

Research Article

Countering Protection Rackets Using Legal and Social Approaches: An Agent-Based Test

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Protection rackets cause economic and social damage across the world. States typically combat protection rackets using legal strategies that target the racketeers with legislation, strong sentencing, and increasing the presence and involvement of police officers. Nongovernmental organizations, conversely, focus on the rest of the population and counter protection rackets using a social approach. These organisations attempt to change the actions and social norms of community members with education, promotional campaigns, and discussions. We use an agent-based model, which draws on established theories of protection rackets and combines features of sociological and economic perspectives to modelling social interactions, to test the effects of legal and social approaches. We find that a legal approach is a necessary component of a policy approach, that social only approaches should not be used because they lead to large increases in violence, and that a combination of the two works best, although even this must be used carefully.

1. Introduction

Protection rackets are widespread and can be found in many countries in the world. Although they vary in multiple ways, mafias can be defined as groups that specialise in the production and sale of protection to people and businesses [1, 2]. Put another way, mafias run protection rackets. The Sicilian Mafia [1]—as well as other mafias in Italy [3], the Russian Mafia [2, 4, 5], and the Yakuza [6] may all be considered to be mafias. The protection they provide includes the supply of real, but often illegal, services, whereby the racketeers protect businesses from criminals and legal competition, as well as pure extortion, in which the only “protection” that racketeers provide is from themselves [1]. Ultimately, mafias harm the societies in which they operate. Among the many costs are those that they impose on businesses for maintaining security, the direct costs of crime, the state-level costs to combatting and countering protection rackets, and the help that they provide to criminals and businesses to conduct illegal transactions [7–13]. While estimates of the costs vary greatly,

all agree upon the basic point: the costs of protection rackets are substantial [9–15]. One study, for instance, estimates that the presence of mafias has lowered GDP growth per capita by 16% in Apulia and Basilicata (regions of Italy) relative to “synthetic controls” [9], while a much more inclusive estimate by the United Nations Office on Drugs and Crime calculates the crime proceeds of transnational organised crime at \$0.9 trillion [16]. Despite the damage caused by protection rackets, they have proven to be resilient. A core difficulty around combatting them is that they comprise a complex system with multiple relevant actors including a state, a mafia (of which there may be multiple competing against each other), shopkeepers and business-people, consumers, nongovernmental organisations, and the rest of society, as well as nonlinear feedback loops between the actions of these actors. Another problem is that it is extremely difficult to conduct experiments on different policies to test their causal effects. Yet, doing so would allow knowledge about effective counter-mafia techniques to accumulate. To understand this usually hidden phenomenon of protection

rackets, and test policy approaches to countering them, we use computational tools. This is different from the tools traditionally used in criminology although there are some recent exceptions [17, 18].

Specifically, our contribution here is to use our agent-based model (ABM) of protection rackets, configured to represent a single neighbourhood in the city of Palermo, to conduct experiments that are relevant to policy, with a focus on the dynamics of social norm change, and discuss the implications of these results for countering protection rackets. We also describe the theoretical grounding of the model. We have presented our model before from a technical perspective in [19], and the simulator underlying the model has been described in [20]. The model, the normative architecture, and some of the results are described in the deliverables of the FP7 EU project GLODERS (deliverables 3.1, 3.3, and 3.4). Some preliminary results are published in a conference proceedings [21] and the model as a book chapter [22]. We use our ABM to ask how effective are laws alone at countering protection rackets? How resilient are any effects that emerge? Are laws sufficient to change social norms and promote a “culture of legality?”. Is a social approach capable of countering protection rackets? Our experimental tests yield insights into the policies that may be effective, the policies that are unlikely to be effective, and the policies that have troubling side effects. They also allow us to consider the resiliency and long-term effects of these approaches.

ABMs allow researchers to observe the social system under study at multiple levels. They can observe agents’ cognitive processes, their individual behaviours, and the patterns of behaviour that emerge from their interactions. As an example of the first level, we could inspect the “minds” of individuals and investigate the dynamics of the expectations and beliefs that support certain behaviours and their change. Such a multilevel investigation is crucial for enriching our understanding of this social phenomenon. ABMs also allow researchers to manipulate variables and run experiments that could not be conducted in real settings. We cannot run field experiments on the different counter-racket approaches, so we test them in our virtual world [17].

The entities in our model are the *state*, the *mafia*, business-people (*entrepreneurs*), the broader population (*consumers*), and a nongovernmental (NGO) antimafia organisation. We gave these entities rules on how to behave based on the literature in criminology, discussions with organised crime experts (see Validation for details), and information extracted from specialised databases. We then use our ABM to test two common approaches of combatting mafias. To counter protection rackets, governments typically use a top-down *legal approach*. They enact and enforce legislation, and increase policing and sentencing, in an attempt to imprison mafiosi. Nongovernmental organisations use alternative means. They use a bottom-up *social approach* to change peoples’ actions through nonlegal means. Often this is aimed to shape the expectations and beliefs of the population about the socially appropriate action to take—“reporting protection racketeers to the police” for instance. In other words, they work on the social norms of a population. Educational and promotional campaigns, communal discussions,

and commitment devices—asking to consumers to sign declarations stating that they commit to not buying from pizzo-paying shops, are all tools in the NGO toolkit [23, 24].

In guiding our ABM development, we draw on two, out of many, theoretical approaches [25]. One approach, which can be found predominantly in the early works on the Sicilian Mafia, *emphasises the role of culture* in shaping protection rackets and determining behaviour [26–31]. Schneider and Schneider [30], for instance, argue that cultural codes celebrating honour, cleverness, and friendship are especially important for understanding the organisation and success of the mafia (p. x). When characterising the mafia too, many of these scholars focus on culture. For them “mafiosi personified a series of attitudes and values, a ‘subculture’ widespread throughout the whole of Sicilian society” [32]. Santoro describes another example of this approach: Pitre “famously argued against the identification of Mafia as a criminal social organization, insisting on its being a diffuse cultural attitude instead” [25]. When these authors make their substantive claims, among them that the Sicilian Mafia is not a united organisation, they employ a cultural focus to elucidate their arguments.

Another, more recent but now-widespread, approach relies on the theoretical framework of economics to explain the features and success of organised crime and mafias. It draws on, among others, “game theory, transaction costs analysis, economic neo-institutionalism” [25] and uses *beliefs, preferences, and constraints* as the core components of its explanations. It provides explanations at the individual level and in terms of people’s decisions. Exemplified in the foundational works of Thomas Schelling [33] and Diego Gambetta [1, 34], this approach draws parallels between protection rackets and businesses. Gambetta, for instance, characterises the Sicilian Mafia as being involved in the industry of private protection and that low levels of trust (the belief that people will cheat other when possible) leads to a demand for protection that is fulfilled by those who are both willing to provide it (based on certain preferences) and are able to do so given their resources.

A fundamental distinction between these two theoretical approaches is in their conception of human nature. The cultural perspective relies on *Homo Sociologicus* as its model: an “oversocialised conception of man” that presumes people unthinkingly follow the social norms that they have internalised, blindly shifting their actions according to others’ expectations [35, 36]. Conversely, the economic perspective employs a *Homo Economicus* view of human nature in which people follow their incentives, often self-interested ones, irrespective of social norms or others disapproval, when deciding what to do [35].

Extensive research now shows that both contain insights. Incentives are fundamental drivers of human behaviour [37–40], yet people consider also social factors when deciding how to act (e.g., [35, 41–43]). Social norms are one of the most important of these social factors [40]. In addition to the decades of observational studies (e.g., [44]), extensive experimental evidence demonstrates the important influence of social norms on behaviour [45–55].

Social norms can be defined as shared behavioural rules proscribing or prescribing certain actions that are followed because of reciprocal expectations and, in some cases, social punishment [51, 56–58]. Norms may, in their simplest incarnations, take the forms “do X” or “do not do Y” [37], but they can be more complex and take conditional forms. The expectations motivating norm compliance can be separated into empirical and normative expectations [56]. The former are people’s beliefs about how prevalent a behaviour is, while the latter are people’s beliefs about what others expect them to do. From another perspective, social norms can also be considered as particular components of institutions [59].

Social norms influence many aspects of our lives: shaping how we interact with our family, friends, and strangers [60]. Given that social norms permeate social life, it seems highly likely that they also operate in the domain of protection rackets. There are empirical hints to back up this supposition. Norms of fairness, reciprocity, in-group favouritism, and omertà—a code of silence—are all plausibly important in affecting paying pizzo, money paid by businesses and individuals to mafias in exchange for protection, and reporting pizzo requests to the police (see [61]).

