Organized Crime and Regime Change

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Abstract

This paper provides a political regime-change interpretation of the organized crime phenomenon. Under the assumption that the a criminal organization in a society benefits of the support of individuals, I investigate the strategic interplay between a criminal organization and a large number of citizens who might be more inclined to support the criminal organization rather than reporting its illegal activities to the legal authority. Borrowing from the economic literature on coordination and regime change, I model a criminal organization as an autocratic regime and claim that illegal activities are used in order to raise citizens support.

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1 Introduction

Starting from the seminal work of Becker (1968), the economics of crime has attracted the attention of many social scientists. In Becker’s work, individuals decide whether to engage
in criminal activities or not by rationally comparing the expected returns to crime with the returns of a legitimate business. When the government increases law enforcement, therefore, crime becomes less attractive (Garoupa, 2000). Most of his and subsequent discussion about the economics of crime, however, focuses on the characterization of the optimal law enforcement. To the best of my knowledge, nobody has yet considered the relationship between individuals and criminal organizations, which is the focus of this paper.

Criminal organizations typically operate over different countries and locations. Criminal headquarters, however, have more power where individuals support the criminal organization more than the police force. As reported in Conciliar et al. (2013), “the strength of the Italian mafia associations, as well as their increasing influence on the legal economic activity, rest on a diffuse external complicity, namely, special relationships between criminal heads and public officials such as national or local politicians, judges, local administrators and members of the police force.”

Under the assumption that the presence (and persistence) of a criminal organization in a society is attributable to the support of individuals, this paper investigates the strategic interplay between a criminal organization and a large number of citizens and explains why such individuals are more inclined to support a criminal organization rather than reporting its illegal activities to the legal authority. Borrowing from the economic literature on coordination and regime change, I model a criminal organization as an autocratic regime and claim that such criminal organization engages in illegal activities in order to raise citizens support (Edmond, 2013). The criminal organization has private information about its strength and engages in criminal activities. Citizens then observe a noisy signal about the criminal organization strength, which is distorted by the intensity of criminal activities. Having observed their signal, each citizen then decides whether to support or not the criminal organization. Such interpretation further suggests that even those criminal activities which does not seem to have a direct impact on the society - such as retaliation murders between clans - have actually an impact on citizens perception of the organized crime strength.
This view complements the existing interpretation of the organized crime phenomenon, because it highlights the informational effect that criminal activities have on citizens perception of the criminal organization strength. The objective of each citizen is to reduce the loss associated with their decision to support or not the criminal organization. When a critical mass of citizens is not supporting the regime, the criminal organization is overthrown by the legal authority. Citizens who did not support the regime receive a payoff that is normalized to zero, while those who did support the regime bear a cost that is associated with the intensity of law enforcement. In the other scenario where the regime is not overthrown, citizens who supported the criminal organization receive a zero payoff, while those who did not support the regime incur a penalty that is set ex-ante by the criminal organization.

This paper makes two main contributions. It provides a formal characterization of citizen support of the criminal organization, identifying the conditions under which: a) citizens are willing to support the criminal organization; b) the criminal organization resists to the attacks of the legal authority. Specifically, the unique equilibrium is characterized by two thresholds as in the standard global games literature (Morris and Shin 2001, Atkeson 2001). When a citizen receives a signal that is lower than a threshold, he will support the criminal organization, and he will not provide support in any other case. Similarly, when the true type of the criminal organization is below a threshold which is a function of the aggregate mass of citizens supporting the regime, the organization will not be overthrown. Conversely, the organization is overthrown when the mass of citizens supporting the regime is not sufficiently large.

Second, I show that the level of criminal activities is increasing when the probability that the criminal organization will be overthrown in equilibrium becomes higher. This suggests that the higher the probability that the legal authority is able to overthrow the criminal organization regime, the more the criminal organization will engage in criminal activities. Put it differently, the criminal organization performs in more criminal activities when it is actually weak compared to the strength of the legal authority.

In addition to the above contribution, I conjecture that, under some parameter conditions,
when we introduce the possibility for a government to endogenously modify the intensity of law enforcement, the optimal response of the legal authority to criminal activities is to reduce the intensity of law enforcement. Assuming that a government wants to maintain the level of criminal activities low, indeed, there are two possibilities to reduce the level of criminal activities. This is because, on one side, the government has the possibility to invest a large amount of resources of law enforcement. Given that the level of criminal activities is increasing with the probability that the criminal organization is overthrown, however, the government may not have enough resources to invest in law enforcement and fight against the regime. When the level of criminal activities is too high, therefore, the government may incur losses whatever the investment in law enforcement. This implies that the optimal reaction of the government would be to reduce the intensity of law enforcement so as to induce the organization to reduce criminal activities.

The paper is organized as follows. Section 2 reviews the existing literature. Section 3 presents the model, and in section 4 I present the main results of the paper. Section 5 briefly discusses further extension of the basic model and section 6 concludes.

