Chapter 7
An Agent-Based Model of Extortion Racketeering

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7.1 Introduction

Mafias can be considered as criminal organisations that are in the business of producing, promoting, and selling protection. Put simply, they are protection racketeering groups (Gambetta, 1993). They are widespread across the globe, among them are the Russian mafia (Varese, 1996, 2001), the Yakuza (Hill, 2006), the Triads (Morgan, 1960), and the Sicilian mafia (Savona, 2012).

They cause both economic and social damage to the societies in which they are embedded (Daniele, 2009). One reason is because they do offer their services not only to people and businesses that participate in legal transactions, but also—and likely more so—to those who are involved in illegal transactions, allowing markets for these illegal, and frequently harmful, goods and services, to exist (Gambetta,

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1993, pp. 226–244). They can also enforce cartels among businesses, driving up costs, hurting consumers, and reducing productivity (Gambetta, 1993, pp. 195–225; Varese, 2013 p. 5). Moreover, they often seek to establish and distort the political and institutional processes. One study estimates that the mafias in Italy combined produce tax-free capital that was equivalent to about 7 % of the national GDP in 2007 (Barone & Narciso, 2013). Other studies have examined the economic harm caused by the Italian mafias, and organised crime more generally, and find that their presence substantially hampers economic growth (Lavezzi, 2008; Pinnotti, 2015a, 2015b).

Thus, overcoming or at least limiting protection rackets is a highly desirable policy objective. Yet, this is a difficult task since buyers actively seek out the protection provided by some groups and, if not, the threat of economic or physical violence and norms of secrecy and honour can dissuade others from cooperating with the police. Hence, protection racketeers receive the support from portions of society and implicit protection from others by their refusal to cooperate.[1]

An important step to take in countering protection racketeering groups is to deepen our understanding of them. These groups, however, are notoriously difficult to investigate. Apart from the obvious risks that adventurous empirical researchers face, there is a more fundamental issue. Even those willing to overlook (or able to elude) the potential danger cannot avoid the secretive nature of such groups that hide their criminal activities from prying eyes making it difficult to uncover empirical data about their operations and dynamics. Even the empirical data that are extracted—the judicial documents from the Maxi Trial (Alfonso, 2011) are one example—capture only a certain proportion of the true levels of the criminal activities, and, in any case, they are not beyond reproach because they may be biased in ways that are difficult to correct for: captured members may not be representative of the group (they are the *losers*) or they may have incentives to distort their testimony. Additionally, unlike many other types of crime, the victims often have little incentive to come forward, in part, because of the long-term, semi-collusive nature of protection rackets.

Such hindrances can be, in part, alleviated with simulation models. They can function as key tools that provide a data source with which to compare or enrich empirical data, bolstering or conflicting with what has already been found. In this sense, such models can be used as checks for what has been found providing further reassurance in case there is congruence, or as warning flags that highlight questionable data when incongruence occurs.

[1] Another part of this is likely down to a selection effect in that those criminal groups which are not entrenched in their milieu do not survive.

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Ultimately these efforts to model protection racketeering should not only help us to understand how such groups work, but also enrich our knowledge of how to stop them working. Simulation models can and should also be used to test bed anti-racket policies. Two important anti-racket approaches can be called *legal* and *social norm*-based approaches (see Chap. 4 – 6). In the legal norm-based approach, the state uses legal norms, or laws, that are norms issued by legal authorities and enforced by specialised actors (Elster, 2007, p. 357). In the social norm-based approach, various actors, be it the state, non-governmental organisations (NGOs), or citizens' groups, try to change peoples' actions through non-legal means, targeting social norms in particular by shaping their expectations and beliefs about what is socially appropriate. We can define social norms as socially shared rules that prescribe what individuals ought or ought not to do and that are often spontaneously monitored and enforced by peers (Bicchieri, 2006, Conte, Andrighetto, & Campennì, 2013, Elster, 2009). Campaigns, discussions, and information spreading, all lacking the bite of the law, are nevertheless powerful tools for behaviour change. Social norms are both a social and a cognitive phenomenon undergoing complex dynamics (Conte et al., 2013, Conte & Castelfranchi, 1999). They influence people by shaping their mental representations, such as normative beliefs and normative goals, which can subsequently affect their behaviour.