Our model integrates Homo Economicus and Homo Sociologicus. Key agents in our model, entrepreneurs, who represent business people, and consumers, who represent the broader population of citizens, consider both their incentives and social norms when deciding how to act. These decision makers’ utility is based on the economic rewards that they obtain and on the degree to which their actions comply with social norms, in the form of taking actions considered as socially appropriate and avoiding those viewed as socially inappropriate. Ultimately, they weigh up both individual and normative reasons to determine what they do (see also [46, 54, 62]).

In the past, the empirical basis for social norms, what they are and how they affect behaviour, was weak. In particular, both the measurement of expectations—the drivers of norm-following behaviour, and experimental manipulations to test the causal effects of social norms were lacking. With the advent of more precise measurement and experimental techniques, we are now better able to provide an empirical grounding for social norms [49, 50, 54, 56]. Another critique of social norms was that they are vague, ignore cognitive mechanisms, and that they are used as a catch-all term. Using a computer simulation forces us to be explicit and precise about what social norms are and the effects they may have in our model. Our model uses prior work done by scholars who have developed a normative agent architecture, “EMIL-A,” that allows norms to be realistically implemented in a model [57]. It is a cognitively grounded normative agent architecture that provides a measure that indicates how active and prominent, or inactive and inconspicuous, a norm is, the “salience of a norm,” which facilitates the incorporation of normative considerations into the agents’ decision-making processes.

There is a large literature on modelling social norms in the complex systems field as well as in the social sciences. Much of this addresses how cooperation can be promoted with social norms [63]. Schlüter and colleagues [64]

consider a common pool resource problem and test how resource abundance and variability influences norm-driven cooperation, while Tessone and coauthors [65] focus on how the distribution of individuals’ sensitivities towards social norms within a population affects norm-following. The latter find that heterogeneity in sensitivity can increase norm-following. Others examine the roots of social norms and test how they emerge [66–69]. Some work tests how social structure and access to information about the behaviour of other agents, only those close by or also those more distant, influences norm-following [70]. ABMs of institutions are also related to our work here [71].

The closest existing ABM that specifically addresses protection rackets comes from the work of Troitzsch [72–74]. Troitzsch presents an ABM of a protection racket in which he integrates instrumental and normative considerations in the decision-making of agents. Different to ours, Troitzsch’s model is more complex, containing more parameters and processes, and he does not use a calibrated version of it to run policy-relevant experiments. Other related ABMs look at instrumental factors [75], how a team-reasoning approach changes entrepreneurs’ willingness to resist [76], and whether presence of fakers, who pose as mafiosi but are unwilling to use violence towards nonpaying shopkeepers, changes the protection racket dynamic [77].

2. Materials and Methods

2.1. Model Overview. Our event-based agent-based model is configured to represent a single neighbourhood of Palermo in which a mafia runs a protection racket and hence we call it the Palermo Scenario. We built our agent-based model as part of the FP7 EU funded project GLODERS. This project included more than twenty domain experts from multiple European countries allowing us to use an iterative participatory modelling approach to construct the model, identify the main actors, and validate the model’s assumptions, dynamics, and outcomes. We identified entrepreneurs, the state, the Sicilian Mafia, consumers, and nongovernmental organisations as key players in the dynamics of protection rackets and implemented these as the agents (Figure 1). This was based on the iterative participatory modelling process with the domain experts and evidence that we extracted from a range of sources including judicial and confiscated mafia documents, academic studies, and newspapers and television interviews. We draw on the model description we previously used in [19] for this section; see also the same paper for technical details of the model. We present an ODD+D (Overview, Design Concepts, and Details + Decision) document [78] concerning our model in Table S1 of the Supplementary Information.

Entrepreneurs represent businessmen and the self-employed. They sell products to consumers and receive an income periodically. They face the decisions to pay pizzo, or not, if approached by mafiosi (*pay*); report pizzo requests to the state if they decide not to pay pizzo (*report*); report any damages to the state that they sustained from mafiosi attacks (*report*); collaborate with the state against specific mafiosi following a request by the state (*collaborate*); and join the

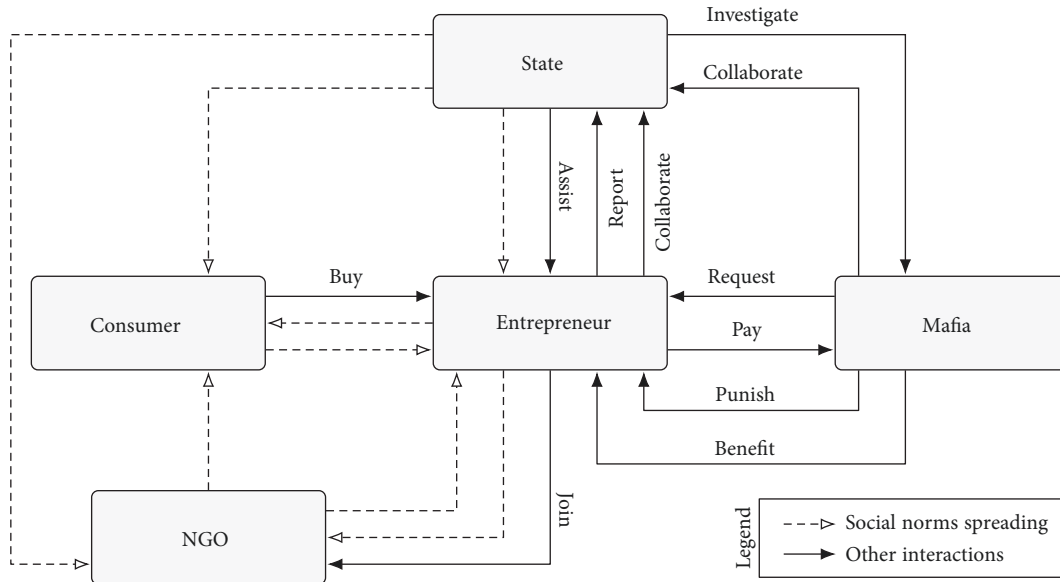


FIGURE 1: Schematic of the agents in the Palermo Scenario and their dynamics. Boxes represent agent types and arrows represent actions.

NGO to signal that they are unwilling to pay *pizzo* and likely to report *pizzo* requests and punishments (*join*). Entrepreneurs and consumers are connected to each other in a static scale-free network [79] that is defined at the start of the simulation. This network defines their range of perceptions regarding others' actions and it is used to update their normative behaviour.

Consumers represent people buying goods from shops. Consumers have a single decision regarding which entrepreneur to buy a product from (*buy*), restricted to their neighbour entrepreneurs in the defined scale-free network. Consumers also spread information through this network that can influence other consumers and entrepreneurs and serve as reservoirs of normative behaviours (*social norm spreading*).

The state represents the government and its institutions that are responsible for enforcing antiracket laws. It is composed of police officers who try to detect *pizzo* requests and imprison mafiosi based on general or specific investigations (*investigate*). General and specific investigations differ in how they are initiated, their duration, and the probability of success. General investigations, which may be thought of as a patrol, occur on an ongoing basis without specific evidence. As such, they have a short duration—allowing police officers to explore more space—but have a low probability of success. In contrast, specific investigations are initiated based on evidence and reports by entrepreneurs, thus justifying the use of resources for a longer period as they have a higher probability of success. Imprisoned mafiosi are removed from the simulation for a set amount of time. After the police capture a mafioso, they may find information about the entrepreneurs who paid *pizzo* to that mafioso—some mafiosi keep accounting books to record information about *pizzo* payers. The state can then use this evidence to elicit collaboration from those entrepreneurs (*collaborate*). If collaboration is obtained, the state uses the collected information to prosecute that mafioso. If collaboration is not obtained, the state may, with a

small probability, fine entrepreneurs. The state can also support entrepreneurs who have suffered damages at the hands of mafiosi (*assist*). Entrepreneurs may apply for monetary support from a fund that periodically recharges and is specifically set up for this purpose. In Italy, this fund is known as the “*Fondo di Solidarietà*.” The state also spreads information 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 programs (*social norm spreading*), and it can work to change people's social norms regarding the mafia by sponsoring and supporting antiracket festivals (*social norm spreading*). The *Festival della Legalità* is one example of the state supporting antiracket festivals.