2 Related Literature

This paper is related to two main strands of literature. The first refers to the sociological and economic interpretation of the organized crime, where a criminal organization is usually seen as an alternative provider of public services. Gambetta (1993), is one of the most known attempt to give a sociological and economic explanation of organized crime. He views the Sicilian Mafia as an informal provider of public services, alternative to a formal state. When there is lack of formal institutions, organized crime can effectively act as an informal way to implement law enforcement.

A first economic formalization of this view may be attributed to Grossman (1995), in which he sees the Mafia as a competitor to the state in the provision of public services and
goods. Protection may indeed be used as an effective substitute good for trust. As reported by Gambetta (1993), “in every transaction in which at least one party does not trust the other to comply with the rules, protection become desirable, even if it is a poor and costly substitute for trust.” According to his studies, the first private protection organizations in Sicily appear during the post-feudal period.

Varese (1994) follows Gambetta’s approach studying the origins of the Russian Mafia. After Gorbachev reforms in the late 80’s, Russia was experiencing economic conditions similar to the post-feudal Sicily. The spread of property rights after the post-communist reforms, created in Russia an unregulated market economy with no law enforcement. Because of this lack of formal institutions for property rights and law enforcement, a market for informal protectors.

Following this interpretation, Dixit (2003) points out that any economic activity needs governance, making an explicit link between his theory and Gambetta’s work. In a more recent research, Dixit (2007, 2009) focuses on the distinction between governance and government, claiming that there is no reason, from an ex-ante perspective, for which formal institutions should be better than informal institutions. Conventional economic theory takes the existence of the rule of law for granted, assuming that a government has a monopoly over coercion power and law enforcement. In contrast with this view, Dixit claims that criminal organizations can act as alternative modes of governance.

Other authors, such as Becker (1968), Grossman (1995) and Garoupa (1997), focus on the optimal law enforcement. Baccara and Bar-Isaac (2008) focus on the optimal structure of a criminal organization, taking into account the trade-off between internal efficiency versus external vulnerability. Conciliar et al. (2013) study the impact of the leniency program introduced in Italy in 1991. They provide a theoretical framework that links the observed fall in Mafia related murders with the introduction of the new reform.

From a technical perspective, this paper is related to the literature on global games of regime change. Global games are known as coordination games with incomplete information.
in which players can only observe noisy signals about the underlying states of the world. Carlsson and van Damme (1993) and Morris and Shin (1998) pioneered this literature using this class of games in macroeconomic applications that are characterized by coordination problems and multiplicity of equilibria as in Diamond and Dybvig (1983). Classical examples go from debt pricing, bank runs to currency attacks and are well reviewed in Morris and Shin (2001).

As pointed out by Atkeson (2001), multiplicity of equilibria arises when agents’ beliefs about what the other agents’ are doing are a function of multiple sources of information. When agents observe only one source of information - typically a noisy signal about the actual state of the world - this multiplicity reduces to a unique equilibrium corresponding that is a function of the actual state of the world.

Global games have also recently been applied to political science. Iaryczower (2006) explains how party leaders discipline their party through the appropriate amount of resource disbursement, in order to guarantee a minimum level of support. Bruno (2008) extends the Hoff-Stiglitz (2004) model of the quest for the rule of law using the global games approach. He claims that the quality of institutions and the information of such quality determine together whether anarchy or the rule of law will prevail in equilibrium.

Finally, this paper is mostly related to Edmond (2013) who provides a model of information manipulation and regime change. An autocratic regime may induce people to riot or not through regime *propaganda*. He proves that as the information becomes very precise, the regime survives more likely. I adopt Edmond’s approach here, claiming that a criminal organization behaves as an autocratic regime.
3 The Model

3.1 Setup

3.1.1 Players

Criminal Organization A criminal organization needs the support of citizens to resist to legal authority attacks and maintain the control over its illegal activities. The criminal organization has private information about its strength, summarized by the parameter $\theta \in \mathbb{R}$. One possible interpretation of $\theta$ is the relative economic strength of the criminal organization with respect to the legal authority. Lower values of $\theta$ are associated to stronger organizations.

The greater the number of people in the society support the criminal organization, the harder the legal authority can overturn the criminal organization. Once the criminal organization knows its type $\theta$, it has the possibility to distort citizens perception of its strength by performing criminal activities, i.e. selecting $a \in \mathbb{R}$.

Citizens A mass of citizens, each indexed by $i$, is uniformly distributed over $[0, 1]$. They have the common uninformative prior that $\theta$ is uniformly distributed over $\mathbb{R}$. Each citizen $i$ receives an i.i.d. signal

$$x_i = \theta - a + \varepsilon_i$$

with $\varepsilon_i \sim \mathcal{N}(0, p^{-1})$, with $p$ indicating the precision of the signal. This heterogeneity may be attributed to the quality of the information each citizen has access to - e.g. the quality of newspapers they read or the news broadcasting channel they watch - or to the personal perception of the criminal power of the organization, which is randomly assigned.