Agent-based modelling (ABM) is a computational modelling approach that is particularly suited for studying dynamics that integrate cognitive and social aspects as it allows agents to be influenced by macro-level social factors, explicitly represent these as mental constructs at the micro-level, and consequently reconstitute the social reality via their actions. Here, we describe the *Palermo Scenario*[2] (Nardin et al., 2016), an agent-based model of protection rackets aimed to deepen our understanding of protection rackets, and help policymakers to evaluate methods for destabilising them. Additionally, since the system is explicitly specified, we can use it to investigate the entire causal pathway from cause to effect: not only from actions to mafia destabilisation, but also the intermediate actions along the path and actors' internal mental representations among the population.

This chapter unfolds as follows. In Sect. 7.2, the Palermo Scenario, along with its main actors and their decision-making, social norms, and dynamics, is described. The description of how the social norms influence on the actors' decisions is given in Sect. 7.3.

7.2 Palermo Scenario

Based on empirical evidence extracted from a range of sources (see Sect. 12.2 and Chap. 6), as well as discussions with GLODERS stakeholders, who are actively involved in anti-mafia policies or initiatives, and members of the GLODERS project,

[2] The model is denominated by Palermo Scenario because most of the empirical data used to develop the model was collected in the area of Palermo. Despite its name, it is worth noting that the model is flexible enough to represent the dynamics behind other racketeering groups.

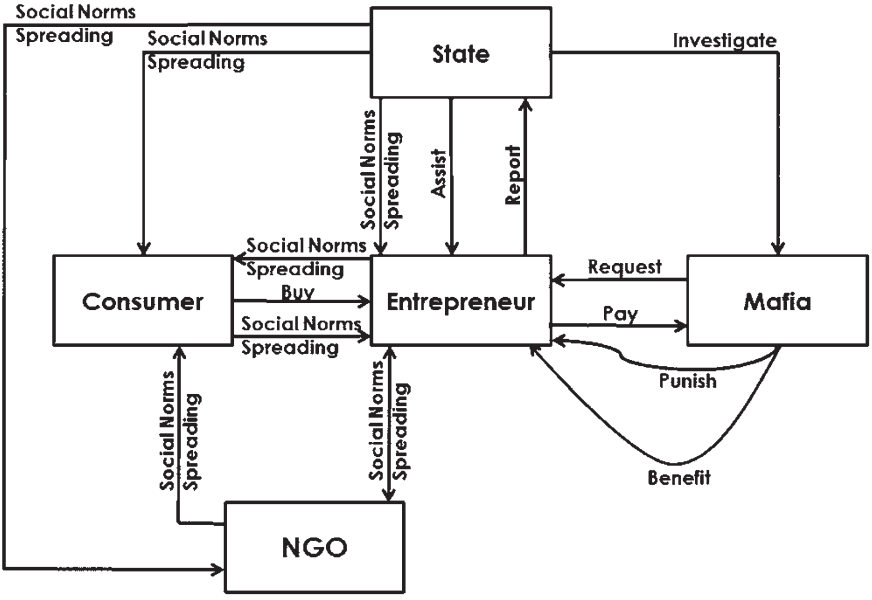

Fig. 7.1 Interrelationship of the Palermo Scenario actors

we identified five key actors in the dynamics of the mafia phenomenon and their interrelationships (shown in Fig. 7.1): Entrepreneurs, Consumers, the State, the mafia, and a Non-Governmental Organisation.[3] Notice that this is a stylised fact simulation model; thus we adopt several simplifications that nevertheless capture the main characteristics of the mafia phenomenon. We start by going through each actor.

Entrepreneurs represent businessmen and liberal professionals. They are modelled as multiple agents and are the central actors in the model. They sell products to consumers at a range of prices and receive income, and make a number of decisions using a combination of economic and normative reasoning. Entrepreneurs can

- Decide to pay pizzo if approached by Mafiosi
- Report pizzo requests to the State if they decide not to pay pizzo
- Report to the State damages that they sustained from mafia attacks
- Collaborate with the State against specific Mafioso if approached by the State
- Join the Non-Governmental Organisation, thereby signalling that they are unwilling to pay pizzo, likely to report pizzo requests and mafia punishments, and obtain respite from mafia requests

The State represents the government institutions. It can

- Imprison Mafiosi: Mafiosi can be sent to prison after investigation by the police, who work with either specific evidence obtained from entrepreneurs or evidence

[3] These sources are judicial documents, confiscated mafia documents such as *Libri Mastri* (accounting books used by some Mafiosi to record various information about extortion payers and that are occasionally discovered by the police), academic studies, literature, and other sources such as newspapers and television interviews.

obtained from general day-to-day observation and police activity. Naturally, investigations based on specific evidence are more effective than those based on general observation. After the police captures a Mafioso, the police may find information about the Entrepreneurs who paid pizzo to that Mafioso: the Mafioso may provide information (i.e. *pentiti*[4]) or the information may be found in assorted documents such as *Libro Mastro*. The State can then use this evidence to elicit collaboration from those Entrepreneurs by threatening them with punishment and if collaboration is obtained the State uses their information to increase the possibility of prosecuting that Mafioso.