The mafia represents a “family” covering a neighbourhood and is composed of mafiosi who request *pizzo* from entrepreneurs (*request*) and provide benefits, which we intend as a simple representation of protection, to *pizzo*-paying entrepreneurs (*benefit*). Mafiosi can also punish non-paying and reporting entrepreneurs. Since they are part of the same family, mafiosi coordinate their actions—whom they target, how often they request *pizzo*, how much they request, and how severely they punish (*punish*). Mafiosi can, with a small probability, turn informant and help the state capture other mafiosi that they know (*collaborate*).

The model mafia in our setup is intended to represent the post-1990s Sicilian Mafia. Following a change in leadership from Totò Riina to Bernardo Provenzano, and protests by parts of the Sicilian population over their public execution of government officials, the mafia undertook a “hidden” strategy in which they limit obvious violent retaliations and request modest *pizzo* from a greater proportion of the population (see Table S2 for the parameters used).

The NGO represents an antiracket nongovernmental organisation. We primarily draw on Addiopizzo (“goodbye *pizzo*”) for our model NGO and we go into more detail about this organisation in Section 3.1. It promotes lawful behaviour

among consumers and entrepreneurs through events such as talks in schools or the organisation of and participation in festivals (*social norm spreading*). The civil society organisation Libera is the main organiser of the aforementioned *Festival della Legalità*. The NGO spreads information depending on the number of actions the state takes against the mafia and the number of extortive actions shared by the affiliated entrepreneurs. It serves as an organisation that entrepreneurs can join if they are not paying pizzo.

2.2. Decision-Making. Agents can be separated into two groups based on their decision-making complexity. The state, the mafia, and the NGO are represented as agents whose decisions are based on fixed probabilities initialised at the start of the simulation. In contrast, entrepreneurs and consumers use more sophisticated reasoning abilities. They base their choices on a combination of instrumental and social considerations.

Instrumental considerations approximate instrumental rationality. They involve strict cost-benefit calculations that motivate agents to take decisions that maximise their own material pay-offs, independently of what a certain norm dictates. Exactly what factors are considered depends on the agent and on the decision being made. For instance, when deciding whether to pay pizzo or not, entrepreneurs consider the cost of paying pizzo, the potential benefit received from paying, the anticipated violence from the mafia to not paying, and the ability of the state to identify pizzo-paying entrepreneurs and the resulting fine.

Social considerations represent the agents' motivations to comply with a norm. The parameter considered is the "salience of a norm." It refers to a measure that indicates how active and prominent, or inactive and inconspicuous, a norm is within a group in a given context. It is a function of how important agents believe norms to be and it approximates in a single value the combined empirical and normative expectations that agents have about a norm. Norm salience is updated by each agent based on its own behaviour (whether it followed the norm or not), the information gathered by observing the behaviour of and actions inflicted on neighbouring agents (whether others followed the norm or not) and normative information spread by the state and NGO (see also [46, 62]).

2.3. Social and Legal Norms. Social norms in our model are implemented using the agent architecture EMIL-A [57], an architecture specifically designed to capture the complex dynamics of social norms. Agents that possess normative reasoning modules (entrepreneurs and consumers) in our model can *recognise* social norms and decide to *comply* with the social norm.

Recognition entails that agents discriminate between whether others' behaviour is driven by, at least in part, the existence of a social norm and if this is the case, to subsequently form a belief concerning that norm. This belief may simply state that the norm exists or it may be more complex and include the further specifications that the norm is applicable to the belief-holding agent who

recognised it, and potentially, that the norm is supported by rewards or punishments.

Following recognition, agents adopt a norm and decide whether to comply with it. Compliance means here that the goals of agents are potentially turned into action. Turning a goal into an action however depends on both the normative goal and instrumental considerations. A key part of the decision-making process that determines the influence of social norms on behaviour is *social norm salience*. This represents the importance that agents place on a social norm and is determined by multiple factors including observed compliance, observed violation, and observed and applied punishments. For details, (see [19], Section 5.4).

The specific social norms we include for entrepreneurs are pay pizzo requests, do not pay pizzo requests, report pizzo requests, and do not report pizzo request. We explicitly represent both a norm and its opposite norm for entrepreneurs, such as pay pizzo and do not pay pizzo, because this allows us to model a greater space of normative situations than if we were to make them complementary. We can represent situations in which the norm of pay pizzo and do not pay pizzo are both low in salience, in which case there are weak or no social norms associated with paying pizzo, or that they are both high in which case there is internal normative conflict within agents. Although these social norms are aimed to capture the mafia-relevant features of the reciprocity, fairness, in-group favouritism, and omertà, they are not meant to relate in a one-to-one way with the norms that occur in reality. Rather, they summarise and capture the effects of those norms that are relevant to the protection racket. The effects of norms of fairness, for instance, are summarised in the salience the four social norms of entrepreneurs.

Consumers also have one social norm: to avoid pizzo-paying entrepreneurs. This is a norm that is not yet widespread nor established in Sicily, but there is some suggestion that it is growing. We do not include the opposite norm, to choose pizzo-paying entrepreneurs, because we could not find evidence that this exists in Sicily or Palermo. We also include legislation in the model that primarily works by targeting mafiosi. All these norms are summarised below (Table 1).

It is worth mentioning that our implementation captures an important feature of real social norms. It allows social norms to simultaneously exist, contained within agents' minds, yet remain latent in a population without being manifested as behaviour [51, 56–59]. It may be that everybody within a population abandons a norm; however, since agents know about this, they keep monitoring how salient it is within their community. Consequently, it is possible that social norm consistent behaviour emerges or reemerges.

2.4. Validation. We built the model using an iterative participatory modelling process. This means that we presented the model to people with antimafia expertise, they gave us feedback, we updated the model, and then at a later stage, we presented them the model again. This process gives the agents and model dynamics *prima facie* validity. In addition, we used participatory modelling as a "powerful tool that can (a) enhance the stakeholders' knowledge and

TABLE 1: Social and legal norms in the Palermo Scenario.

Legal norms	Social norms
Criminalise mafia-style organisations	Pay pizzo request
Confiscate mafiosi resources	Do not pay pizzo request
Reimburse victims of mafia crimes	Report pizzo request
	Do not report pizzo request
	Avoid pizzo-paying entrepreneurs

understanding of a system and its dynamics under various conditions, as in collaborative learning and (b) identify and clarify the impacts of solutions to a given problem, usually related to supporting decision-making, policy, regulation, or management” ([80], see also [81]). Ultimately, an iterative participatory modelling approach increases the benefits that can be derived from the model to both policymakers and researchers.

Although the iterative participatory validation approach is an important piece of specifying a general protection racket simulation model—as well as increasing the relevance of the model, it does not validate the model for a specific protection racket, e.g., the Sicilian Mafia. To do this, we compare whether the model’s outputs match data already acquired from the real system (known as replicative validity or retrodiction) [82]. Zeigler [82] distinguishes between three types (or levels) of validity for this purpose: *replicative validity* means that the model matches data already acquired from the real system (also known as retrodiction); *predictive validity* means that the model matches data before the data are acquired from the real system; and *structural validity* means that the model is not only capable of replicating the observed real system behaviour but reflects exactly the sequence of steps the real system operates to produce this behaviour. Structural validity can almost never be accomplished, especially in models that represent individuals who are reluctant to communicate about their motivations and behaviour propensities. In these circumstances, one will never uncover how real individuals operate to produce their behaviour in sufficient detail. Predictive validity is also difficult to accomplish due to this same issue in which one would not have enough detail about the behaviours to consistently reproduce them in yet unknown future circumstances. However, if we succeed in finding simulation output which is in line with relevant statistics, we can claim that our model is replicatively valid—but this has no direct consequences for its predictive and, more so, for its structural validity. We undertake replicative validation by comparing the model’s outputs to historical trends in Sicily and to contemporary empirical data collected from police records and judicial trials as well as surveys. By applying this approach, we validate our model in two further ways.

Our first approach is to compare the qualitative patterns observed in the model to historical trends reported from Sicily (for further details of this validation, see [19]). To do

this, we group the relevant historical periods into five categories: pre-1980s, 1980 to early 1990s, early 1990s to mid 1990s, mid 1990s to 2000, and post-2000. We draw on historical information to qualitatively set up the model’s parameters and then we run the model for 50,000 time units. At every 10,000 time units, we shift the parameter setup to match that drawn from the historical literature and carry over the information from the prior time units. This provides a continuity to the simulation. Each 10,000 time units thus corresponds to a historical time period (time units are not intended to correspond on a 1 : 1 basis with real time. Instead, the 10,000 time units per historical period were chosen to allow changes to stabilise before the model’s parameters are changed). We repeated the simulation, for the purposes of validation, 10 times to ensure that the results are robust.