Having observed his signal, each citizen decides whether to support the criminal organization or not, choosing an action $r_i \in \{0, 1\}$, where $r_i = 1$ ($r_i = 0$) when a citizen supports (opposes to) the criminal organization.

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1Morris and Shin (2001) prove that, as long as conditional expectations are well defined, uninformative priors - i.e. priors with infinite mass of probability - are not an issue.

2A citizen is supporting the criminal organization when he does not cooperate with the legal authority. For
Let $R := \int_0^1 r_i \, di$ be the mass of people that supports the criminal organization. When there exists a sufficient mass of people who supports the criminal organization activities - i.e. when $R > \theta$ - the criminal organization survives, while the regime is overthrown otherwise.

### 3.1.2 Timing

The timing of the game is summarized as follows.

![Figure 1: The timing of the game.](image)

Nature draws the parameter $\theta \in \mathbb{R}$. Once the criminal organization learns $\theta$, it selects the level of criminal activities $a$. Citizens receive idiosyncratic noisy signals, distorted by the level of criminal activities, and decide whether to support or not the criminal organization.

The outcome of the game depends on the strength of citizens support. The criminal organization is not (resp. is) overthrown by the legal authority when there is (resp. there is not) a sufficient mass of citizens supporting its activities, i.e. if $R > \theta$ (resp. $R < \theta$).

### 3.1.3 Payoffs

Assuming that the presence of the criminal organization can only lower the citizens welfare, I represent citizens preferences with a loss function. Because the underlying state of the world is unknown, there are two possible scenarios, depicted as follows.

When the criminal organization is not overthrown, each citizen not supporting the regime receives punishment (i.e. retaliation) $P_M \geq 0$ from the criminal organization, and 0 otherwise. The criminal organization gains $G(R)$ - with $R$ being the aggregate mass of supporters - and example, having observed a criminal activity, a citizen supports the criminal organization when he does not report such event to the police authority. This indirect support to the criminal organization, or any general act of non-cooperation with the legal authority is known as *omertà*.

\[^3\text{In section} \underline{5} \text{ we analyze and discuss the implications of introducing the legal authority as a third player of the game.}\]
bears the cost of engaging criminal activities $C(a)$. Revenues increase with the number of citizens supporting the organization, i.e. $G'(R) > 0 > G''(R)$, while the cost of performing criminal activities is such that $C'(a) > 0$, $C''(a) > 0$ and $C(0) = 0$.

In the other case where the criminal organization is overthrown, each citizen supporting the regime receives a punishment $P_L \geq 0$ from the legal authority, and 0 otherwise. The parameter $P_L$ can be interpreted as the intensity of law enforcement. When the regime is overthrown, the criminal organization only bears the cost of performing criminal activities $C(a)$ and does not gain any revenue.

The following table summarizes the payoffs.

<table>
<thead>
<tr>
<th>Citizen $i$</th>
<th>Regime is overthrown</th>
<th>Regime is not overthrown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizen</td>
<td>$-r_i P_L$</td>
<td>$-(1 - r_i) P_M$</td>
</tr>
<tr>
<td>Criminal Organization</td>
<td>$-C(a)$</td>
<td>$G(R) - C(a)$</td>
</tr>
</tbody>
</table>

Fig. 3.2: The matrix of payoffs.

The parameters $P_L$ and $P_M$, both non negative, are monetary-equivalent punishments that either the legal authority or the criminal organization respectively inflict on citizens according to their choice of $r_i$.

### 3.2 Complete information benchmark

When $\theta$ is known by both the citizens and the criminal organization, it is optimal for the criminal organization to set $a = 0$ for any $\theta$. In this case, multiple equilibria arise.

When $\theta \leq 0$, the organization always survives. Because it is a dominant strategy for each citizen to participate, every citizen does so, implying that $R = 1$ and the organization is never overthrown.

When $\theta \geq 1$, it is a dominant strategy for each citizen to select $r_i = 0$, so that $R = 0$ and the organization is always overthrown.

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4When either $P_L$ or $P_M$ are chosen endogenously, citizens should also take into consideration this information when computing their posterior beliefs about $\theta$ as, for instance, in Angeletos, Hellwig, Pavan (2006). For simplicity, we do not consider here this case.
When $\theta \in (0, 1)$, citizens face a standard coordination problem where multiple equilibria are sustainable\(^5\). For any given value of $\theta$, there exist two equilibria. When each citizen believes all other citizens are (not) supporting the organization, it is optimal for him to do so, so that $r_i = 1 (r_i = 0)$. Given the symmetry of the game, every citizen supports (does not support) the regime and $R = 1 (R = 0)$. Which of the two outcomes actually occurs depends on what citizens believe about other citizens behavior.