- Support Entrepreneurs who have suffered damages at the hands of Mafiosi: Entrepreneurs who have suffered some damages from mafia retaliation can apply for monetary support to a fund that is set up specifically for this purpose, the *Fondo di Solidarietà* (i.e. a state-run fund to support mafia victims), which contains resources that depend on a politically determined component and a component derived from the resources of captured Mafiosi.
- Spread facts about successful actions that it has carried out against the mafia (consider this as the State providing information to journalists who report and propagate the news in newspapers and television programmes).
- Change peoples' attitudes regarding the mafia using campaigns and education regarding appropriate behaviour, some of which is done by sponsoring and supporting anti-racket festivals, such as the *Festival della Legalità*, or by promoting the culture of legality.

The mafia represents criminal organisations. It is composed of many actors who

- Request pizzo from Entrepreneurs
- Provide benefits to paying Entrepreneurs (e.g. protection from predation, and contract and cartel enforcement)
- Punish non-paying and reporting ones with a specific severity. They are coordinated in their actions—whom they target, how often they request pizzo, how much they request, and how severely they punish—because they are part of the same family. Mafiosi can
- Turn pentiti (a very unlikely event) and help the State capture other Mafiosi
- Mafiosi who are captured by the State are temporarily removed from the simulation and may provide information about other Mafiosi and the Entrepreneurs who paid pizzo to it in the past allowing the State to approach these Entrepreneurs for evidence.

Consumers are multiple actors who do not directly interact with the mafia. They are connected to other Consumers and Entrepreneurs in a social network; this determines the other actors with which they socially interact. Consumers have the goal to purchase a product and their single decision is to buy a product from Entrepreneurs. The decision regarding which Entrepreneur to buy from is based on a combination of economic considerations (i.e. price of the product) and normative considerations (i.e. relative strength of the norm of buying from Entrepreneurs who do not pay

[4] *Pentiti* designate former members of criminal organisations that, in most cases following their arrest, decide to collaborate with the judicial system to help investigations.

pizzo, dynamically updated over the simulation). They serve as reservoirs of normative attitudes and behaviours and automatically spread information that can influence other Consumers and Entrepreneurs.

The Non-Governamental Organisation is a single actor that embodies a civil society or business organisation. It promotes the culture of legality among Entrepreneurs and Consumers through events such as talks in schools, or the organisation or participation in festivals: for instance, the civic organisation *Libera* is the main organiser for the aforementioned Festival della Legalità. It serves as an organisation that Entrepreneurs can join if they are not paying pizzo.

7.2.1 Decision Processes

The decision-making of actors in the Palermo Scenario can be broadly divided into two different levels of complexity. Entrepreneurs and Consumers are endowed with more sophisticated decision-making abilities and base their choices on a combination of economic and social norm-based reasoning, whereas the State, the mafia, and the Non-Governmental Organisation are represented as reactive actors whose decisions are defined exogenously based on fixed probabilities specified at the start of the simulation.

The Entrepreneurs' and Consumers' decisions are taken assuming that the utility of an actor consists of an *individual* component, which represents the economic part of their reasoning, and a *normative* component, which represents the social norm-based aspect. The individual component approximates instrumental decision-making and involves strict cost-benefit calculations that motivate actors to take decisions that maximise their own direct utility, independently of what a certain norm dictates. The normative component models the actor's motivation to comply with a norm. It is a function of *norm salience*, a parameter updated by each actor based on its own behaviour and the information gathered by observing the behaviour of other actors.