We find results that are broadly consistent with the trends from these periods in Sicily. Pre-1980s, the governmental authorities did not have effective laws to fight the Sicilian Mafia. So, the mafia could proliferate and use violence against entrepreneurs without fear of strong reactions from the authorities, resulting in a high number of pizzo requests and pizzo paid [83]. During the 1980 to early 1990s, several antimafia laws were implemented enabling the state to effectively fight against mafia (Rognoni-La Torre law; law n. 646, 1982; law n. 8, 1991; law n. 82, 1991; law n. 44, 1999; law n. 512, 1999). This reduced the absolute number of pizzo payments, but increased the amount of damage and violence against entrepreneurs who did not pay [84]. From the early 1990s to mid-1990s, however, the Sicilian Mafia changed its strategy by reducing violence and the amount of pizzo requested, thus being less visible and avoiding imprisonment [84–86]. However, the level of pizzo reporting did not increase in these periods because the population’s social norms were not changed. In the mid-1990s to 2000, the improvement in legislation has been highly effective at imprisoning mafiosi (see law n. 356, 1992), seizing their properties (see law n. 109, 1996; law n. 296, 2006; law n. 92, 2008; law n. 40, 2010), and creating the conditions for the emergence and thriving of civil society organisations. In this period, several nongovernmental organisations began to operate and to raise awareness of the importance of reporting extortion to the authorities. This change on the population mind-set increased the number of reports helping the authorities to fight the mafia. Later, the state also started to raise awareness on the population helping to increase even further the proportion of reports and investigations successes.

The second validation approach we take is to compare the output pattern of our model to contemporary empirical data extracted from police reports and court trials that indirectly gives us information on the Sicilian Mafia. This empirical data is a database of more than 600 cases of extortion in Sicily and Calabria during the past decade (database available at <https://doi.org/10.7802/1116>). For this validation, the percentages of unreported cases (i.e., cases where the police got to know about an extortion without the help of the victim) and the percentages of completed extortions (i.e., not only attempted, but also unsuccessful) that took place in Palermo were calculated.

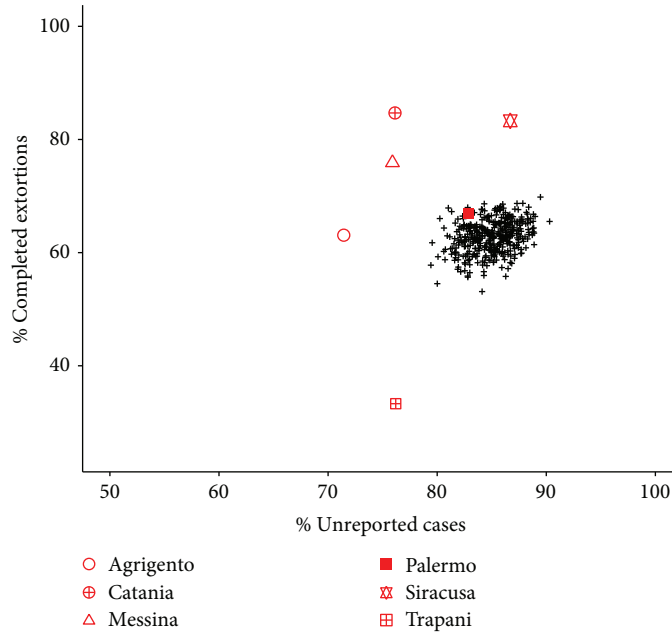


FIGURE 2: Comparison between empirical data of different cities in Sicily and simulated data. Simulated data shown in black while survey data shown in red.

We calibrate some of the input parameters using data concerning Southern Italy and the surrounding islands that are extracted from surveys such as the European Values Study (European Values Study data is available at <https://europeanvaluesstudy.eu>). Using this survey data, Troitzsch [87] estimates that the population in Southern Italy has individual weight of 0.41 and normative weight of 0.59, which implies that people in this region are highly sensitive to norms—even more so than individual factors. We use the ordering, a greater weight on normative than individual factors, reported by Troitzsch, but fine-tune the weights by comparing the outputs of our model with data observed in Palermo. We find that the weights of 0.2 and 0.8, respectively, for the individual and normative weight, replicate the data observed in Palermo well and thus use these. However, to check whether our results depend on these weights, we also run our model with an individual weight of 0.41 and a normative weight of 0.59 and find that the substantive results remain the same (see Figures S1–4 in the Supplementary Information).

Given the fact that the empirical data do not cover all parameters of the model due to the secretive nature of protection rackets, we cannot use traditional validation methods in which empirical data is extensively used. Instead, we let input parameters randomly vary, run our simulation model multiple times varying these parameter values at each run, and we then compare the outcomes of the simulation with the trends of empirical data. If they match, we can claim that our model is replicatively valid and calibrated.

Therefore, we run our model 400 times varying multiple input parameter values (i.e., the state’s frequency and duration of general investigations, probability of accepting to conduct and duration of specific investigations, probability to capture and convict mafiosi, and duration of imprisonment

and the mafia’s pizzo amount request, probability, and severity of punishment or benefit) and compare the outcomes with the empirical data collected in several cities in Sicily concerning the percentages of unreported cases (i.e., the number of extortions that were identified by the police through independent investigations, so never reported, divided by the total number of extortions) and the percentages of completed extortions (i.e., the number of extortions paid to the mafia divided by the number of extortion requests). Figure 2 shows that the percentage of unreported cases and completed extortions generated with our model (black plus “+” signs) closely reproducing the outcomes observed in Palermo as the Palermo empirical data (red square) lies within the cloud formed by the simulation outcomes. These results indicate that our model is calibrated to represent the protection racket characteristics observed in Palermo more than in other city in Sicily.

3. Results and Discussion

3.1. Treatments and Research Questions. We test three treatments in the Palermo Scenario and compare them against a *baseline* setup (B). The treatments are a *legal approach* (LA), a *social approach* (SA), and a *combined approach* (CA). For the specific parameters used in our treatments, see Table S2. Our core research question is *what are the independent and combined effects of legal and social approaches on the mafia and the rest of the population?*

States typically use legal approaches to combat organised crime (this is represented by our LA treatment). These rely on the institutions of the state to identify, prosecute, and incarcerate people running protection rackets. Their targets, in an ideal system, are only criminals. In Italy, the government introduced specific laws that allow mafiosi to

be prosecuted and help victims and increased police presence and sent special investigators to direct the antimafia efforts, for instance, General Carlo Alberto Della Chiesa during the Second Mafia War (see [89]) into Sicily. The crime of mafia association was introduced by the Rognoni-La Torre law n. 646 of 13/9/1982 along with 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. 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 mafia crimes and intimidation (see [88] for details). Here, we test if this approach works to imprison mafiosi and reduce the activity of mafia, as expected, and whether it has any effects on the behaviour and social norms of the population. Moreover, we explore whether a LA has resilient effects (see below for an explanation of how we test the resilience of the treatments).

While a social strategy is typically used by NGOs, in recent years, the Italian state also supports these social initiatives through festivals (e.g., *Festival della Legalità*), education campaigns, and strongly publicized successful antimafia operations. We include this pathway in our model. In Italy, a number of NGOs use such an approach, among them, Addiopizzo, Fondazione Rocco Chinnici, Libera, and Professionisti Liberi. Consider the approaches used by Addiopizzo to combat the mafia [23, 24]. They (i) certify shops as pizzo-free and provide them with a visible indicator of their certification allowing shopkeepers to reliably signal their opposition to the paying pizzo, (ii) condemn mafia activity in the media, (iii) educate schoolchildren in various campaigns, and (iv) collect signatures from consumers in which they declare that they will avoid pizzo-paying shops. The expectation is that these activities will change the social norms and behaviours of the population thereby indirectly undermining the mafia. Will this be borne out in our model? And is this approach resilient to exogenous shocks?

Combined approaches use both legal and social strategies to counter protection rackets. They employ the traditional institutional tools of the state to capture and imprison mafiosi, and, they add a bottom-up norm-change strategy that targets citizens. This two-pronged approach to targeting mafias, with both legal and cultural sides, is an approach that is advocated for among scholars by Godson and coauthors [90, 91] and by Orlando, the current, and previous, mayor of Palermo [89]. They argue that the development of a “culture of lawfulness” is a crucial factor in fighting organised crime.