### 3.3 Incomplete information without criminal activities

When $\theta$ is private information of the criminal organization, citizens receive only a noisy signal about $\theta$, as defined by \[ \theta \]\(^6\). The strategies of the criminal organization and of each citizen are set conditionally on the realization of $\theta$ and $x_i$, respectively.

#### 3.3.1 Strategies

Having observed $\theta$, the criminal organization chooses the level of criminal activities $a$. A pure strategy for the criminal organization is a mapping from $\mathbb{R}$, the domain of signals, to $\mathbb{R}^+$, the domain of criminal activities.

A pure strategy for each citizen $i$ maps any signal $x_i$ into a decision to support the criminal organization or not $r_i \in \{0, 1\}$. Each citizen $i$ expected utility rewrites, therefore, as

$$V(x_i, r_i) = \int_{\theta < R(\theta)} (-(1 - r_i)P_M) \mu(\theta|x_i) d\theta + \int_{\theta > R(\theta)} (-r_iP_L) \mu(\theta|x_i) d\theta$$  \hspace{0.5cm} (2)

where $\mu(\theta|x_i)$ is the posterior belief, defined below, of citizen $i$ with signal $x_i$.

#### 3.3.2 Equilibrium concept

We look for a symmetric Perfect Bayesian Equilibrium (PBE), defined by the collection

$$\left( a^* (\theta), (r^*_i (x_i))_{i \in [0, 1]}, R (\theta, a), \mu(\theta|x_i) \right)$$  \hspace{0.5cm} (3)

\(^5\)See, for instance, Diamond, Dybvig (1983).
with

$$\forall \theta, \ a^* (\theta) \in \arg \max_{a \in \mathbb{R}} \{G (R (\theta, a) ) \mathbb{I}_{\{R(\theta,a) > \theta\}} - C (a) \}$$  \hspace{1cm} (4)$$

$$\forall i, \forall x_i, \ r_i^* (x_i) \in \arg \max_{r_i \in \{0,1\}} V (x_i, r_i)$$  \hspace{1cm} (5)$$

$$R (\theta,a) := \int_0^1 \int_{-\infty}^{+\infty} r_i^* (x_i) \varphi(x_i|\theta,a) dx_i di$$  \hspace{1cm} (6)$$

$$\mu(\theta|x_i) := \frac{\Pr (x_i - \theta + a (\theta)) \Pr(\theta)}{\int_{-\infty}^{+\infty} \Pr (x_i - \theta' + a (\theta')) \Pr(\theta') d\theta'}$$  \hspace{1cm} (7)$$

where, specifically: $a^* (\theta)$ maximizes the criminal organization’s utility for any $\theta$, $r_i^* (x_i)$ maximizes each citizen $i$ expected utility for any given signal $x_i$; $R (\theta,a)$ is the expected mass of citizens supporting the criminal organization for a given $\theta$ and a given level of criminal activities $a$, with $\varphi(\cdot)$ being a normal p.d.f.; $\mu(\theta|x_i)$ is the posterior belief of each citizen $i$ for a given signal $x_i$. Finally, the indicator function $\mathbb{I}_{\{}$ is equal to one when $R (\theta,a) > \theta$ and equal to zero otherwise.

4 Results

Let us first focus on the case of no endogenous information distortion, that is the case where $a (\theta) = 0$, for any $\theta$. Let $\Pr (\theta < R(\theta)|x_i) := \int_{\theta < R(\theta)} \mu(\theta|x_i) d\theta$ be the citizen $i$ belief that the criminal organization will not be overthrown, and $\Pr (\theta > R(\theta)|x_i) = 1 - \Pr (\theta < R(\theta)|x_i)$ be the complementary probability. Therefore,

Lemma 1. Citizen $i$ chooses $r_i = 1$ if and only if

$$\Pr (\theta < R(\theta)|x_i) \geq \frac{P_L}{P_L + P_M}$$  \hspace{1cm} (8)$$
Proof. See Appendix.

From (8), we see that each citizen decision to support the criminal organization depends on the ratio between the level of law enforcement $P_L$ and the retaliation of the criminal organization $P_M$. It is easy to show that, when the level of $P_M$ increases, each citizen $i$ will support the criminal organization more often. On the other hand, when $P_L$ increases, less citizens are willing to support the criminal organization, implying that (8) is satisfied less often.