Following Conte et al. (2013, p. 99), we use *norm salience* to refer to a measure that indicates how active and prominent, or inactive and inconspicuous, a norm is within a group in a given context. Formally,

$$\mathrm{Sal}^n = \frac{1}{\alpha}(\beta + (\frac{C-V}{C+V} \times w_c + \frac{O_c - O_v}{O_c + O_v} \times w_o + \frac{\max(0,(O_v+V)-P-S)}{O_v+V} \times w_{npv} + \frac{P \times w_p + S \times w_s}{\max(P+S, O_v+V)} + \frac{E_c - E_v}{E_c + E_v} \times w_e))$$

where n is the norm being evaluated; α and β are normalisers that render the norm salience value in the range [0,1]; C is the number of times the actor complied with the norm n; V is the number of times the actor violated the norm n; O_c is the number of times the actor observed other actors complying with the norm n; O_v is the

Table 7.1 Social cues and weights for the norm salience updating (Andrighetto et al., 2010)

Cue	Description	Weight
C/V	Own norm compliance/violation	$w_c = (+/-)\ 0.99$
O	Observed norm compliance	$w_o = +0.33$
NPV	Non-punished violators	$w_{npv} = -0.66$
P	Observed/applied/received punishment	$w_p = +0.33$
S	Observed/applied/received sanction	$w_s = +0.99$
E	Observed/applied/received norm invocation	$w_e = +0.99$

Table 7.2 Summary of the social norms in the Palermo Scenario

Actor	Id	Social norm
Entrepreneur	N^{P}	Pay pizzo request
	N^{NP}	Do not pay pizzo request
	N^{R}	Report pizzo request
	N^{NR}	Do not report pizzo request
Consumer	N^{NB}	Avoid paying pizzo Entrepreneurs

number of times the actor observed other actors violating the norm n; P is the number of punishments received, applied, or observed due to the violation of norm n; S is the number of sanctions received, applied, or observed due to the violation of norm n; E_c is the number of messages received from others 'demanding' that the actor complies with the norm n; and E_v is the number of messages that the actor received 'demanding' the violation of the norm n.

Each term in the norm salience calculation has a weight value associated with it, and the coefficients α and β have the values 6.27 and 2.97, respectively. The weights are used to assign different importance to each of the factors in generating the overall norm salience. In Table 7.1, the weight associated to each term is presented, the values of which are based on the work of Cialdini, Reno, and Kallgren (1990). It is important to stress that the important aspect of these weights is the proportionality among them and not their specific value.

Entrepreneurs use these economic and normative aspects to decide whether or not to pay or report pizzo request to the State. Consumers use it to decide which Entrepreneur to purchase a product from. Those decisions are intimately related to the social norms modelled in the Palermo Scenario described next.

7.2.2 Social Norms

The summary of the specific social norms that Entrepreneurs and Consumers consider in the Palermo Scenario is shown in Table 7.2. For a discussion of social norms in protection rackets, please refer to Chap. 4.

N^{P} and N^{NP} are norms that potentially influence the decision of Entrepreneurs to pay pizzo to Mafiosi following a request, and N^{R} and N^{NR} are norms that can play a

role in Entrepreneurs' decision to report the request for pizzo by Mafiosi to the State. N^{NB} is a norm that can influence the Consumers' decisions regarding which Entrepreneur to purchase a product from.

Norms N^{P} and N^{NR} are part of the set of norms that are associated with the traditional mentality of the individuals regarding the mafia, in which pizzo should be paid and not reported to the police (*omertà*). Conversely, norms N^{NP} and N^{R} represent the set of norms that correspond to a recent emerging anti-racket sentiment that is based on the understanding of the social and economic harm caused by the mafia. Differently to these, norm N^{NB} is one factor that is used by Consumers to rank the different Entrepreneurs that may buy a product from.

7.3 Interplay of Social Norms and Decision Processes

We now go over the racket-related social norms that we identified in Sect. 7.2.2, and verbally describe them from the perspective of the relevant decision of each actor.

Entrepreneurs recognise and consider four different social norms. These norms are to (1) pay pizzo, (2) do not pay pizzo, (3) do not report pizzo requests to the police, and (4) report pizzo requests to the police.

The first two relate to the decision of the Entrepreneur to pay pizzo, following a pizzo request by a Mafioso. One prescribes that the Entrepreneur should pay pizzo while the other proscribes the action and entails that the Entrepreneur should not pay pizzo. The second two norms relate to the Entrepreneur's decision to report a pizzo request to the police or not: a decision that is taken by Entrepreneurs if they chose not to pay following a pizzo request.