“Bolstered by a sympathetic culture ‘culture of lawfulness’ law enforcement and regulatory systems function more effectively in myriad ways. Those who transgress the rules find themselves targeted not only by law enforcement but also by many sectors of society. Community support and involvement can also focus on preventing and on rooting out criminal and corrupt practices without the need for expenditures for a massive law enforcement and punitive

establishment. This involvement also reduces the risk and expense of intrusive government surveillance and regulatory practices harmful to individual liberties and creative economic, social, and political initiatives” [90].

We put this idea to the test: will a combined approach perform best?

We compare these three approaches to a baseline setup. This setup represents a state of affairs in which the state almost entirely lacks a legal approach and there is no social approach at all. It is used as an experimental control.

Almost all systems, states and NGOs, use some combination of social and legal approaches to reduce crime, and, where applicable protection rackets. So, this is an important approach to test. The reason we also explore social and legal approaches in isolation is to see the causal effect that these “extreme” strategies would lead to and to contrast it with that of the combined approach. Because of this reasoning, we test a pure legal approach in which there is no campaigning or information promotion by the state or NGO. When testing the social approach, we leave a weak legal backing in place: this is because it is never the case that a state has no legal approach entirely. Were this to be the case, the “state” would cease to be a state in that area.

To test the causal effect and robustness of each treatment, we run the Palermo Scenario for 10,000 time units and then revert the parameters of the simulation to the B setup and continue to run the simulation for a further 10,000 time units. With this approach, we test the average treatment effect with the initial 10,000 time units and the stability of the results that arise from each of the different approaches by comparing the second 10,000 time units. We then repeat the simulation 30 times for each treatment to give us a robust average of the results. The simulation has 100 entrepreneurs, 200 consumers, 20 mafiosi, 1 NGO, and 1 state agent. The state has 20 police officers. For simplicity, the number of each type of agents remains fixed throughout the simulation (e.g., there are always 20 mafiosi in the simulation).

3.2. Findings. To understand what happens in the different treatments, we consider the following outcomes: the imprisonment of mafiosi, the efficiency of the state at imprisoning mafiosi, pizzo requests and punishments meted out by the mafia, pizzo paying and reporting by entrepreneurs, and the social norm saliences of entrepreneurs. The model outcomes we refer to are always averages of the 30 repetitions aggregated by 1000 time units because our model is based on an event-based rather than a time-step approach.

Consider the ability of the state to imprison mafiosi. In both the B and the SA, very few mafiosi are incarcerated (3/20 and 5/20 on average, respectively), while in the LA and the CA, around 65% (13/20) are incarcerated (Figure 3(a)). None of the effects on increased imprisonment are really robust. After the change in parameters, LA and SA tend to converge with the B treatment, although the CA retains some capacity to imprison over the baseline.

While the LA and CA end up imprisoning a similar number of mafiosi, they do so in very different ways (Figure 3(b)). The LA achieves this solely through general investigations—the police conducting their routine antimafia activity.

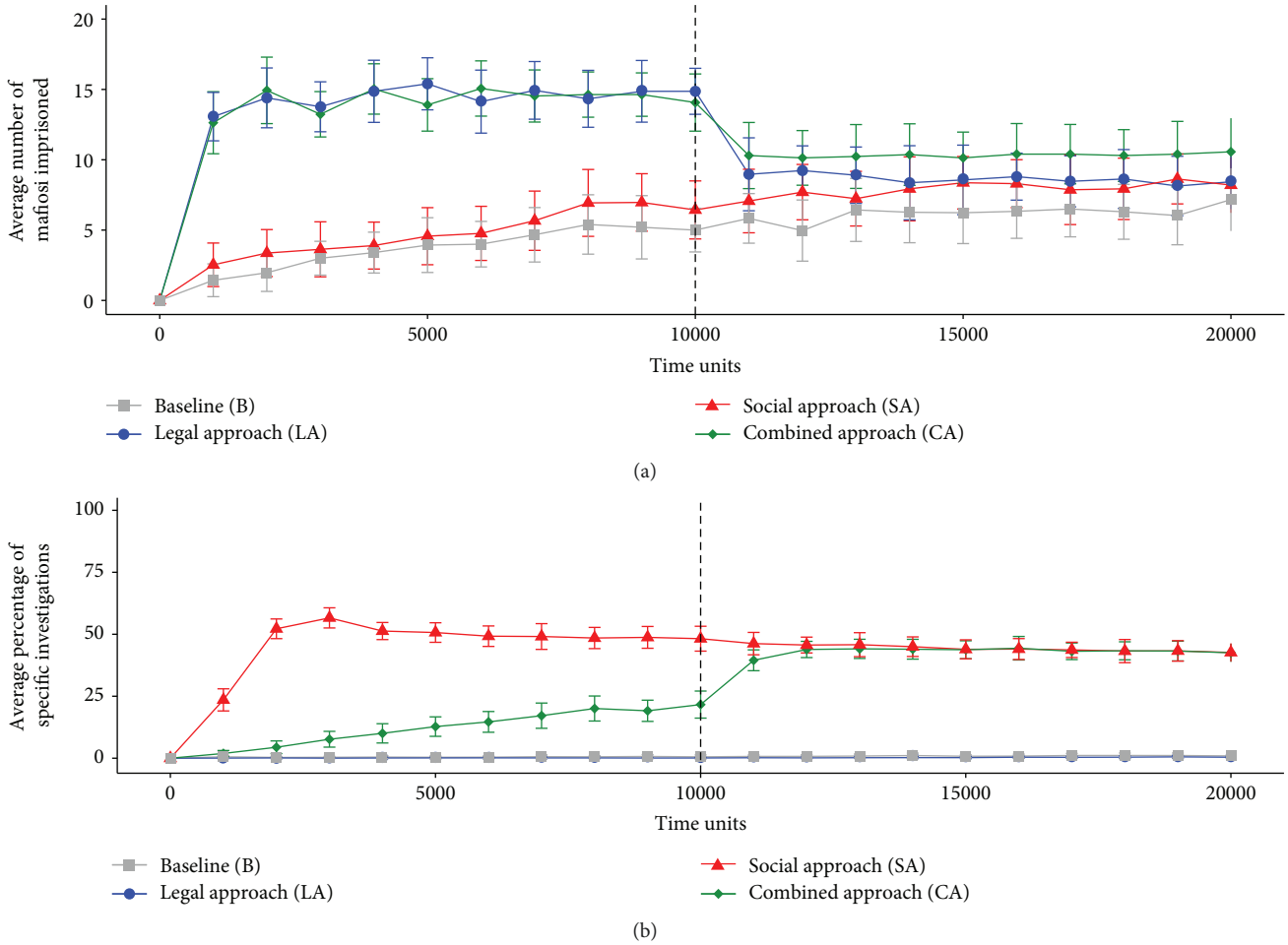


FIGURE 3: Mafia imprisonment. Means plotted and error bars indicate ± 1 standard deviation. (a) The number of mafiosi (out of 20) imprisoned in each treatment and (b) proportion of investigations that are specific investigations. The dashed line indicates the change to baseline parameters.

While the CA attains a substantial percentage of its imprisonments through specific investigations. This suggests that the CA is more efficient at imprisoning mafiosi since it can target them based on information it receives from entrepreneurs. The BA, similar to the LA, uses no specific investigation and there are very few mafiosi whom it imprisons, while the SA, even though the state pursues specific investigations, leads to little imprisonment.

Pizzo requests are substantively affected by the different policies (Figure 4(a)). The LA and the CA hugely decrease the number of pizzo requests that entrepreneurs are approached with relative to the B. However, there is little resilience to the LA but some resilience to the CA following a change to B parameters. The SA has a small effect on reducing the number of pizzo requests.

Particularly interesting is the treatments' effects on punishment (Figure 4(b)). The SA, in the first 10,000 time units, strongly increases the number of punishments that entrepreneurs receive. Employing only a SA leads to increased violence relative to the B treatment. This is because Entrepreneurs increase their refusal to pay pizzo, yet because they lack state support, in the form of strong counter-mafia measures, they

are punished for their resistance. Conversely, the LA and the CA both reduce violence to a lower level even than in the B.