4.1 Morris-Shin benchmark

I now explicitly characterize the equilibrium, assuming that each citizen $i$ adopts a cutoff strategy, that is:

$$r_i(x_i) = \begin{cases} 1 & \text{if } x_i < \hat{x}_i \\ 0 & \text{if } x_i > \hat{x}_i \end{cases} \quad (9)$$

Using definition (6), the aggregate mass of supporters $R(\theta)$ is continuous and strictly decreasing in $\theta$, so that $R(0) > 0$ and $R(1) < 1$. Since $R(\theta)$ is a real-valued mapping from $\mathbb{R}$ to $[0, 1]$, then there exists a unique threshold $\theta^* \in [0, 1]$ such that

$$\begin{cases} R(\theta) > \theta^* & \text{if } \theta < \theta^* \\ R(\theta) = \theta^* & \text{if } \theta = \theta^* \\ R(\theta) < \theta^* & \text{if } \theta > \theta^* \end{cases} \quad (10)$$

which allows us to rewrite $P(\theta < R(\theta^*)|x_i)$ as $P(\theta < \theta^*|x_i)$. The following figure provides a graphical interpretation of (10).

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\footnote{This argument follows from the normality assumption. It can be easily checked, indeed, that $P(x_i|\theta) = e^{-\frac{(x_i-\theta)^2}{2}}\theta$ is strictly decreasing in $\theta$ for any $\theta \geq x_i$.}
Figure 2: The aggregate mass of citizens supporting the criminal organization decreases with \( \theta \).

We are now able to prove that there exists a unique equilibrium à la Morris-Shin (2001), defined by threshold rules. Each citizen \( i \) supports criminal activities when he receives a signal \( x_i \) lower than a threshold \( x^* \) and the criminal organization resists resist to attacks if \( \theta \) is lower than a threshold \( \theta^* \).

**Proposition 1.** [Morris-Shin benchmark] The game has a unique equilibrium defined by thresholds \((x^*, \theta^*)\) which simultaneously solve the following system

\[
\begin{align*}
\text{i)} & \quad \mathbb{P}(x_i \leq x^* | \theta = \theta^*) = \theta^* \\
\text{ii)} & \quad \mathbb{P}(\theta \leq \theta^* | x_i = x^*) = \frac{P_L}{P_L + P_M}
\end{align*}
\]

(11)

**Proof.** See Appendix.

4.2 Comparative Statics

Using an explicit characterization of the equilibrium thresholds, we can derive policy implications under this simple framework.

Let \( \Phi \left( \sqrt{p} \left( x^* - \theta^* \right) \right) \) replace \( \mathbb{P}(x_i \leq x^* | \theta^*) \), where \( \Phi(\cdot) \) is a standard normal cdf, with
which makes \( x^* \) an increasing function of \( \theta^* \). This implies that, as it becomes harder to overthrow the criminal organization (i.e., as \( \theta^* \) increases), the probability that each citizen \( i \) supports the criminal organization decreases.

Condition \( \text{ii}) \) of (11) rewrites, instead, as

\[
\mathbb{P}(\theta \leq \theta^* | x_i = x^*) = \frac{P_L}{P_L + P_M}
\]

\[
\iff \frac{\int_{-\infty}^{\theta^*} \sqrt{P} \varphi(\sqrt{P}(x^* - \theta)) d\theta}{\int_{-\infty}^{+\infty} \sqrt{P} \varphi(\sqrt{P}(x^* - \theta)) d\theta} = \frac{P_L}{P_L + P_M}
\]

\[
\iff 1 - \Phi \left( \sqrt{P} (x^* - \theta^*) \right) = \frac{P_L}{P_L + P_M} \tag{13}
\]

where \( \varphi(.) = \Phi'(.) \). Using [12], we can substitute \( x^* \) in (13) and, rearranging the terms, get

\[
\theta^* = \frac{P_M}{P_L + P_M}. \tag{14}
\]

and

\[
x^* = \frac{P_M}{P_L + P_M} + \frac{1}{\sqrt{P}} \Phi^{-1} \left( \frac{P_M}{P_L + P_M} \right) \tag{15}
\]

As intuition suggests, both thresholds are increasing in the level of retaliation, \( P_M \), and decreasing in law enforcement, \( P_L \). When \( \theta^* \) increases, indeed, the probability that the criminal organization resists to attacks rises; when \( x^* \) increases, instead, more people are willing to support the organization. The policy implication is straightforward: higher levels of law enforcement increase the probability that the criminal organization may be overthrown.

The precision of the signal also plays an important role. Indeed, as precision tends to
infinity - i.e. as the variance goes to zero - incomplete information vanishes, so that the signal that makes a citizen indifferent between supporting or not becomes equal to $\theta^*$. Because in this case citizens would be able to coordinate perfectly, this suggests that increasing the precision in the signal is also a welfare-increasing policy.

### 4.3 Criminal Activities as Endogenous Information Distortion

When we consider the case of endogenous information manipulation, the criminal organization distorts the perception of the citizens according to the value of $\theta$. Because the distortion shifts the distribution of the signals that the citizens are receiving, the thresholds that determine whether the regime is overthrown or not will be different from that derived without signal distortion.

