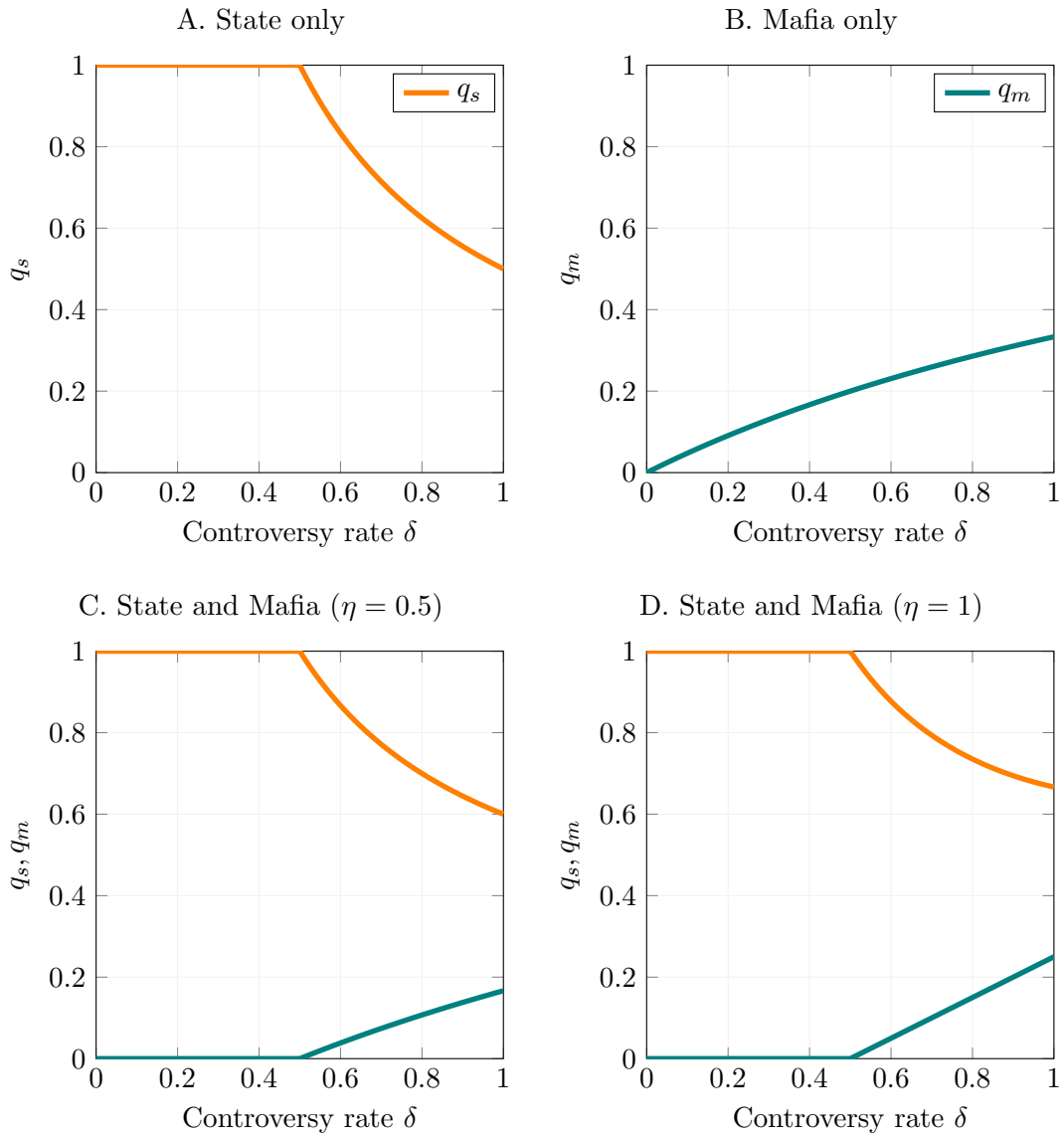

Figure 2: State (q_s) and Mafia (q_m) contract enforcement.

2.2 Discussion

> *"Common distinctions such as that between legal and illegal markets, lose analytical relevance and puzzles which have long occupied the minds of the scholars, such as the mafia's miraculous ability to adapt to new circumstances, become largely insignificant."*[12]

The model described in section 2.1 relies on a set of simplifying assumptions. This section intuitively describes the implications of relaxing them.

[12] Gambetta [1993], Introduction.

First, the model does not address any other Mafia business. As suggested by Gambetta [1993], consider the Mafia as a firm. Other institutional activities such as property right enforcement (Bandiera [2003]) or legitimate violence (Acemoglu et al. [2020]), can be considered as different sectors of the same main business, "protection". Under the strong assumption that activities from each sector are additive separable, contract enforcement can be analyzed separately. In addition, infiltration in private legal business (Piemontese [2020], Mirenda et al. [2022]) or in the public sector, such as distortion of public procurement (Tulli [2019]) or in public offices (Fenizia et al. [2020]), intuitively reconcile to this theory as they can be considered as vulnerable markets that lack protection. Indeed, the Mafia uses the provision of protection to infiltrate them. Further, the model does not take into account illegal markets - e.g. it considers contract enforcement in legal markets only. Protection in general, which might include other services beyond contract enforcement - is more scarce in the illegal markets. Even more, the Mafia has a monopoly of protection since no other legal alternative is available. However, this raises another important question about the State's capacity, namely the ability to reduce all other crimes that are not organized. In her interesting book project, Dipoppa [2022] describes how organized crime is flourishing in strong States due to the high demand for protection in illegal markets.

Second, the model presented in this paper does not address the quality of contract enforcement directly, meaning that there is no measure of *fairness*. Rather, it provides a simplification of reality by setting a way of controversy resolution that is independent of the parties' guilt. It is a strong assumption meant to neutralize the opportunity cost of "making a mistake that can generate a controversy". Introducing a measure of *fairness* has a few implications. In transactions happening between non-affiliated citizens, nothing changes as the State is *fair* and it is not convenient to receive a punishment. In transactions happening between affiliate citizens, it becomes relevant if it is possible to bribe the Mafia to turn the resolution in one's favor. Finally, in a transaction between an affiliate and a non-affiliate, it is reasonable to expect that the former has the incentive to create a controversy that will be solved in her favor. Hence, the main effect of this assumption on the equilibrium outcome is to underestimate the negative impact of the Mafia on total welfare.

Third, citizens are homogeneous. Since it acts as a generalized institution (Ogilvie and Carus [2014]), this information is irrelevant to the State. However, it has an implication for the Mafia which acts as a particularized institution. Introducing heterogeneity, such as the citizen's main economic field of work or their income level, might generate a sorting mechanism into affiliation, which is random in the current model. Further, some geographical areas might have a larger share of industries of high interest for the Mafia, or the Mafia itself might have specialized in the protection of that particular industry.

Fourth, transactions happen at a constant speed and concern a pair of business partners with random and unknown identities, namely their affiliation status. Allowing for different transaction speeds is an alternative

way to introduce heterogeneity as some industries require more frequent interaction and, as a result, have higher exposure to contract enforcement (Nunn [2007]). This might generate additional market power for the Mafia, resulting in an interest in serving a particular economic sector more than others. Conversely, there might be a channel through which the Mafia impacts the transaction speed. Adding this dimension to the model in section 2.1 will possibly reveal which sectors are more appealing for the Mafia. Allowing for transactions with more than one economic partner will open the discussion on corruption, with an increase in affiliation desirability, an increase in the Mafia's market power, and an increase in negative externalities of the Mafia's presence. Allowing citizens to choose the identity of their business partners might reduce the total number of transactions since the non-affiliates might refrain from engaging in business with the Mafia.

Fifth, citizens undertake transactions automatically and they do not have the option to shrink (Gambetta [1993], Greif [2000] and Dixit [2004]). This assumption has the main implication of underestimating the effect of ineffective contracting institutions on the number of transactions, which is constant in this model.

Sixth, while the Mafia's choice of optimal level of violence is an interesting research question itself, it goes beyond the intent of this paper since it only partially depends on the conditions of the market of contract enforcement. According to Gambetta [1993], *"The real reason for the extensive use of violence by the mafia may depend not so much on the structural features of the market as on contingent factors. One such factor involves the relationships among mafia families. The more stable and organized these are, the less the likelihood of violence"*. See Daniele and Le Moglie [2020] for a reflection about the use of violence by organized crime and Braccioli [2023] for a discussion on crime related to the data.