Following the change in parameters back to the baseline setup, violence returns to baseline levels in the LA treatment, but in the SA, the harmful effects are maintained, while in the CA, harmful effects emerge. Punishment in the CA becomes higher than in the B and worst of all, in terms of punishment is the SA. Two factors drive this: entrepreneurs not paying and reporting pizzo requests in the SA and CA combined with the inability of the state to imprison mafiosi (Figures 5(a) and 5(b)). As mafiosi are released from prison in the CA, punishment rapidly rise.

Given the persistence with which our model citizens report mafiosi and refuse to pay pizzo despite the punishments that they receive in the SA, one may wonder whether the high punishment finding would extend to the real world. As mentioned before, we consider this, as well as the LA, to be extreme tests. Yet, we think that the core finding, a higher level of punishment than in the other treatments, would be found also in reality. Even if the extent to which it occurs is lower, the lack of state support, coupled with some reporting and refusal to pay pizzo would increase punishment.

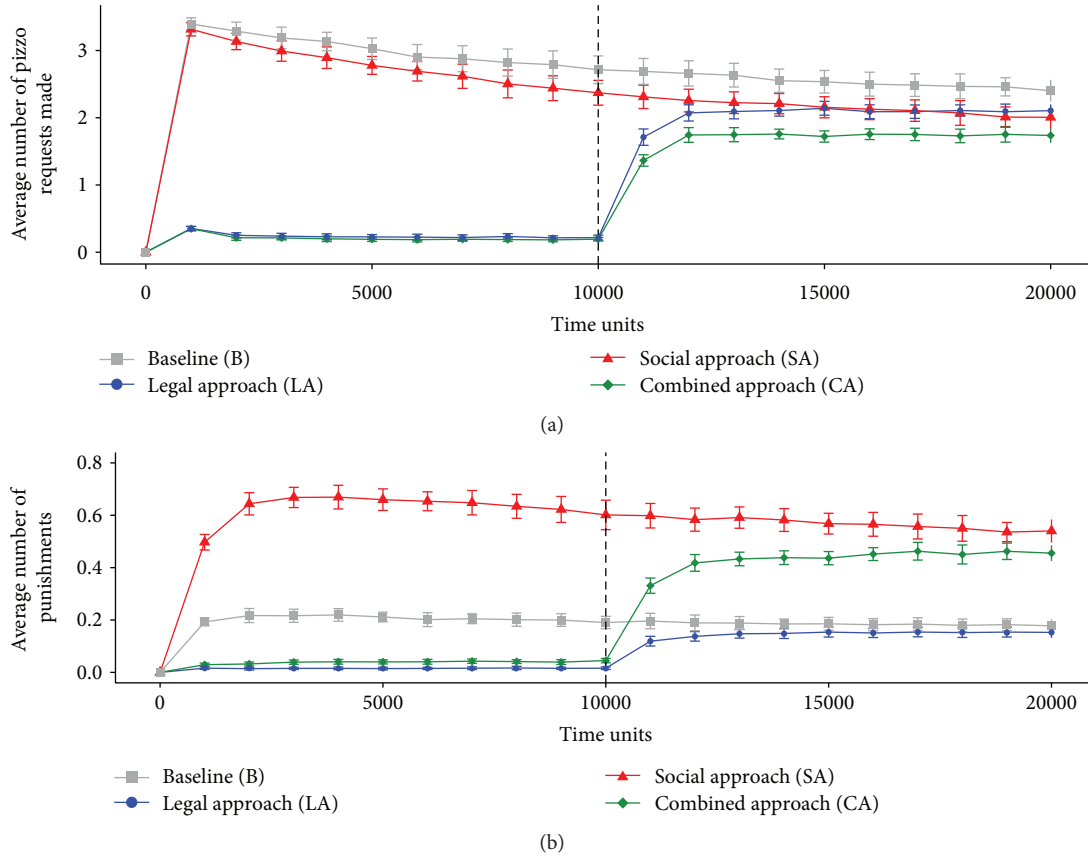


FIGURE 4: Actions of the mafia. Means plotted and error bars indicate ± 1 standard deviation. The number of (a) pizzo requests made by mafiosi and (b) punishments inflicted upon entrepreneurs. The dashed line indicates the change to baseline parameters.

Entrepreneurs in the B treatment pay pizzo the greatest percentage of the time (Figure 5(a)). The LA has no effect on reducing pizzo payment relative to B (79% are paid in both), while the SA and the CA reduce pizzo payment substantially to 49% and 54%, respectively (it is unclear whether the difference in pizzo paying between SA and CA is meaningful. There are reasons to be sceptical: it is small, likely to decrease in longer simulations—much of it arises in the first 5000 time units, and it essentially disappears with different individual and normative weights (see Figure S3A). Moreover, the effects of the treatments are largely resilient to the change to the baseline parameters. This implies that the changes brought about in pizzo payment by the SA and CA are robust. Later, we show that this is down to changes in social norms (see Figure 6).

A greater proportion of pizzo requests are reported in the CA (10.7% on average) and the SA (10.9%) than in the LA (0.2%) and the B (0.2%) (Figure 5(b)). So, the CA and the SA are the most effective at eliciting cooperation from citizens. And the LA is entirely ineffective. Interestingly, the SA is comparable to the CA in increasing reporting also in its resilience: after 10,000 time units reporting in the SA increases to 12.8%, while in the CA, it increases to 16.3%. The effects of the SA and CA treatments are maintained, and even increased, after the parameters return to the B levels.

Consider now the social norms for paying and not paying pizzo. In the B, the social norm salience for paying pizzo

decreases slightly from the starting level and stabilises (average of 89.2%; Figure 6(a)), while the salience of not paying pizzo remains stable at an average of 6.8% (Figure 6(b)). The norm saliences for both norms in the LA follow the same pattern. In contrast, the salience of the norm for paying pizzo decreases strongly (average of 53.7% in the SA and 60.2% in the CA) and the salience of the norm do not pay pizzo increases strongly (average of 51.2% in the SA and 44.4% in the CA) in the SA and the CA (Figures 6(a) and 6(b)). All these effects are resilient to the change in parameters that occurs after 10,000 time units.

Following closely the pattern observed for pay pizzo and do not pay pizzo, we find that the saliences for the norms report pizzo and do not report pizzo in the B and the LA are very similar (Figures 6(c) and 6(d)). The norm salience for reporting pizzo remains stable at the low level of 2.3% in the B and 4.2% in the LA and the norm salience remains high at 97.2% in the B and 96.4% in the LA. The SA and the CA are able to change the norms to make them less mafia supporting (Figures 6(c) and 6(d)). In both treatments, the norm salience of report pizzo increases to around 40% (average of 39.6% in the SA and 37.5% in the CA) and the do not report pizzo goes below the 50% level for the SA and approaches that level in the CA (average of 44.6% in the SA and 58.2% in the CA). The treatment effects are unaffected by the change in parameters at 10,000 time units.