In this respect, let $\theta_a^*$ be the threshold value that determines whether the organization is overthrown or not in case of endogenous distortion, i.e. when $a^* (\theta) > 0$ for some $\theta$. Because the organization survives whenever $\theta < \theta_a^*$, the distortion is effective when $\theta_a^* > \theta^*$. In other words, because the citizens willingness to support the regime is increasing with $\theta_a^*$, an effective distortion increases the probability that the regime is not overthrown.

Let us focus on the case of endogenous distortion. Given that $a$ is unobservable, each citizen does not have additional information about $\theta$ other than the signal $x_i$; this ensures the equilibrium to be unique (see Edmond (2012), Angeletos et al. (2007)). The criminal organization solves

$$\max_{a \in \mathbb{R}_+} G(R(\theta, a)) \mathbb{I}_{\{R(\theta, a) > \theta\}} - C(a)$$

(16)

Since each citizen $i$ is not able to disentangle $\theta - a$ from the observed signal $x_i$, $R(\theta, a)$ just depends on the difference $\theta - a$. This implies that (16) can be rewritten as

$$\max_{a \in \mathbb{R}_+} G(R(\theta - a)) - C(a)$$

s.t. $R(\theta - a) \geq \theta$

(17)
which has two possible solution, according to the true value of $\theta$.

**Proposition 2.** Assume $\frac{\partial R}{\partial a} > 0$ and $\frac{\partial^2 R}{\partial a^2} \leq 0$. When the criminal organization solves (17), then

**Case 1.** If $\theta \geq \theta^*_a$, the optimal level of criminal activities is $a^*(\theta) = 0$.

**Case 2.** If $\theta < \theta^*_a$, the optimal level of criminal activities $a^*(\theta)$ is increasing in $\theta$.

**Proof.** See Appendix.

The intensity of the distortion and, therefore, the intensity of criminal activities, depend on the actual value of $\theta$. When $\theta$ is close to 0 - the case of a powerful organization - there is no reason to perform criminal activities. This is because the organization knows that, on average, signals are very low and the probability that each citizen will support the regime is very high. The optimal distortion, in this case, is such that $a^*(\theta) = 0$. As $\theta$ rises, the organization is more willing to use criminal activities to distort citizens perception of the regime. Therefore, there exists some range of $\theta \in (0, \theta^*_a)$, in which the criminal organization sets $a^*(\theta) > 0$.

When $\theta$ reaches the threshold value $\theta^*_a$, the criminal organization is indifferent between performing criminal actions or not. When $\theta \geq \theta^*_a$, the criminal organization has again no reason to perform illegal actions, since they are costly and they do not add any improvement to the criminal organization’s welfare.
Figure 3: Criminal activities as a function of $\theta$.

Focusing on the last and more interesting case, the mass of supporters is no longer a continuous function. As long as $\theta < \theta^*_a$, the signal is artificially pushed down by criminal activities, which are still positive. Therefore, the aggregate mass of supporters is greater with respect to case without signal-jamming. When $\theta$ is just above $\theta^*_a$, the criminal organization does not have incentive to perform costly criminal actions, since it would be overthrown anyway. In this case, the mass of supporters dramatically falls and declines even more as $\theta$ becomes bigger. Picture 3.5 summarizes.
Figure 4: The aggregate mass of supporters with signal distortion.

The position of the new curve, depicted in blue, is of course arbitrary. We do not know whether the constraint is binding or not at the threshold $\theta^*_a$.

5 Discussion and Extension

The following section is a preliminary attempt to extend the model analyzed above. Let us consider the case where the legal authority is able to select endogenously the intensity of law enforcement $P_L$ and see how this affect the equilibrium of the game.

I assume that a government has access to a technology that allows to observe criminal activities $a$. The state parameter $\theta$, however, is still private information of the criminal organization: even if the government can observe $a^*(\theta)$, it cannot observe the actual $\theta$. After the criminal organization sets the level of criminal activities, the government chooses the intensity of law enforcement based on the observed value of $a^*(\theta)$. Citizens, therefore, observe their signal and decide whether to support or not the criminal organization. Again, the criminal organization resists to attacks if there is a sufficient mass of people that supports the organization. Figure 3.6 summarizes the new timing.
Figure 5: The timing of the game with endogenous law enforcement.

For the sake of simplicity, I focus on the case where the choice of $P_L$ does not convey any information to citizens. Each citizen $i$, therefore, selects his optimal action according to the sole source of information $x_i$. The equilibrium thresholds change, however, because they are affected by the intensity of law enforcement $P_L$.