Entrepreneurs simultaneously hold both the norm proscribing action X and the norm prescribing that same action X. More than just an absence of a rule that prescribes that action, in the converse norm, the action is actually proscribed, and may be enforced through sanctions. For the social norm to pay pizzo, this means that there are reciprocal expectations about paying pizzo. For the social norm to not report pizzo requests, the same pertains, although here there is some evidence that it can be enforced via sanctions. While it may seem odd to have a social norm prescribing pizzo payment and proscribing reporting, there are real-life examples in which people are punished in some way, ostracised for instance, for violating them. In one case, citizens boycotted a shopkeeper because he reported pizzo requests to the police (Diliberto, 2013).

Entrepreneurs may be approached by Mafiosi and asked to pay pizzo, and subsequently, they have to decide whether to pay or not. From the perspective of the Entrepreneur, two social norms are relevant to making this decision: the norm to 'pay pizzo' and the norm 'do not pay pizzo'. Let 'Sal^{P}' indicate the norm salience of former and 'Sal^{NP}' the norm salience of the latter, and '*NG*' the normative goal that is adopted for this decision.

The norm salience values for the two norms are generated and updated during the simulation. When the Entrepreneur is faced with the decision, it compares the val-

ues of the two norm saliences ('Sal^{P}' and 'Sal^{NP}'). If the norm salience of pay is higher than the norm salience of not pay, then the Entrepreneur adopts the norm of paying as its normative goal. So, if $Sal^{P} > Sal^{NP}$, then $NG = Sal^{P}$. When paying is adopted as the goal, the eventual probability of paying is increased. Otherwise, if the norm salience of not paying is higher than the norm salience of paying, then the Entrepreneur adopts not paying as its goal. More specifically, in this case, the Entrepreneur uses one minus the norm salience value of not paying as its normative goal. So, if $Sal^{NP} \geq Sal^{P}$, then $NG = 1 - Sal^{NP}$. This is implemented in such a way because it ensures that a higher not-pay norm salience leads to a lower probability of paying.

The Entrepreneur then weights and combines the normative goal value that it adopts with a weighted value for its other goal, the 'individual goal' relevant for this decision, and out of these creates a threshold value 'T^{*}'. While we do not discuss the individual goal here, it is relevant to mention that the individual goal varies according to which decision the Entrepreneurs are making. A randomly selected number is drawn from the interval 0–1, and if this number is less than the threshold then the Entrepreneur pays; otherwise it does not (i.e. if the number selected from $[0, 1] < T^{*}$ then pay; otherwise do not).[5]

Consider now the decision to report pizzo requests to the police or not to do so. Only Entrepreneurs who previously chose not to pay pizzo face this decision. The two social norms relevant to this decision are 'report pizzo request' and 'do not report pizzo request'; let their respective norm saliences be indicated by 'Sal^{R}' and 'Sal^{NR}' and 'NG' the normative goal that is adopted for this decision.

When deciding, Entrepreneurs compare the norm saliences attached to the two norms, 'Sal^{R}' and 'Sal^{NR}'. If the salience of the norm to report is greater than the salience of the norm not to report, then that norm, and associated value, is adopted as the Entrepreneurs's goal. Thus, if $Sal^{R} > Sal^{NR}$ then $NG = Sal^{R}$. Otherwise, if the salience of the norm not to report is greater than the salience of the norm to report, then the Entrepreneur adopts the normative goal of not reporting. Specifically, one minus the salience value of the not-report norm. If $Sal^{NR} \geq Sal^{R}$, then $NG = 1 - Sal^{NR}$.

The normative goal that is adopted is then combined, in a weighted manner, with the individual goal relevant for this decision, and a threshold 'T^{**}' is created. A number is then randomly selected from the interval 0–1; if the number is less than the threshold then the Entrepreneur decides to report; otherwise it does not (i.e. if a randomly chosen number from $[0, 1] < T^{**}$ then report; otherwise do not).

The final decision of Entrepreneurs that is affected by their social norms is their decision to join the *Organisation* or not. This is a decision that can be taken by

[5] Consider a high norm salience for the norm 'do not pay pizzo' and assume that it is adopted. In this case, since $1 - Sal^{NP}$ is used, the threshold that emerges from the combined goals is low, meaning that the probability that a randomly drawn number is greater than T^{*} is high. Therefore, the probability of paying is low. In contrast, consider a low norm salience for 'do not pay pizzo' and assume that it is adopted. In this case, the normative goal value is high (since $1 - Sal^{NP}$), and thus, the probability that the threshold will be exceeded is low, and consequently the probability of paying is high.