Finally, the State maximization problem abstracts from the budget allocation among the provision of different public goods as well as from tax collection. Further, it is assumed to be an unconstrained problem - e.g. the budget constraint is not binding.

3 Data and Descriptive Statistics

The database includes 140 Italian tribunal districts[13], that is the universe of the first instance courts in the country, for the period 2014-2019.

[13]The geographical competence of the Italian tribunals has been reformed in 2012. I refer to the *Serie Generale n.213 del 12-09-2012 - Supplemento Ordinario n. 185*, Table A of the *Gazzetta Ufficiale della Repubblica Italiana* (G.U. [2012]) to map the municipalities covered by 135 tribunal districts. As all the other sources I consult provide data for 140 tribunals, I manually reconstruct the geographical competence for five of them, consulting the tribunals' webpages. In particular, the Tribunals of Avezzano and Sulmona appear aggregated with L'Aquila; Lanciano and Vasto with Chieti; Urbino.

Tribunals. The Directorate General for Statistics and Organisational Analysis of the Italian Ministry of Justice provides yearly data on the number of civil controversies received by each tribunal, the number of civil controversies solved - i.e. a final sentence has been announced - within the year, and the number of civil controversies pending at the end of each year - i.e. a final sentence has not been announced yet. Table 3.1 shows the summary statistics. On average, around 18 thousand cases are solved every year. However, the total demand for contract enforcement is much larger, with 38 thousand cases per year pending plus new ones[14].

I obtain confidential yearly data from the Superior Council of the Judiciary about the judge's staffing level. I observe the number of judges expected to be in office and the number of vacancies for each tribunal. I have information about the reasons for a vacant position: transfers, retirement, and other reasons. The sum of active and vacant positions is the total planned staffing of the tribunal, and the law fixes it. The latter was modified in 2012 during the reform mentioned above of the judicial system and successively updated by the Ministry of Justice to match better the need of the tribunals[15]. From 2014 to 2019, the overall observed increase is 2% of judges. I construct the variable *Judges* as the difference between the planned staff and the vacancies for transfers and other reasons. I separate retirements as they will serve as an exogenous shock in the empirical analysis. As the tribunals' needs are pretty heterogeneous, the number of judges varies from a minimum of 3 to a maximum of 352, while the retirements are 0 for one-third of the tribunals and range from 1 to 4 for the rest of them. Unfortunately, the data do not distinguish between judges working on civil versus criminal cases.

Table 3.1: Summary Statistics.

	Sample size	Mean	SD	Min	Max
Mafia[a]	840	0.24	0.36	0	1
Judges[b]	840	32.57	44.49	3	352
Retirements[c]	840	0.20	0.52	0	4
Pending Cases	840	20'554.09	24'735.57	1'931	207'489
New Cases	840	17'592.74	21'639.56	1'516	193'154
Solved Cases	840	18'356.57	22'782.42	1'355	198'699
Population	840	422'998.60	379'557.29	58'264	2'820'219
GDP[d]	840	18'607.87	27'077.22	127	418'239

[a] Share of population living in Mafia-controlled areas over the total population.
[b] Number of active judges.
[c] Number of judges retired for seniority.
[d] Total GDP in million euros.

[14]Note that this is a rough measure as the correct way of computing the total demand of contract enforcement in each year is to sum the new cases to the pending ones of the previous year.

[15]Updates in 2014, 2016, 2017, 2019, and 2022. All information is available on the Ministry of Justice's official webpage.

Mafia presence. Since Mafia contract enforcement relies on widespread control of the territory (Gambetta [1993]), I use a novel database that identifies neighborhoods and municipalities controlled by each Mafia surname for the year the years 2014-2019 (Braccioli [2023]), overcoming some limitations of other indices of Mafia presence (Bernardo et al. [2021]). The data are published by the Directorate of Anti-mafia Investigation[16] (DIA [2014-2019]) and they identify areas where the Mafia has stable activities[17]. Hence, it can acquire all the necessary information to provide contract enforcement. For example, figure A-3 in appendix D shows the names of Mafia families that controlled each neighborhood of Reggio Calabria in 2019. I use this information to construct the share of the population living in Mafia-controlled areas over the total population.

Other variables. Population data at the municipal level for 2014-2019 and GDP per capita at the provincial level are publicly available from the National Institute of Statistics (ISTAT). I construct the GDP at the district level as the weighted average of GDP at the provincial level, using the number of municipalities in each tribunal district as weights.

4 Empirical Analysis

This section discusses the empirical analysis. First, I recall and bring the main model prediction to the data. While the model generates three predictions, in the empirical analysis, I focus on the first one as it directly addresses the research question. Then, I discuss related endogeneity issues and provide an instrumental variable approach to mitigate these concerns. Finally, I present the results to document ineffective civil tribunals' impact on the Mafia contract enforcement supply.

4.1 OLS: from theory to empirics

According to the theoretical framework, the main testable prediction is that a decrease in the tribunal's effectiveness q_s increases the share of the population q_m offered contract enforcement by the Mafia, as defined in section 2. This section brings the main theoretical prediction to the data.

First, the most accurate measure for q_m would be the share of affiliates on the total population. As this is not observable, I build the share of the population in a municipality with Mafia presence on the total population in the tribunal district, $M_{i,t}$, and I will refer to it as Mafia-affiliation share. Note that $M_{i,t}$ is considered an upper bound with respect to q_m, since it assumes that all the individuals living in Mafia-

[16] The DIA is a multi-force investigation body with the main aim of fighting and preventing any Italian organized crime or mafia activity. It was established with the law decree n. 345 of 29 October 1991.

[17] The information delivered by this data is comparable to those provided by Damiani [1881], and Cutrera [1900], used by Bandiera [2003] and Acemoglu et al. [2020] respectively.

controlled municipalities are offered Mafia protection. The first map in figure 3 shows the geographical distribution in deciles. Half of the Italian territory appears outside the direct control of organized crime, and hence, the first five deciles register a value of the variable equal to zero. Not surprisingly, higher population shares are registered in the South. Some areas in the Northwest also register some mild infiltration. For example, in areas colored in very light green, the share of the population living in a Mafia-controlled area is less than 10%.