5.0.1 Government’s problem

The government observes the level of criminal activities $a$, then decides the intensity of law enforcement. The government’s strategy, therefore, maps the intensity of law enforcement $P_L$ from $\mathbb{R}_+$ to $\mathbb{R}_+$. I assume that the government seeks to solve, for any $a$,

$$\max_{P_L \in \mathbb{R}_+} W(P_L, a) - C(P_L)$$

s.t. $P_L \leq E$

where the welfare function $W(P_L, a)$ is decreasing in $a$, $C(P_L)$ is the cost of implementing law enforcement and is such that $C'(\cdot) < 0$, and $E$ is the maximum amount of resources that the government can allocate to law enforcement. One reason that justifies why the welfare function of the government is decreasing in the level of criminal activities is that criminal activities scare citizens and increases the perception of living in an unsafe environment. Because citizens may take this perception into account when they are asked to vote and elect a new government, a high level of criminal activities loads the incumbent government bears with the implicit cost of a reduced probability of re-election.

When the government wants to reduce as much as possible criminal activities, we may obtain a counter-intuitive result. When the level of criminal activities is too high, the gov-
ernment incurs losses whatever the investment in law enforcement. This is because the level of criminal activities increases with the probability of overthrowing the criminal organization. After observing a large amount of criminal activities, therefore, the optimal reaction of the government would be to reduce the intensity of law enforcement, so as to induce the criminal organization to reduce the level of criminal activities.

When fighting crime is too costly, we may obtain a paradoxical equilibrium outcome where the government reduces law enforcement to reduce the level of criminal activities.

6 Conclusion

This model provides an alternative interpretation of criminal activities performed by organized crime. When we consider criminal organizations as autocratic regimes, criminal activities can be interpreted as a distortion of citizens perception of the criminal organization’s strength.

A good empirical example may be the Mafia murders in the early 90’s in Italy. In that period, the Sicilian Mafia was under the pressure of very intense legal authority’s attack. In particular, the two prosecuting magistrates Giovanni Falcone and Paolo Borsellino obtained important successes in the fight against Mafia. Between May and July 1992, however, the two judges were killed by the Sicilian Mafia, an assassination ordered by the Corleonesi’s family. Following other similar and dramatic events attributable to the Sicilian Mafia, in 1993, the Italian Minister of Justice temporarily reduced law enforcement for 140 jailed mafia leaders “in order to avoid further murders,” as he said.8

This model pictures two possible scenarios without criminal activities. Either the criminal organization is so powerful that it has no need to distort the citizens perception of its strength or, in the other case, the criminal organization is actually overthrown by the legal authority. This interpretation shed new light on the rise and fall of organized crime murders and terrorist attacks observed in Italy before and after 1992.

Appendix

Proof of Lemma 1. Consider the expected utility of each citizen $i$, $V(x_i, r_i)$ as defined in (2). Having observed $x_i$, when citizen $i$ chooses $r_i = 1$, he gets $-P_L \mathbb{P}(\theta > R(\theta) | x_i)$. Choosing $r_i = 0$, instead, citizen $i$ gets $-P_M [1 - \mathbb{P}(\theta > R(\theta) | x_i)]$. Citizen $i$, therefore, chooses to support the criminal organization when

$$-P_L \mathbb{P}(\theta > R(\theta) | x_i) \geq -P_M [1 - \mathbb{P}(\theta > R(\theta) | x_i)]$$

which is equivalent to (8). Q.E.D.

Proof of Proposition 1. We prove that there exists unique thresholds $(x^*, \theta^*)$ which solve the system of equations defined in (11). Because citizens play according to a threshold strategy, as defined by (9), I proceed in steps through iterated elimination of weakly dominated strategies.

Step 1. Let us fix a very low candidate threshold $\hat{x}_{i0} \in (0, 1)$ such that $\mathbb{E}[V(\cdot, 0) | \hat{x}_{i0}] < 0$. This implies that, for any $x_i \leq \hat{x}_{i0}$, because citizen $i$ is so confident that $\theta$ is actually low, his best response is to set $r_i = 1$ regardless of what the other players are doing. Consider now a very high threshold, $\hat{x}^0_i \in (0, 1)$ such that $\mathbb{E}[V(\cdot, 1) | \hat{x}^0_i] < 0$. Similarly, when citizen $i$ observes any signal $x_i \geq \hat{x}^0_i$, his best response is to set $r_i = 0$ regardless of what the other players are doing. Thresholds $\hat{x}_{i0}$ and $\hat{x}^0_i$ define two regions where each player $i$ has a weakly dominant strategy.

Step 2. Starting from $\hat{x}_{i0}$ (resp. $\hat{x}^0_i$), let us define a slightly higher (resp. lower) threshold $\hat{x}_{i1}$ (resp. $\hat{x}^1_i$) so that $\mathbb{E}[V(\cdot, 0) | \hat{x}_{i1}] < 0$ (resp. $\mathbb{E}[V(\cdot, 1) | \hat{x}^1_i] < 0$) for any $x_i \leq \hat{x}_{i1}$ (resp. $x_i \geq \hat{x}^1_i$). This implies that, for any $x_i \leq \hat{x}_{i1}$ (resp. $x_i \geq \hat{x}^1_i$), each citizen $i$ has a weakly dominant strategy by playing $r_i = 1$ (resp. $r_i = 0$).