Entrepreneurs only after a pizzo request and only if the Entrepreneurs decided not to pay—no 'fakers' can join the Non-Governmental Organisation.

This decision employs the norm salience value that is created, and updated, for the norm to report pizzo requests: 'Sal^{R}'. This norm's salience is more stringent than that for not paying pizzo, in the sense that it is harder to achieve a higher value, because the Entrepreneur will hardly ever observe others following it and thus is the one that most closely corresponds to the idea of extreme indignation arising from anti-Mafiosi sentiment. The threshold used in this decision is exogenously set; let this threshold be represented by 'NG^{*}'. If the salience for the norm to report is higher than this threshold, then the entrepreneur joins. Alternatively, if the salience for this norm is lower than the threshold, the Entrepreneur does not join (i.e. if $Sal^{R} > NG^{*}$ then join while if $Sal^{R} \leq NG^{*}$ then do not join). For this decision, there is no individual goal—Entrepreneurs do not combine the normative goal with an individual goal—because empirically Entrepreneurs seem to be motivated by normative reasons and not instrumental ones.[6] Joining is irreversible, so Entrepreneurs who join cannot leave.

Consumers recognise a single social norm: (1) do not buy from pizzo-paying shops. And have one decision that is affected by their social norms: their *purchasing decision*. The social norm that is relevant to this decision is 'do not buy from pizzo-paying shops'. Let the salience for this norm be represented by 'Sal^{NB}'.

A set of Entrepreneurs is randomly selected for consideration by the Consumers. They are the Entrepreneurs from whom the Consumer may wish to buy a product. The norm salience for avoiding pizzo-paying shops is then integrated into a ranking formula that also considers the price of the product sold by each Entrepreneur. Each Consumer is consequently left with a list of ranked Entrepreneurs, and the consumer chooses the highest ranked Entrepreneur. Consumers with higher norm saliences, 'Sal^{NB}', rank shops that they believe to be paying pizzo further down the list. They form their beliefs about each shop's pizzo payment based on the reputation of each shop, which in turn is based on observations of shop behaviour and sanctions applied to those shops by others.

Consumers and Entrepreneurs update the salience of their norms throughout the simulation. They both consider their own history of compliances or violations, the history of others' compliances or violations, the history of punishments and lack of punishments that occurred following their own and others' norm violations, the history of sanctions that occurred following their own and others' norm violations, and explicit norm invocations to comply or violate the norm that they receive.

The State holds two legal norms: (1) combat the mafia and (2) assist Entrepreneurs. These are based on the *Rognoni-La Torre Law n. 646 of 13/9/1982* that introduced into the Italian criminal code the crime of mafia-style criminal organisation (art. 416 bis) and the possibility of confiscating mafia properties with their consequent social reuse. In addition, *Law n. 8 of 15/01/1991* and *Law n. 82 of 15/03/1991* aim at providing denouncing incentives and protecting victims who report extortion activities.

[6] Although in theory they can be motivated to join for instrumental reasons, we did not implement this due to the unnecessary complexity that would be added to the model.

Finally, *Law n. 44 of 23/02/1999* and *Law n. 512 of 22/12/1999*, respectively, introduced economic support to victims of extortions and the solidarity fund for victims of Mafioso-style crimes and intimidation. These norms are implemented as actions that the State carries out. The State does not hold any social norms. However, it can promote the social norms held by Entrepreneurs and Consumers.

The State combats the mafia using two different types of investigations. Police officers conduct general investigations on an ongoing basis, keeping a general lookout for pizzo requests and punishments enacted by Mafiosi. It also carries out specific investigations that are based on reports by Entrepreneurs. In addition to such direct anti-racket legal norms, the State spreads normative information, exhorting Entrepreneurs and Consumers to pursue actions that undermine the mafia, and it spreads information about successful anti-racket operations that it carried out.

Regarding assistance to Entrepreneurs, the State has a resource pool, partly comprised of resources confiscated from the mafia and partly composed of money allocated into it by the government: the Fondo di Solidarietà. Entrepreneurs who report Mafiosi activity and are punished for doing so can obtain reimbursement from the fund.

Generally put, legal norms structure interactions—with the sole exception of Entrepreneurs' decision to collaborate—while social norms influence agents' decision-making within interactions.

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