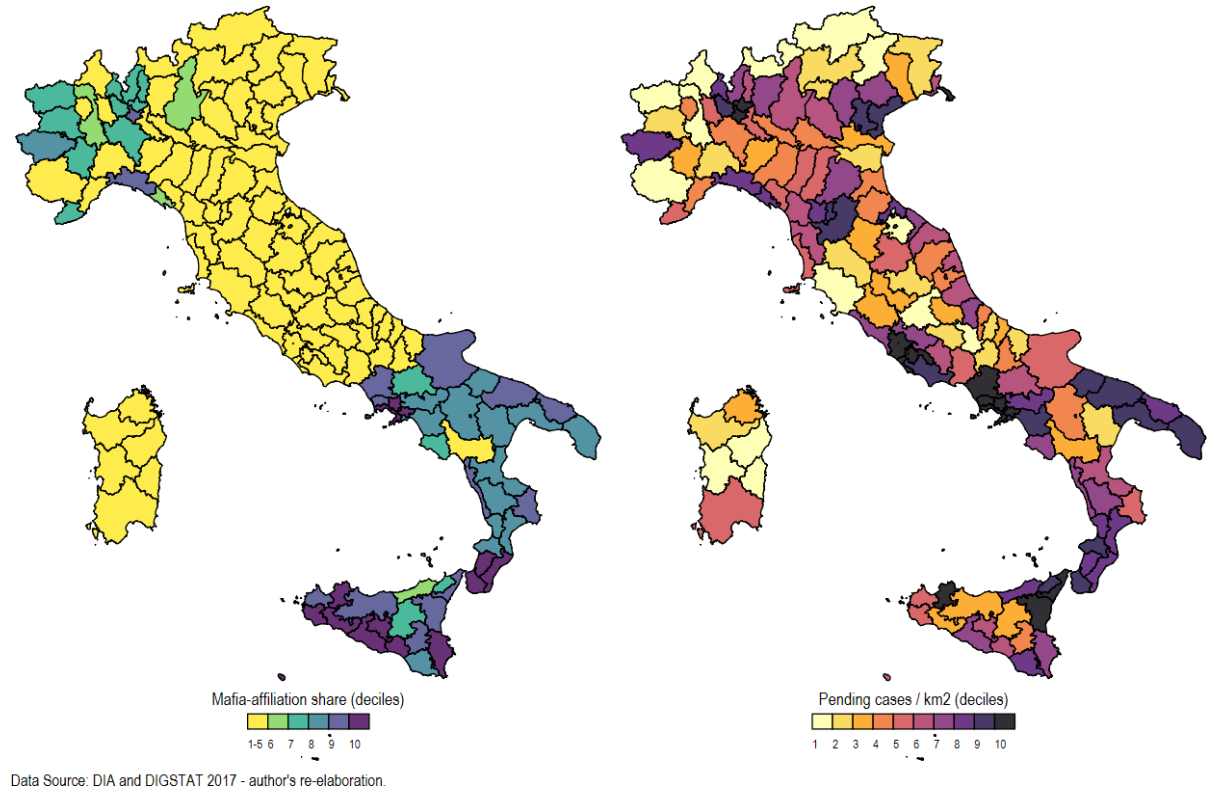

Figure 3: The Mafia-affiliation share and the number of pending cases per km^2, district level (2017).

Second, q_s is the number of civil cases solved by the tribunal over the total demand of contract enforcement, that is, the number of pending cases of the previous year plus new ones. I use the number of pending cases $P_{i,t}$ to measure tribunals' ineffectiveness. The model suggests three types of normalization, by total demand of contract enforcement, by the total number of transactions, and by population. However, each of these variables introduces correlation with the main dependent variable $M_{i,t}$ by a different channel with respect to $P_{i,t}$ making it impossible to disentangle the two. Indeed, as stated by the *Preposition II* from the model in section 2, increasing the demand for contract enforcement increases Mafia affiliation. Further, while the model does not aim at explaining the impact of the Mafia on the total number of transactions, approximated with GDP, there are both empirical and theoretical results suggesting GDP reduction due to

the presence of the Mafia (Greif [2000], Dixit [2004], Pinotti [2015]). Finally, in the theoretical framework, the population size is normalized to 1. However, any population movements due to the presence of the Mafia might interfere with the identification. Hence, in the main specification, I will use the territorial extension of the tribunal district in km^2 to normalize the number of pending cases $P_{i,t}$. This measure is handy as it is fixed and can not be impacted by any other variable considered, including the presence of the Mafia. The second map in figure 3 plots deciles of $P_{i,t}$ in 2017. Many tribunals in the South have the highest number of pending cases, particularly in Apulia and Campania. However, some areas in the Center and North also display high levels of pending cases. Figure A-4 in appendix D plots the normalizations mentioned above.

Finally, as the model is static, it does not suggest whether the effect of $P_{i,t}$ on $M_{i,t}$ is to be expected to be contemporaneous or lagged. However, as the tribunal effectiveness is measured at the end of each t, it is reasonable to expect any effect on the affiliation $M_{i,t}$ to appear in the following year. Hence, I will present the analysis using the lagged value of the number of pending cases $P_{i,t-1}$.

The baseline OLS regression is the following:

$$M_{i,t} = \alpha^{OLS} + \beta^{OLS} P_{i,t-1} + \tau_i + \kappa_t + \epsilon_{i,t}^{OLS} \tag{5}$$

where $M_{i,t}$ is the share of the Mafia-affiliated population, $P_{i,t-1}$ is the lagged number of pending cases normalized by the territorial extension of the tribunal, τ_i and κ_t are tribunal and year fixed effect respectively, β_{OLS} is the parameter of interest. Theory predicts it to be positive.

Equation 5 might suffer from endogeneity for several reasons. The most obvious and standard with all the literature on the origin of organized crime is the "weak State" omitted variable bias. It is easier for the Mafia to expand in areas where the State is absent or less effective. This concern is likely to result in an upwards bias. A second possible threat is reverse causality. The direction of this effect is not apparent. The Mafia might increase litigiousness, causing part of the courts' ineffectiveness and resulting in an upward bias, or reduce the legal demand of contract enforcement, generating a downward bias. Section 4.2 presents an instrumental variable approach to address these concerns.

4.2 First stage: judges' retirement and tribunals' production function

This section proposes an instrumental variable approach to address the endogeneity concerns for equation 5 presented in section 4.1. In particular, I use judges' retirement for seniority as an instrument, a negative shock, for the tribunals' productivity. Unfortunately, information about the time it takes to replace a judge is unavailable. However, even in the extreme case that the replacement arrives the day after retirement, some organizational and bureaucratic fulfillment possibly slows down the activities. All the variables involved in

the first stage regression follow the normalization by km^2 applied to $P_{i,t}$ as discussed in the previous section.

The exclusion restriction relies on retirements being orthogonal to the presence of the Mafia. The main concern is that judges ask to be transferred away from problematic areas, and hence more of them reach retirement age in more desirable tribunals. To provide evidence against this concern, I built the total number of judges aged 65 years old in 2015 as the sum of all the retirements for seniority in the years 2015 to 2019 included. I built the total number of vacancies in the years 2000 to 2014 included[18] I normalize both measures by the total number of judges expected to be in charge by the law. A strong negative correlation between these two measures would have signaled that older judges concentrate in certain districts. Figure 4 provides evidence against this threat. For completeness, table A-5 in appendix D plots the same distribution accounting for the length of the vacancy.

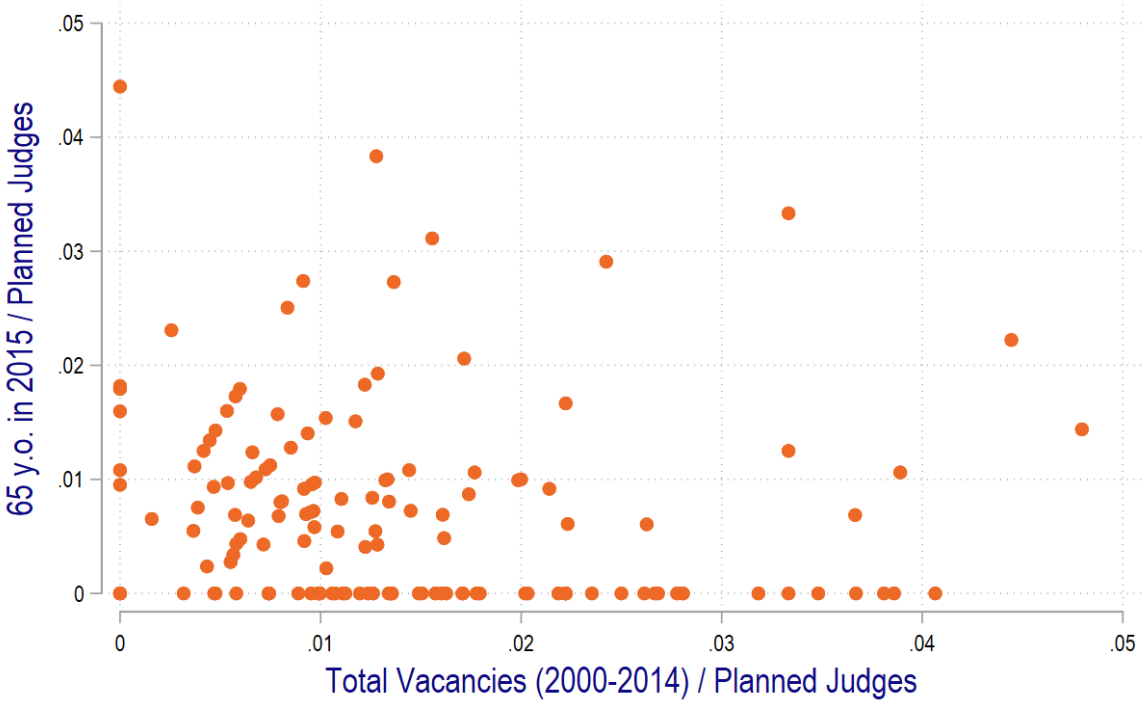

Figure 4: Retirements versus previous years' vacancies.