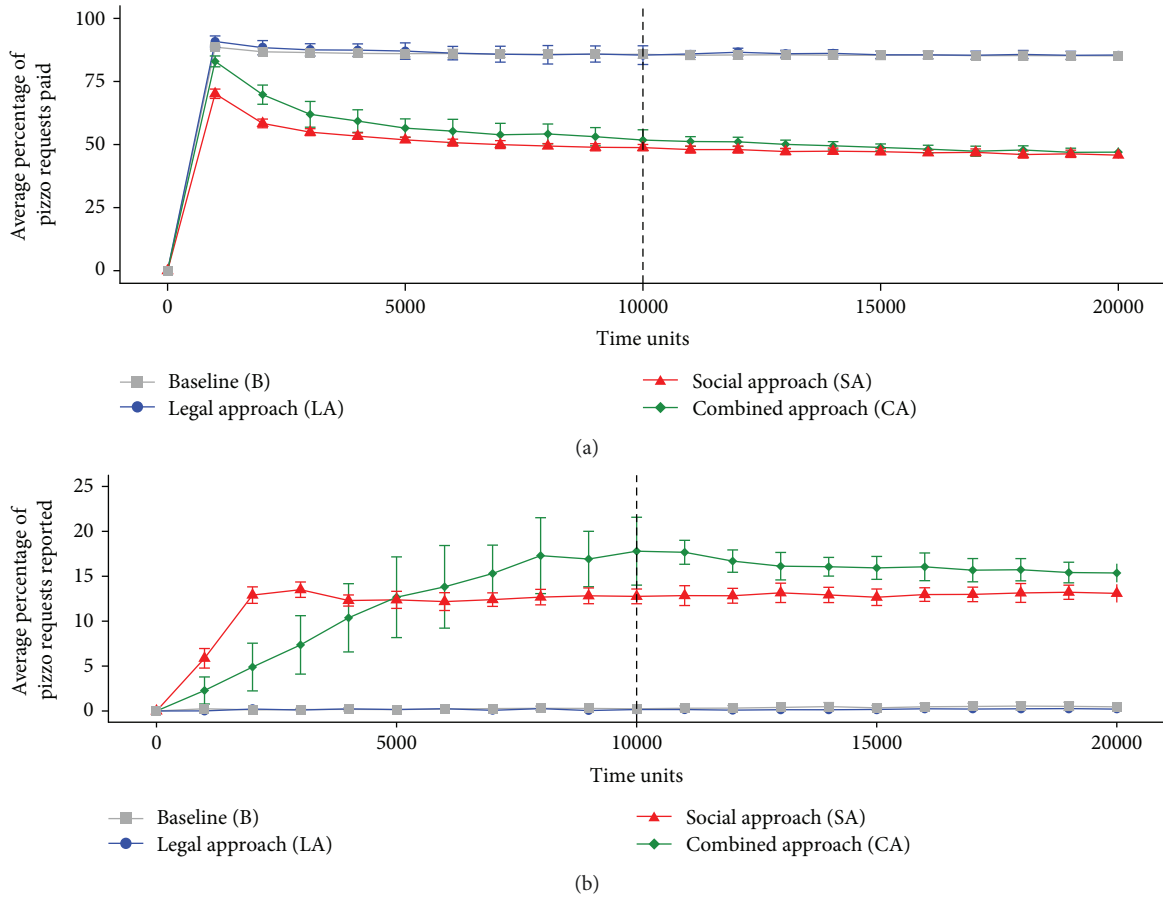


FIGURE 5: Entrepreneurs' actions. Means plotted and error bars indicate ± 1 standard deviation. The (a) proportion of pizza requests paid and (b) reported in each treatment. The dashed line indicates the change to baseline parameters.

Social norms remain stable even after the change in parameters at 10,000 time units because once they have been built up, they are difficult to change. It is particularly difficult to change them through punishment by mafiosi since this has a low weight in the norm salience calculation relative to the observation of other entrepreneurs' actions. Additionally, the actions of entrepreneurs influence norm salience in the opposite direction to the punishment of mafiosi making their net effect on social norm salience small.

Concerning norm diffusion and change, we ultimately find that norms, whether good or bad, are unaffected by a B or LA approach. Instead, social norms are strongly changed with a SA or CA approach. Interestingly, a social only approach, SA, diffuses and changes norms faster than a combined approach. This counterintuitive result is a consequence of an increase on extortion-related actions—pizza requests and punishments due to more free mafiosi—which causes the NGO to increase the promotion of lawful behaviour among the population. It is also a finding that holds when we use individual and normative weights of 0.41 and 0.59 (see Figure S4).

4. Conclusion

Our agent-based model combines elements of both cultural and economic approaches to understanding protection

rackets, in part, by modelling agents that combine core features of Homo Sociologicus and Homo Economicus. This implementation allows us to represent realistic aspects of cultural and normative transmission and influence. Agents are capable of enacting cultural change by affecting each other's behaviour through changes in the strength of social norms and agent's actions shape culture and culture simultaneously shapes agent's decisions.

Using the model, we then test widespread approaches that policymakers and law-enforcement agencies employ to counter protection rackets. Simulations of social, legal, and combined approaches in our model world have uncovered a range of relevant findings.

Start with the legal approach: the standard tool in the antimafia toolkit of agencies and governments. We find that the LA approach dramatically increases the state's capability to imprison mafiosi (although not its efficiency in achieving this). Consequently, requests for pizza and punishment received by citizens are greatly reduced. Thus, such antimafia efforts lead to strong and direct results.

The LA, however, fails to change how compliant citizens are to the mafia: the proportion of entrepreneurs paying pizza and reporting remain the same as in the baseline. Additionally, the LA does not change social norm and the benefits that it produces lack resilience. These findings imply that if a state reduces its antimafia efforts, say, due to a decrease in

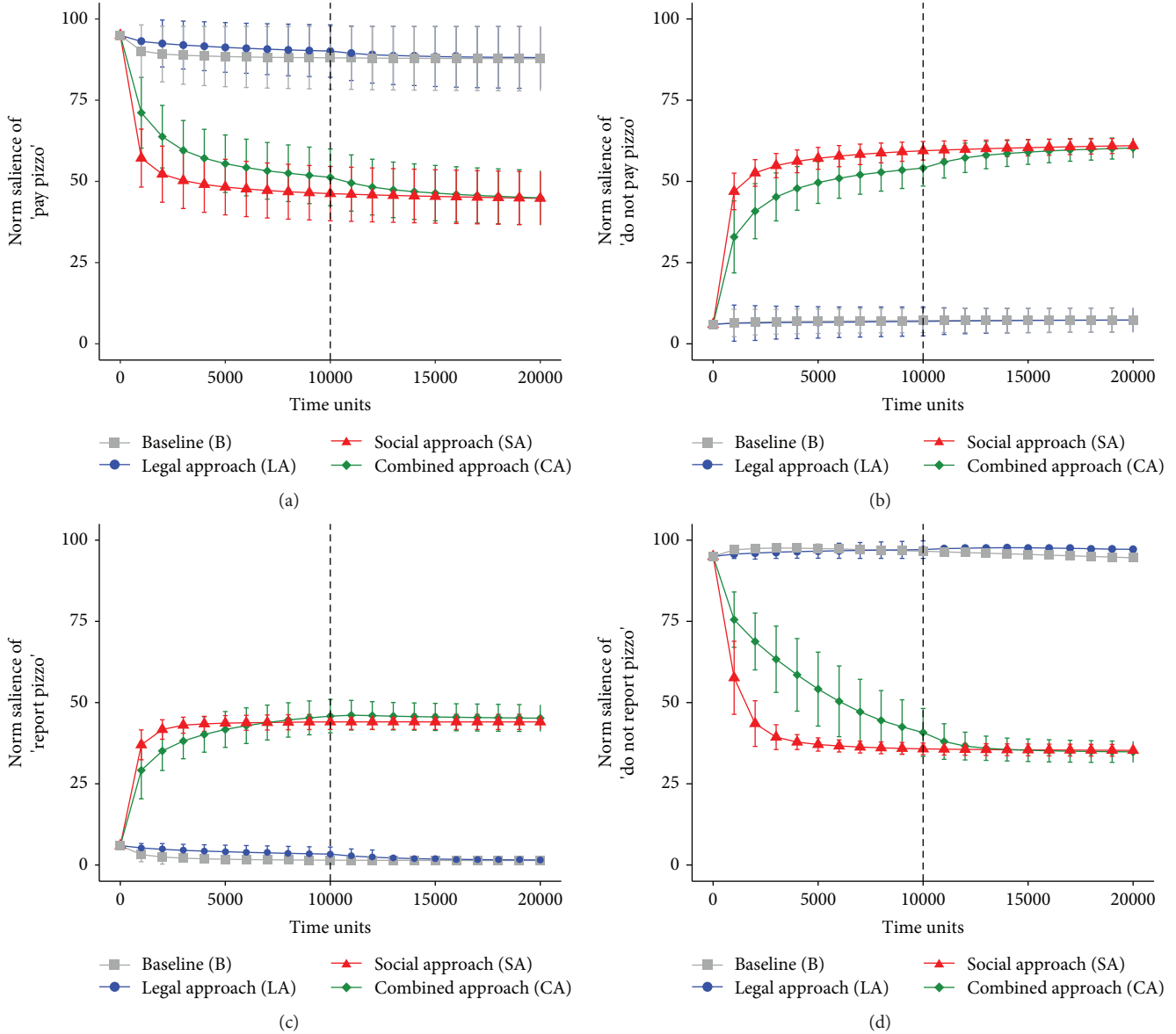


FIGURE 6: Social norm importance in the population. Means plotted and error bars indicate ± 1 standard deviation. Saliences of the social norm (a) pay pizzo, (b) do not pay pizzo, (c) report pizzo, and (d) do not report pizzo. The dashed line indicates the change to baseline parameters.

resources or a change in political agenda, then the gains that it previously made are lost. For these reasons, a legal only approach is not an ideal, nor a long-lasting, anti-mafia tool.