Step 3. Repeating iteratively step 2, let us define two (bounded) series of monotone increasing (resp. decreasing) thresholds $\{\hat{x}_{ik}\}_{k=0}^K$ (resp. $\{\hat{x}^k_i\}_{k=0}^K$), with $k \in \mathbb{N}$. Because the series are
both monotone and bounded, let $\hat{x}_{i\infty} := \lim_{K \to +\infty} \{\hat{x}_{ik}\}_{k=0}^{K}$ (resp. $\hat{x}^{\infty} := \lim_{K \to +\infty} \{\hat{x}_{i}^{k}\}_{k=0}^{K}$) be such that $E[V(\cdot, 0) | \hat{x}_{i\infty}] \leq 0$ (resp. $E[V(\cdot, 1) | \hat{x}^{\infty}] \leq 0$). Citizens' threshold strategies rewrite then as

$$r(x_i) = \begin{cases} 0 & \text{if } x_i > \hat{x}_{i\infty} \\ 1 & \text{if } x_i < \hat{x}_{i\infty} \end{cases}$$

and because citizens are ex-ante symmetric, the threshold strategy reduces to

$$r(x_i) = \begin{cases} 0 & \text{if } x_i > \hat{x}^{\infty} \\ 1 & \text{if } x_i < \hat{x}^{\infty} \end{cases}$$

for every citizen $i$.

**Step 4.** We now need to show that $\hat{x}_{\infty} = \hat{x}^{\infty} = x^*$. This reduces to show that

$$\begin{cases} E(V(\cdot, 0) | \hat{x}_{\infty}) = 0 \\ E(V(\cdot, 1) | \hat{x}^{\infty}) = 0 \end{cases}$$

which is true if and only if citizen $i$ is indifferent between $r_i = 0$ and $r_i = 1$. Because of the normality assumption, the probability that a citizen supports the criminal organization is continuous and strictly decreasing in $x_i$, implying that for each threshold candidate $\theta^*$, there exists a unique threshold $x^*$ for which a citizen is indifferent between the two actions. Therefore $\hat{x}_{\infty} = \hat{x}^{\infty} = x^*$.

**Step 5.** We last need to prove that the threshold $\theta^*$ exists and is unique. A criminal organization is not overthrown if $\theta \leq \Phi \left( \sqrt{p} (x^* - \theta) \right)$; because the probability on the right hand side is continuous and strictly increasing in $\theta$, for any given value $x^*$, there is a unique value of $\theta$ such that $\theta^* = \Phi \left( \sqrt{p} (x^* - \theta^*) \right)$. Q.E.D.

**Proof of Proposition 2.** I proceed in two steps. Consider Case 1. When $\theta \geq \theta^*_a$, the utility of the criminal organization is decreasing in $a$ because performing criminal actions only increase costs. This is because, for any $\theta \geq \theta^*_a$, $G(R(\theta - a)) - C(a) = 0$. Therefore it is
optimal for the Mafia to set \( a^* (\theta) = 0 \).

Consider now Case 2. The optimal level of criminal activities \( a^* (\theta) \) is characterized by the first order necessary condition that solves the criminal organization problem. Specifically, for any \( \theta < \theta^*_a \),

\[
G' (R (\theta - a)) \frac{\partial R (\theta - a)}{\partial a} = C' (a)
\]

(18)

The second order condition is also satisfied since, for any \( \theta < \theta^*_a \):

\[
G'' (R (\theta - a)) \left( \frac{\partial R (\theta - a)}{\partial a} \right)^2 + G' (R (\theta - a)) \frac{\partial^2 R (\theta - a)}{\partial a^2} - C'' (.) < 0
\]

(19)

Conditions (18) and (19) implicitly define the optimal level of criminal activities that the criminal organization is willing to perform for a given value of \( \theta \). To show that the level of such criminal activities is increasing in \( \theta \), we just need to prove that the cross derivative of the objective function is positive. In other words, \( a^* (\theta) \) is increasing in \( \theta \) because

\[
\frac{\partial}{\partial \theta} \{G (R (\theta - a)) - C (a)\} = G' (R (\theta - a)) \frac{\partial R (\theta - a)}{\partial \theta}
\]

and

\[
\frac{\partial^2}{\partial \theta \partial a} \{G (R (\theta - a)) - C (a)\} = -G'' (R (\theta - a)) \left( \frac{\partial R (\theta - a)}{\partial \theta} \right)^2 - \frac{\partial^2 R (\theta - a)}{\partial \theta \partial a} C' > 0
\]

(20)

where \( \frac{\partial^2 R(\theta-a)}{\partial \theta \partial a} < 0 \) because of decreasing returns to criminal activities. Q.E.D.

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