To clarify the link between retirements and the number of pending cases, I introduce a descriptive model of tribunals' production function. As I will investigate the impact of the lagged value of the number of pending cases $P_{i,t-1}$ on the Mafia affiliation share, the first stage regression is presented in $t-1$. In each

[18]The available years are 2000-2020. I excluded 2020 from the analysis due to the major shock caused by the COVID-19 pandemic.

tribunal i, the number of pending cases $P_{i,t-1}$ at the end of the year $t-1$ is given by the following identity:

$$P_{i,t-1} \equiv D_{i,t-1} - S_{i,t-1} \tag{6}$$

where $D_{i,t-1}$ is the total demand of contract enforcement, given by $P_{i,t-2}$ and $N_{i,t-1}$, and $S_{i,t-1}$ the number of controversies solved. I assume that solved cases are the output of a tribunal production function, which depends on active judges $J_{i,t}$, the number of retired judges $R_{i,t}$, and the tribunals fixed effects ϕ_i, as follows:

$$S_{i,t-1} = f(J_{i,t-1}, R_{i,t-1}, \phi_i) = \psi^S J_{i,t-1} - \psi_2^S J_{i,t-1}^2 - \rho^S R_{i,t-1} + \rho_2^S R_{i,t-1}^2 + \phi_i + \epsilon_{i,t-1}^S \tag{7}$$

where ψ is the average number of cases a judge deals with, and ρ is the average number of cases a retired judge would have dealt with. This allows the productivity of retiring judges to be different from the productivity of others. Then, the identity 6 can be rewritten as the following equation:

$$P_{i,t-1} = -\rho^P R_{i,t-1} + \rho_2^P R_{i,t-1}^2 - \psi^P J_{i,t-1} + \psi_2^P J_{i,t-1}^2 + \omega^P D_{i,t-1} + \gamma_t + \phi_i + \epsilon_{i,t-1}^P \tag{8}$$

where γ_t are the year-fixed effects.

Table 4.1 presents the results for equation 8. Column 1 assumes homoskedasticity, column 2 reports clustered standard errors and column 3 robust ones. Heteroskedasticity is likely to arise at the tribunal level. However, given many fixed effects, clustering at the tribunal level results in too few clusters, and standard errors might not be reliable[19]. The F-statistic in column 1 has a value of 189, and the Kleibergen-Paap test for columns 2 and 3, corrected for the cluster and robust cases, takes values of 10 and 14, respectively.

The interpretation of the coefficients is not straightforward. The absolute change for one additional retirement is around 2'500 cases[20]. On the contrary, the decrease in the number of pending cases for introducing one additional judge is around 90 cases[21]. The difference between these effects can be interpreted as the difference in experience between the average judge operating in the tribunal and the most experienced one, the ones that retire.

[19] Wild bootstrap TBA.

[20] $\Delta y = \beta \Delta x$, where the average x equals 0.0002, the number of retirements per km^2. The average tribunal's extension is $2'102\ km^2$. Hence $0.0002 * 1'219 * 2'102 = 512$ gives the change in the absolute number of pending cases for a change of x equal to its average. As x average in absolute terms is 0.2, the absolute change for one additional judge is $512 * 5 = 2'562$

[21] $\Delta y = \beta \Delta x$, where the average x equals 0.0322, the number of judges per km^2. The average tribunal's extension is $2'102\ km^2$. Hence $0.0322 * 42 * 2'102 = 2843$ gives the change in the absolute number of pending cases for the average value of x, which equals 32. The decrease in the number of pending cases for introducing one additional judge is around 88 cases.

Table 4.1: First Stage - Judges' retirement and tribunals' production function.

	(1) Pending$_{t-1}$	(2) Pending$_{t-1}$	(3) Pending$_{t-1}$
Retired$_{t-1}$	1,218.841***	1,218.841***	1,218.841***
	(116.331)	(355.872)	(322.582)
Retired$^2_{t-1}$	-688.272***	-688.272***	-688.272***
	(38.386)	(150.890)	(132.264)
Judges$_{t-1}$	-42.604***	-42.604	-42.604
	(12.405)	(29.029)	(26.593)
Judges$^2_{t-1}$	1.070***	1.070***	1.070***
	(0.036)	(0.190)	(0.159)
Demand$_{t-1}$	0.489***	0.489***	0.489***
	(0.007)	(0.041)	(0.033)
Observations	700	700	700
R-squared	1.000	1.000	1.000
F-statistic	188.8	10.41	13.60
Year FE	✓	✓	✓
Tribunal FE	✓	✓	✓
SE	Homosk.	Cluster[a]	Robust

[a] Cluster at tribunal level.

4.3 Second stage: the impact of ineffective tribunals on the Mafia supply

This section documents the impact of ineffective civil tribunals on the Mafia supply of contract enforcement.

Using the identification strategy proposed in section 4.2, I estimate the following second stage regression:

$$M_{i,t} = \alpha^M + \beta^M P_{i,t-1} + \delta^M X_{i,t-1} + \tau_i + \kappa_t + \epsilon^M_{i,t} \tag{9}$$

where $P_{i,t-1}$ is the lagged number of pending cases, instrumented with retiring judges as in equation 8, $X_{i,t-1}$ set of first stage controls $(J_{i,t-1}, J^2_{i,t-1}, D_{i,t-1},)$, τ_i and κ_t are tribunal and year fixed effect respectively.

Table 4.2 shows the results, columns 1, 3, and 5 with robust standard error; columns 2, 4, and 6 with standard errors clustered at the tribunal level. Colum 1 and 2 refer to the OLS regressions as in equation 5 adding the controls $X_{i,t-1}$. These coefficients suffer from downward bias, compatible with a reverse causality due to a decrease in demand for contract enforcement as part of it is addressed by the Mafia. Columns 3 and 4 show the coefficients for the first stage, already discussed in the previous section.

The coefficient in columns 5 and 6 expresses a 2% increase of Mafia-affiliation share for an increase

Table 4.2: Second stage: the impact of ineffective tribunals on the Mafia supply

	OLS		IV		2SLS	
	(1) Mafia	(2) Mafia	(3) $Pending_{t-1}$	(4) $Pending_{t-1}$	(5) Mafia	(6) Mafia
$Pending_{t-1}$	0.0164***	0.0164***			0.0208***	0.0208**
	(0.004)	(0.006)			(0.007)	(0.008)
$Retired_{t-1}$			1,218.841***	1,218.841***		
			(322.582)	(355.872)		
$Retired^2_{t-1}$			-688.272***	-688.272***		
			(132.264)	(150.890)		
Observations	700	700	700	700	700	700
R-squared	0.974	0.974	1.000	1.000		
F-statistic			13.60	10.41		
Controls	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Tribunal FE	✓	✓	✓	✓	✓	✓
SE	Robust[a]	Cluster	Robust	Cluster	Robust	Cluster

[a] First stage controls as in equation
[b] Cluster at tribunal level. 8.

of around 42'040[22] pending cases. Considering that the average population living in a Mafia-controlled municipality for a tribunal district is around 106'000 (see table 3.1), this translates into approximately 2'000 individuals, which is the size of a small Italian town and less than a neighborhood in one of the largest cities[23].

To understand whether this magnitude is large or small, it is helpful to provide some benchmark for the variation in pending cases and Mafia affiliation. In 2019, there were 2'645'342 pending cases in Italy, and new ones were 2'447'018, meaning that cases that had been pending for longer than one year amount to a minimum[24] of 200'000. Bringing this number to zero would imply a reduction of Mafia affiliation share of about 10%[25]. In 2019, 16 million individuals were living in Mafia-controlled areas. Reducing this number by 10% equals taking away a city of 1.6 million inhabitants from organized crime. Given the incredibly high persistence of the phenomenon[26] over centuries; this would be a reasonably successful result.

[22]The average value of $Pending_{t-1}$ is 20 pending cases per km^2. The average tribunal's extension is $2'102km^2$.
[23]For example, neighborhoods in Naples have an average size of 32'000 inhabitants (ISTAT [2011]).
[24]This is a rough approximation since it assumes that all cases last longer than one year.
[25]200'000 divided 42'040 pending cases (the variation needed to generate 2% increase in Mafia-affiliation share) and multiplied by 2%.
[26]The only available estimation concerns the presence of the Paesant Fasci in 1893 made a municipality 69% more likely to register the presence of the Mafia in 1900. In 2019 this probability is still 53% (Acemoglu et al. [2001],

5 Conclusion

This paper examines the relationship between the ineffectiveness of the Italian judicial system in enforcing contracts and the presence of the Mafia. Through the use of both theory and empirical evidence, the paper provides insight into how the ineffectiveness of the State in contract enforcement creates a demand for the Mafia's services, resulting in the negative externality of violence. The results of the regression analysis suggest that a decrease in the effectiveness of tribunals leads to an increase in the population served by the Mafia. The contribution of this paper to the literature is threefold. Firstly, it adds to the literature on lawlessness and economics by analyzing a context where the State is present but ineffective. Secondly, it provides evidence linking the Mafia's presence to the judicial system's ineffectiveness in contract enforcement, a dimension of the State's capacity that has not been studied before. Finally, the paper contributes to the growing body of literature documenting the effects of ineffective civil courts on economic outcomes by showing that the judicial system's ineffectiveness in contract enforcement directly impacts the presence of the Mafia.

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A Appendix

A.1 Detailed Solutions

This section solves the extensive form game in figure (1) by backward induction. Starting from the last node, the representative citizen (C) is indifferent between $a_i = M$ and $a_i = S$ if $u_{in} = u_{out}$. Replacing $w_1 = 1$ and $w_0 = 0$ yields the following indifference condition:

$$p(q_m, q_s) = \delta(1 + q_m\eta + q_s q_m - q_m - q_s) \tag{10}$$

The State solves the maximization problem in equation (2). Plugging equations 10, 3, 4 and population shares α_j yields:

$$\begin{aligned}
\max_{q_s} \quad & V_s(q_s, q_m) = (1 - q_m)[1 - \delta + \delta(1 - q_m)q_s + \delta q_m(1 - \eta)] + \\
& \qquad + q_m[1 - \delta + \delta(1 - q_m)q_s + \delta q_m(1 - \eta)] - \delta(1 - q_m)\frac{q_s^2}{k_s} \\
& \frac{\partial V_s(q_s, q_m)}{\partial q_s} = \delta - \delta q_m - 2\delta(1 - q_m)\frac{q_s}{k_s} = 0 \\
& q_s^* = \frac{k_2}{2}
\end{aligned} \tag{11}$$

To solve the Mafia-leader maximization problem stated in equation 1, use equation 10 and 11 as follows:

$$\max_{q_m} \quad \pi_m(q_m, q_s) = \delta(1 + q_m\eta - q_m + q_s q_m - q_s)q_m - \frac{q_m^2}{k_m} \tag{12}$$

$$\begin{aligned}
\max_{q_m} \quad & \pi_m(q_m, q_s) = \delta\Big(1 + q_m\eta - q_m + \frac{k_2}{2}q_m - \frac{k_2}{2}q_m\Big) - \frac{q_m^2}{k_m} \\
\max_{q_m} \quad & 2\delta k_m q_m - \delta k_m k_s q_m + \delta k_s k_m q_m^2 - 2\delta k_m q_m^2 + 2\delta\eta k_m q_m^2 - 2q_m^2 \\
& \frac{\partial \pi_m(q_s, q_m)}{\partial q_m} = 2\delta k_m - \delta k_m k_s + 2\delta k_s k_m q_m - 4\delta k_m q_m + 4\delta\eta k_m q_m - 4q_m = 0 \\
& q_m^* = \frac{\delta k_m(2 - k_s)}{4 + 4\delta k_m - 2\delta k_m k_s - 4\delta\eta k_m}
\end{aligned} \tag{13}$$

A.2 Comparative Statics

Proposition I To obtain $\frac{\partial q_m^*}{\partial q_s^*}$, start from the maximization problem 12:

$$\begin{aligned}
\max_{q_m} \quad & \pi_m(q_m, q_s) = \delta(1 + q_m\eta + q_s^* q_m - q_m - q_s^*)q_m - q_m^2 \\
& \frac{\partial \pi_m(q_s, q_m)}{\partial q_m} = \delta + 2\delta\eta q_m + 2\delta q_s^* q_m - 2\delta q_m - \delta q_s^* - 2q_m = 0 \\
& q_m^*(q_s^*) = \frac{\delta(q_s^* - 1)}{2\delta\eta + 2\delta q_s^* - 2\delta - 2} \\
& \frac{\partial q_m^*(q_s^*)}{\partial q_s^*} = \frac{\delta(2\delta\eta + 2\delta q_s^* - 2\delta - 2) - 2\delta^2(q_s^* - 1)}{(2\delta\eta + 2\delta q_s^* - 2\delta - 2)^2} > 0
\end{aligned} \tag{14}$$

The denominator in equation 14 is always positive. The numerator is positive for $\delta > \frac{1}{\eta}$. Hence, for $\eta \leq 1$, $\frac{\partial q_m^*(q_s^*)}{\partial q_s^*} < 0 \quad \forall \delta \in [0, 1]$. This is the most common case as the negative externality destroys at most all the outcome of the transaction $w_1 = 1$, but not more than that. For $\eta > 1$, the sign of the derivate depends on δ.

Proposition II From equation 13:

$$\begin{aligned}
\frac{\partial q_m^*}{\partial \delta} &= \frac{2(4 + 4\delta - 4\delta\eta) - (2\delta - 1)(4 - 4\eta)}{(4 + 4\delta - 4\delta\eta)^2} \\
\frac{\partial q_m^*}{\partial \delta} &= \frac{-8\delta + 12}{(4 + 4\delta - 4\delta\eta)^2}
\end{aligned}$$

Note that the denominator is always positive and the numerator is positive for $\delta \in [0, \frac{4}{3}]$. Hence, $\frac{\partial q_m^*}{\partial \delta} > 0$, that is an increase in demand for contract enforcement (controversy rate), always leads to an increase in the Mafia supply.

From equation **??**:

$$\begin{aligned}
\frac{\partial q_s^*}{\partial \delta} &= \frac{(2 - 2\eta)(5\delta + 2\delta^2 - 4\delta^2\eta) - (2 + 2\delta - 2\delta\eta)(5 + 2\delta - 4\delta\eta)}{(5\delta + 2\delta^2 - 4\delta^2\eta)^2} \\
\frac{\partial q_s^*}{\partial \delta} &= \frac{12\delta^2 + 16\delta\eta - 4\delta^2 - 8\delta^2\eta^2 - 8\delta - 10}{(5\delta + 2\delta^2 - 4\delta^2\eta)^2}
\end{aligned}$$

Note that the denominator is always positive. It is possible to check that when $12\delta^2 + 16\delta\eta > 4\delta^2 + 8\delta^2\eta^2 + 8\delta + 10$, then the numerator is also positive. This is not true in most of the cases of interest for this analysis, that is for i. $\delta \in [0, 1]$ and $\eta \in [0, 1]$; ii. for $\delta = 1 \bigwedge \eta \in [0, 1.25)$; iii. for lower level of δ, the level of η required to turn the sign is higher - e.g. for $\delta = 0.5 \bigwedge \eta \in [0, 1.66)$ the derivative is negative. Hence $\frac{\partial q_s^*}{\partial \delta} < 0$, that is an increase in demand for contract enforcement (controversy rate), always leads to decrease in the State supply.

Proposition III From equation 13:

$$\frac{\partial q_m^*}{\partial \eta} = \frac{4\delta(2\delta - 1)}{(4 + 4\delta - 4\delta\eta)^2} \tag{15}$$

Note that the denominator is always positive. The numerator is also positive for $\delta \in [\frac{1}{2}, 1]$ but negative for $\delta \in [\frac{1}{2})$.

From equation **??**:

$$\frac{\partial q_s^*}{\partial \eta} = \frac{-2\delta(5\delta + 2\delta^2 - 4\delta^2\eta) + 2\delta^2(2 + 2\delta - 2\delta\eta)}{(5\delta + 2\delta^2 - 4\delta^2\eta)^2}$$
$$\frac{\partial q_s^*}{\partial \eta} = \frac{\delta^2(2\delta - 1)}{(5\delta + 2\delta^2 - 4\delta^2\eta)^2}$$

Note that the denominator is always positive. The numerator is also positive for $\delta \in [\frac{1}{2}, 1]$ but negative for $\delta \in [\frac{1}{2})$.

A.3 Monopoly with fringe

The indifference condition (10) and the State contract enforcement in (11) remain unchanged, with $q_m = q_M + \sum_{F=1}^{N} q_F$. Turning to the Mafia's side, I solve the monopolist with the fringe problem by backward induction. The monopolist set the price and the fringe act as a follower. First, the firms of the fringe solve

the maximization problem stated in equation (12) as follow:

$$\max_{q_F} \quad \delta\big[1 + q_m\eta + r_s(q_m)q_m - q_m - r_s(q_m)\big]q_F - c_F N q_F^2$$

$$\max_{q_F} \quad \delta q_F + \delta\eta q_m q_F + \frac{\delta q_m q_F}{2\delta(1-q_m)} - \delta q_m q_F - \frac{\delta q_F}{2\delta(1-q_m)} - c_F N q_F^2$$

$$\max_{q_F} \quad 2\delta(1-q_m)q_F + 2\delta\eta(1-q_m)q_m q_F + q_m q_F - 2\delta(1-q_m)q_m q_F - q_F +$$
$$- 2c_F N(1-q_m)q_F^2$$

$$\max_{q_F} \quad 2\delta(1-q_m)q_F + 2\delta\eta(1-q_m)q_m q_F - (1-q_m)q_F - 2\delta(1-q_m)q_m q_F +$$
$$- 2c_F N(1-q_m)q_F^2$$

$$\max_{q_F} \quad 2\delta q_F + 2\delta\eta q_m q_F - q_F - 2\delta q_m q_F - 2c_F N q_F^2$$

$$\max_{q_F} \quad 2\delta q_F - 2\delta(1-\eta)(q_M + \sum_{F=1}^{N} q_F)q_F - q_F - 2c_F N q_F^2$$

$$\frac{\partial \Pi_F(q_F, q_M)}{\partial q_F} = 2\delta - 1 - 2\delta(1-\eta)q_M - 2N\delta(1-\eta)q_F - 2\delta(1-\eta)q_F +$$
$$- 4c_F N q_F = 0$$

$$q_F(q_M) = \frac{2\delta - 1 - 2\delta(1-\eta)q_M}{2\delta(1-\eta)(N+1) + 4Nc_F} \tag{16}$$

Second, plug the indifference condition (10) into the Mafia monopolist maximization problem as follows:

$$\max_{q_M} \quad \Pi_F(q_F, q_M) = \delta\big[1 + q_m\eta + r_s(q_m)q_m - q_m - r_s(q_m)\big]q_M - c_M q_M^2$$

Further, plug $r_s(q_m)$ from equation (11) and simplify:

$$\max_{q_M} \quad \delta q_M + \delta\eta q_m q_M + \frac{\delta q_m q_M}{2\delta(1-q_m)} - \delta q_m q_M - \frac{\delta q_M}{2\delta(1-q_m)} - c_M q_M^2$$

$$\max_{q_M} \quad 2\delta(1-q_m)q_M + 2\delta\eta(1-q_m)q_m q_M + q_m q_M - 2\delta(1-q_m)q_m q_M - q_M - 2c_M(1-q_m)q_M^2$$

$$\max_{q_M} \quad 2\delta(1-q_m)q_M + 2\delta\eta(1-q_m)q_m q_M - (1-q_m)q_M - 2\delta(1-q_m)q_m q_M - 2c_M(1-q_m)q_M^2$$

$$\max_{q_M} \quad 2\delta q_M + 2\delta\eta q_m q_M - q_M - 2\delta q_m q_M - 2c_M q_M^2$$

$$\max_{q_M} \quad 2\delta q_M - 2\delta(1-\eta)(q_M + Nq_F)q_M - q_M - 2c_M q_M^2$$

Finally, plugging $q_F(q_M)$ from equation (16) yields the following maximization problem:

$$\max_{q_M} \quad 2\delta q_M - 2\delta(1-\eta)\Big[q_M + N\frac{2\delta - 1 - 2\delta(1-\eta)q_M}{2\delta(1-\eta)(N+1) + 4Nc_F}\Big]q_M - q_M - 2c_M q_M^2$$

$$\max_{q_M} \quad 2\delta q_M - 2\delta(1-\eta)q_M^2 - \frac{2\delta(1-\eta)(2\delta-1)Nq_M}{2\delta(1-\eta)(N+1) + 4Nc_F} +$$

$$+ \frac{4\delta^2(1-\eta)^2 N q_M^2}{2\delta(1-\eta)(N+1) + 4Nc_F} - q_M - 2c_M q_M^2$$

Taking first order condition w.r.t. q_M yields:

$$\frac{\partial \Pi_M(q_F, q_M)}{\partial q_M} = 2\delta - 1 - \frac{2\delta(1-\eta)(2\delta-1)N}{2\delta(1-\eta)(N+1) + 4Nc_F} + \frac{8\delta^2(1-\eta)^2 N q_M}{2\delta(1-\eta)(N+1) + 4Nc_F} +$$

$$- 4\delta(1-\eta)q_M - 4c_M q_M = 0$$

Solving for q_M^* and simplifying yields:

$$q_M^* = \frac{2\delta(1-\eta)(2\delta-1)N - (2\delta-1)\big[2\delta(1-\eta)(N+1) + 4Nc_F\big]}{8\delta^2(1-\eta)^2 N - \big[4\delta(1-\eta) + 4c_M\big]\big[2\delta(1-\eta)(N+1) + 4Nc_F\big]} =$$

$$= \frac{(2\delta-1)\big[2Nc_F + \delta(1-\eta)\big]}{4\big[2Nc_F + \delta(1-\eta)(N+1)\big]c_M + 4\delta(1-\eta)\big[2Nc_F + \delta(1-\eta)\big]} \tag{17}$$

Plugging (17) in (16) yields:

$$q_F^* = \frac{2\delta - 1}{2\delta(1-\eta)(N+1) + 4c_F} - \frac{2\delta(1-\eta)}{2\delta(1-\eta)(N+1) + 4c_F} \cdot \\ \cdot \frac{(2\delta-1)(2c_F + \delta - \delta\eta)}{4\big[(2c_F + \delta - \delta\eta)(c_M + \delta - \delta\eta) + \delta(1-\eta)Nc_M\big]} =$$

$$= \frac{(2\delta-1)\Big\{2\big[2c_F + \delta(1-\eta)(N+1)\big]c_M + \delta(1-\eta)\big[2c_F + \delta(1-\eta)\big]\Big\}}{4\big[2Nc_F + \delta(1-\eta)(N+1)\big]\Big\{\big[2Nc_F + \delta(1-\eta)(N+1)\big]c_M + \delta(1-\eta)\big[2Nc_F + \delta(1-\eta)\big]\Big\}} \tag{18}$$

At the equilibrium, the total supply from the Mafia is the following:

$$q_m^* = q_M^* + Nq_F^* = \\ = \frac{(2\delta-1)\big[2Nc_F + \delta(1-\eta)\big]}{4\big[2Nc_F + \delta(1-\eta)(N+1)\big]c_M + 4\delta(1-\eta)\big[2Nc_F + \delta(1-\eta)\big]} + \\ + \frac{(2\delta-1)N\Big\{2\big[2Nc_F + \delta(1-\eta)(N+1)\big]c_M + \delta(1-\eta)\big[2Nc_F + \delta(1-\eta)\big]\Big\}}{4\big[2Nc_F + \delta(1-\eta)(N+1)\big]\Big\{\big[2Nc_F + \delta(1-\eta)(N+1)\big]c_M + \delta(1-\eta)\big[2Nc_F + \delta(1-\eta)\big]\Big\}}$$

$$= \frac{(2\delta-1)\Big\{\big[2Nc_F + \delta(1-\eta)(N+1)\big]\big[2Nc_M + 2Nc_F + \delta(1-\eta)\big] + \delta(1-\eta)N\big[2Nc_F + \delta(1-\eta)\big]\Big\}}{4\big[2Nc_F + \delta(1-\eta)(N+1)\big]\Big\{\big[2Nc_F + \delta(1-\eta)(N+1)\big]c_M + \delta(1-\eta)\big[2Nc_F + \delta(1-\eta)\big]\Big\}} \tag{19}$$

B Appendix

This section presents the solution for a situation with the State only and the Mafia only.

B.1 State only

Suppose that the only third party contract enforcement agency available is the State. Note that there is only one possible utility function for the citizens, which can be obtained by setting $q_m = 0$ in equation 4 as follow:

$$u(q_s) = (1-\delta)w_1 + \delta[w_1 q_s + (1-q_s)w_0] \tag{20}$$

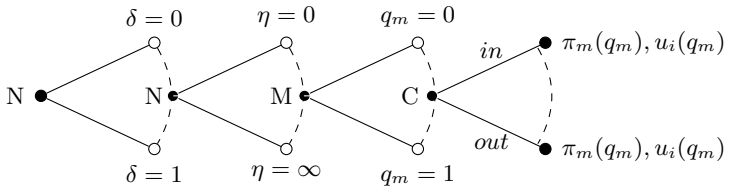
Hence, the problem presented in section 2 becomes a one player game - the State - with Nature and continuous payoff. In particular, the State maximizes:

$$\begin{aligned}
\max_{q_s} \quad & V_s(q_s) = u(q_s) - \delta^2 c(q_s) \\
\max_{q_s} \quad & V_s(q_s) = 1 - \delta + \delta q_s - \delta^2 q_s^2 \\
& \frac{\partial V_s(q_s)}{\partial q_s} = \delta - 2\delta^2 q_s = 0 \\
& q_s^* = \frac{1}{2\delta}
\end{aligned} \tag{21}$$

B.2 Mafia only

Suppose now that the Mafia is the only third party contract enforcement agency availably. The extensive form game in figure 1 becomes the game in figure 1, a two players game with Nature.

Figure A-1: Extensive form: Mafia only



Note that the outside option for the citizens is now $u_{out} = (1-\delta)w_1 + \delta q_m(w_1 - \eta)$. Hence, the indifference condition in equation 10 becomes $p(q_m) = \delta - \delta q_m(w_1 - \eta)$ and the Mafia's maximization problem:

$$\begin{aligned}
\max_{q_m} \quad & \pi_m(q_m) = p(q_m)q_m - c(q_m) \\
\max_{q_m} \quad & \pi_m(q_m) = (\delta - \delta q_m + \delta\eta q_m)q_m - q_m^2 \\
& \frac{\partial \pi_m(q_m)}{\partial q_m} = \delta - 2\delta q_m + 2\delta\eta q_m - 2q_m = 0 \\
& q_m^* = \frac{\delta}{2 + 2\delta - 2\delta\eta}
\end{aligned} \tag{22}$$

C Appendix

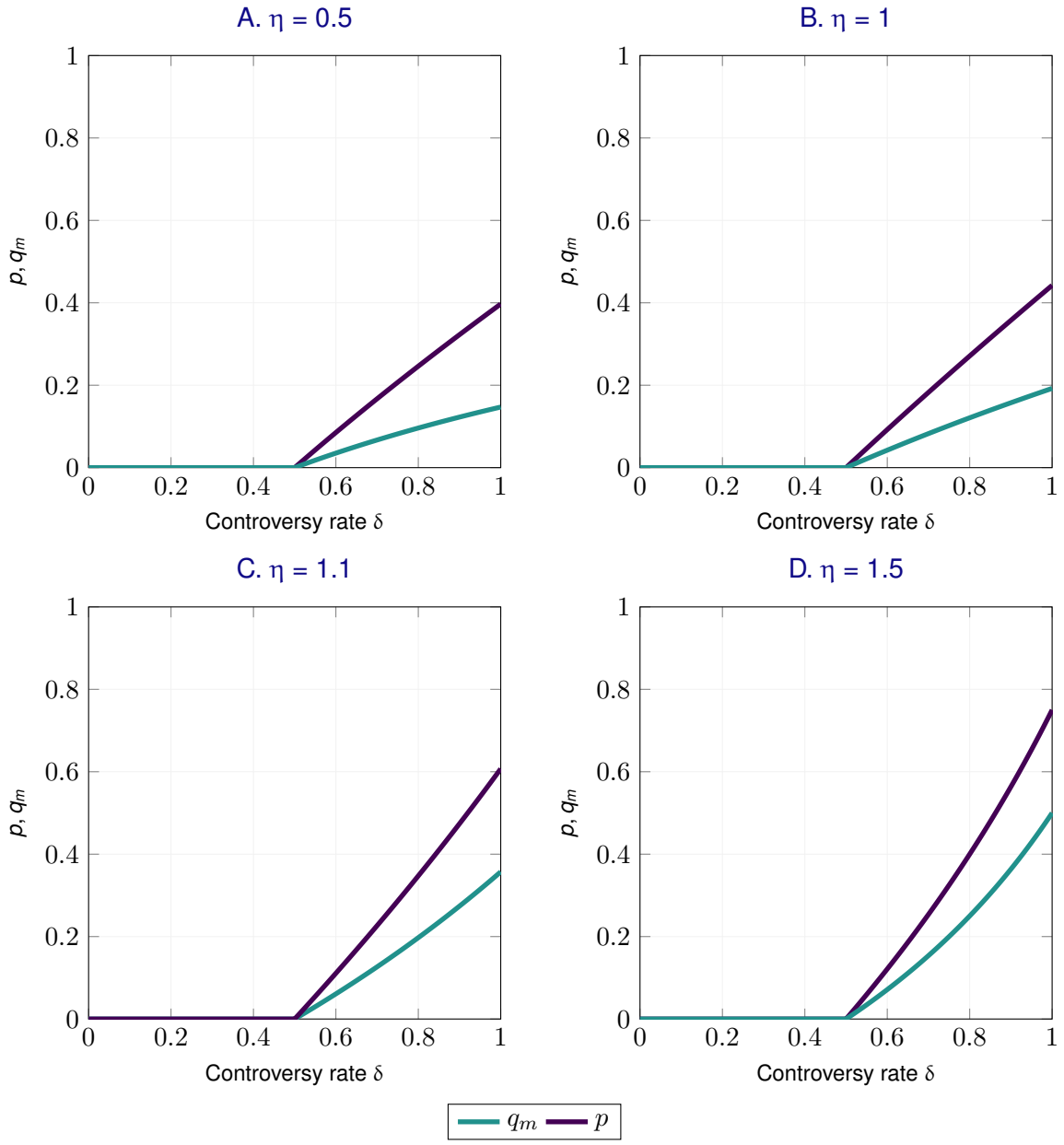


Figure A-2: Mafia supply of contract enforcement (q_m) and prices (p) for different level of violence (η).

D Appendix

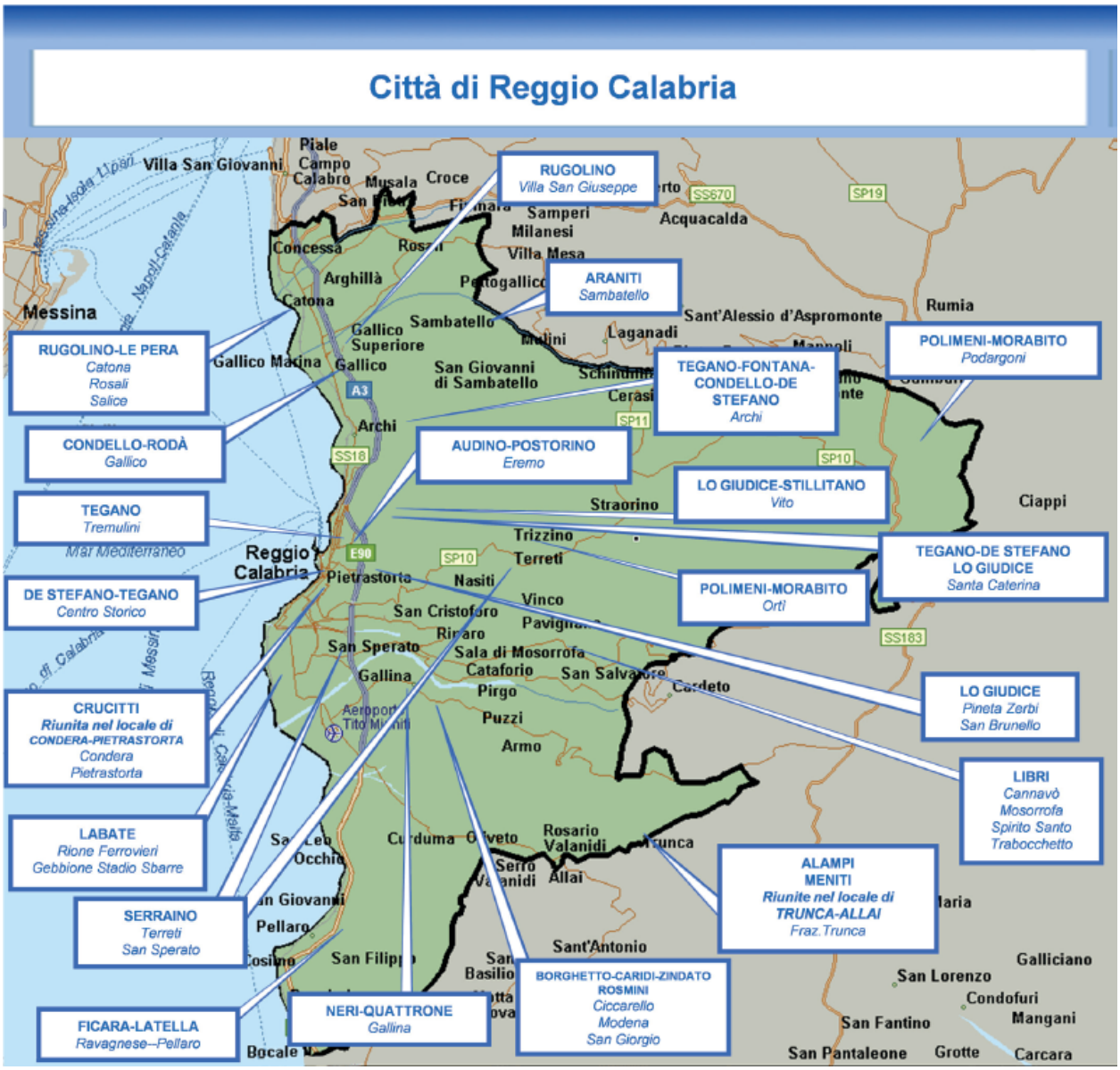


Figure A-3: Mafia families in the city of Reggio Calabria. Source: DIA (2019)

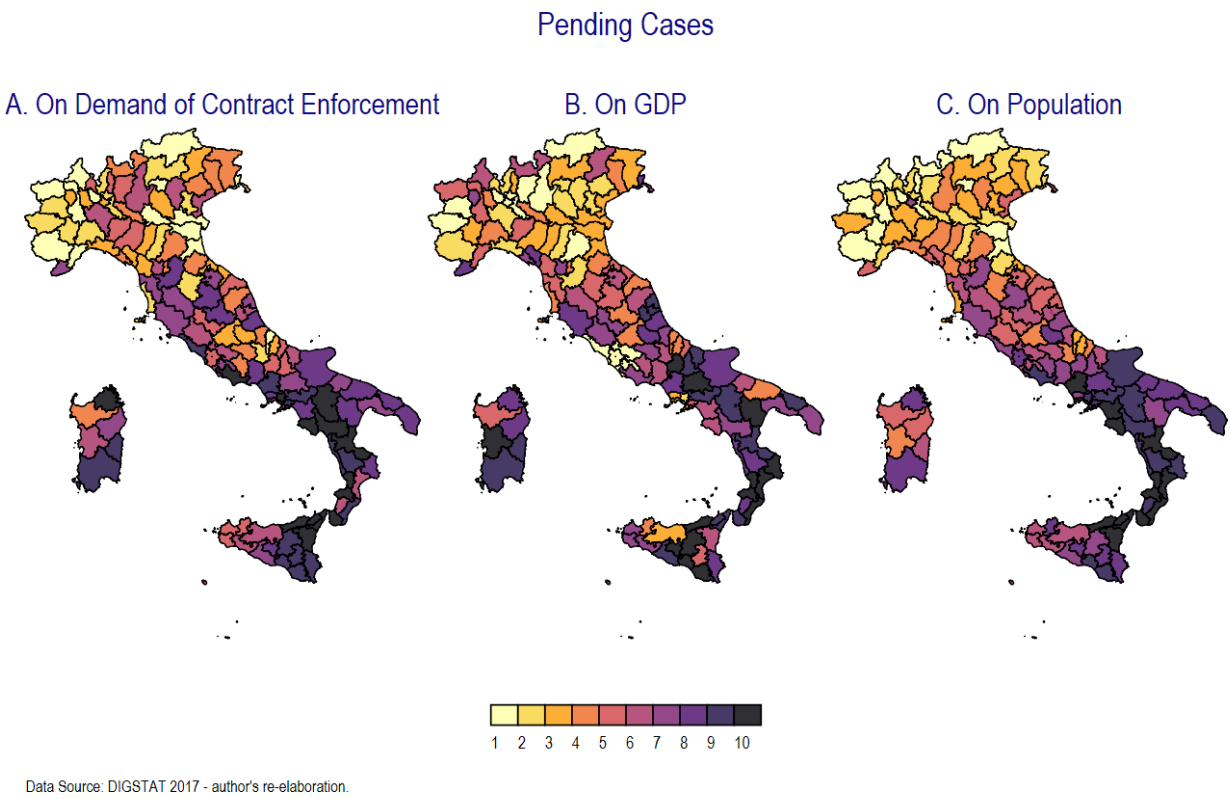
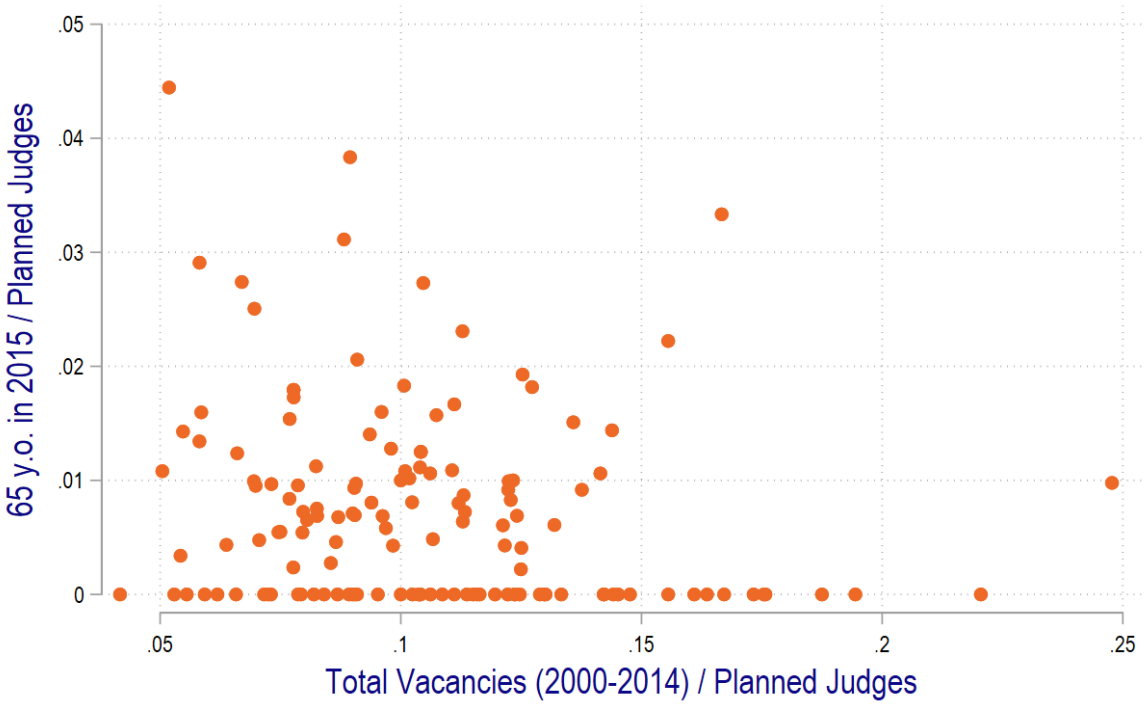


Figure A-4: The number of pending cases normalized by A. demand of contract enforcement; B. GDP; C. population. (2017).



Data Source: Superior Court of the Judiciary - author's re-elaboration.

Figure A-5: Retirements versus previous years' vacancies length.