Next, consider the strategy utilised by NGOs: the social approach. This approach changes citizens' behaviours and social norms for the better. Entrepreneurs decrease the proportion of pizzo that they pay, increase their reporting of mafiosi to the state, and their social norms become less supportive of the mafia. These positive changes are robust and remain even after the SA is abandoned.

Yet the SA has flaws. The approach barely increases the number of mafiosi in prison and the efficiency with which the state puts them there. Because of the former, the number of pizzo requests made to entrepreneurs decreases only a little. Although one could expect that decreased support and increased reporting among citizens leads to

distributed enforcement, thereby imprisoning mafiosi and reducing pizzo requests, this is not the case. The lesson to draw is that without state support, reporting by citizens is largely ineffective.

Worst of all, the lack of support from the state leads to large increases in violence. This is the fatal problem of the SA approach: it substantially increases the number of punishments that mafiosi inflict on citizens. It does this to a higher level than in all the other treatments. And, even after the SA approach is stopped, the increase in violence remains. In other words, initiating the policy increases violence straight-away and stopping the policy does not revert punishments to baseline levels. For this reason, a pure SA is dangerous and not a viable antimafia policy.

The final approach we look at combines the legal and social approaches simultaneously. The CA also leads to a

higher number of mafiosi being imprisoned and it increases the efficiency with which the state imprisons mafiosi. Although the number of mafiosi that the state imprisons in the CA is similar to the number that it imprisons in the LA, the former approach is more efficient at achieving the same outcome since it relies on targeted investigations for the job. This means that a state operating with a CA, in real-world terms, spends fewer resources to achieve the same level of imprisonment as a state using only a LA.

Other benefits created by the CA are that it reduces pizzo requests, punishments, and pizzo payment and increases reporting to the state. The CA also changes the social norms of entrepreneurs to make them less mafia supporting.

Some of the effects of the CA are robust: the increase in specific investigations, the reduction in pizzo payment, the increase in reporting, and the change in social norms are all resilient. These changes last even after the approach is reverted back to the baseline. To a much smaller degree, the increase in mafia in prison and the reduction in pizzo requests all retain some resilience.

There is however a drawback of the CA. Surprisingly, once the CA is removed, and the parameters are reverted to the baseline, punishments against Entrepreneurs increase. This increase is nearly as high as that which occurs in the SA following a reversion to the baseline. Using the CA and then abandoning it lead to high levels of violence.

Overall, the CA has many benefits. It imprisons mafiosi the most efficiently, and it changes citizens' behaviours and social norms for the better. Moreover, some of these beneficial changes are resilient. Yet, it has one important failing: preemptively stopping the CA leads to high levels of violence against entrepreneurs. If a state starts a combined approach, it needs to fundamentally undermine a mafia before it decreases its counter-mafia efforts.

We can summarise the main findings from our model as follows:

- (1) Legal approaches are necessary components of an effective antimafia strategy. Without legal backing, antimafia efforts fail
- (2) Purely social approaches should be avoided. Small advantages are more than offset by the increase in punishment and violence towards citizens
- (3) Combined approaches are the most powerful antimafia tools
- (4) Combined approaches should not be stopped prematurely, before the mafia is essentially defeated, because this leads to high levels of violence

It is worth reiterating an unexpected but troubling finding. The most violent situations are those in which entrepreneurs are convinced to change their behaviour by the state and the NGO but are not supported by legal power. This is because in these configurations, entrepreneurs partially change their behaviour but, since they are not supported by the state, are subject to high levels of punishments and retaliation by the mafia. This occurs directly in the SA and in the

CA after the policy is stopped. A clear policy recommendation can be drawn from this: states should ensure that any social change initiatives are sufficiently supported by legal backing and that such combined approaches should be used until mafias are overcome. The crucial part of this recommendation is the last one: *combined approaches should not be prematurely stopped* as this could lead to large outbreaks of violence.

From the perspective of nonstate actors, a possible policy implication is that NGOs should only work carefully and to a limited extent and avoid directly challenging protection rackets when governments are weak. Conversely, when governments are strong, NGOs can be bolder in their counter-mafia steps and change the population norms.

Our findings need to be accompanied with a number of caveats. First, although our model is complex, it still is only a model of reality. Empirical tests are essential to check whether its predictions hold in the real world. Second, the mafia in our setup is configured as a marginally exploitative organisation. Entrepreneurs pay slightly more to the mafia than the benefits that they receive in return. This setup captures important cases in which the state is providing effective protection and the protection from a genuine protection-providing mafia is unnecessary and somewhat costly. Alternatively, it may be that the mafia is somewhat parasitic, irrespective of the state's protection provisioning. What it does not capture is the situation in which the mafia provide genuine protection that is useful to many entrepreneurs, which, as Gambetta [1] and Varese [92] write, is undoubtedly true in some cases. Thus, our results may not apply to a mafia type organisation that entrepreneurs prefer to pay. Third, even in the best-case configurations, the majority of entrepreneurs pay pizzo, and only minority of them ever choose to report. Moreover, entrepreneurs' social norms are only just reversed regarding pizzo paying and not reporting, from mafia supporting to antimafia, and their social norms for reporting are never reversed. Putting these caveats to one side, our results are fairly encouraging regarding the possibility of overcoming protection rackets using a combination of top-down legal and bottom-up social approaches.

Our simulation demonstrates how complex and hard-to-study social problems such as protection rackets can be fruitfully addressed using an ABM. Simulations may have substantial untapped benefits in studying hidden and dangerous phenomena and have relevance to policy development in constantly changing environments. Our model has allowed us to understand the relative benefits that different counter-mafia public policies may yield as well as their longer-term resilience. We have also been able to explore the dynamics of norm change within a population and identify policies that may be effective, ineffective, and harmful.

Data Availability

The simulation code and data are available on the OSF at <https://osf.io/f34mh/>. The model implementation is also available at <https://github.com/LABSS/gloderr>.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Supplementary Materials

Additional tables are provided in the Supplementary Information. Table S1 is an ODD + D protocol for the Palermo Scenario. Table S2 contains a full list of the initial parameter values of the model and indicates the parameter values that are changed for the different treatments. (*Supplementary Materials*)

References

- [1] D. Gambetta, *The Sicilian Mafia: The Business of Private Protection, New Edition*, Harvard University Press, Cambridge, MA, USA, 1993.
- [2] F. Varese, *The Russian Mafia: Private Protection in a New Market Economy*, Oxford University Press, Oxford, 2001.
- [3] E. U. Savona, “Italian mafias’ asymmetries,” in *Traditional Organized Crime in the Modern World*, D. Siegel and H. Bunt, Eds., vol. 11 of Studies of Organized Crime, pp. 3–25, Springer, Boston, MA, USA, 2012.
- [4] F. Varese, “Is Sicily the future of Russia? Private protection and the rise of the Russian mafia,” *European Journal of Sociology/Archives Européennes de Sociologie*, vol. 35, no. 2, pp. 224–258, 1994.
- [5] F. Varese, “What is the Russian mafia?,” *Low Intensity Conflict and Law Enforcement*, vol. 5, pp. 129–138, 1996.
- [6] P. B. E. Hill, *The Japanese Mafia: Yakuza, Law, and the State*, Oxford University Press, Oxford, 2006.
- [7] V. Daniele, “Organized crime and regional development. A review of the Italian case,” *Trends in Organized Crime*, vol. 12, no. 3-4, pp. 211–234, 2009.
- [8] A. M. Lavezzi, “Economic structure and vulnerability to organised crime: evidence from Sicily,” *Global Crime*, vol. 9, no. 3, pp. 198–220, 2008.
- [9] P. Pinotti, “The economic costs of organised crime: evidence from southern Italy,” *The Econometrics Journal*, vol. 125, no. 586, pp. F203–F232, 2015.
- [10] P. Pinotti, “The causes and consequences of organised crime: preliminary evidence across countries,” *The Econometrics Journal*, vol. 125, no. 586, pp. F158–F174, 2015.
- [11] G. Frazzica, M. Lisciandra, V. Punzo, and A. Scaglione, “The Camorra and protection rackets: the cost to business,” *Global Crime*, vol. 17, no. 1, pp. 48–59, 2016.
- [12] G. D. Gennaro and A. L. Spina, “The costs of illegality: a research programme,” *Global Crime*, vol. 17, no. 1, pp. 1–20, 2016.
- [13] M. Lisciandra, “Proceeds from extortions: the case of Italian organised crime groups,” *Global Crime*, vol. 15, no. 1-2, pp. 93–107, 2014.
- [14] A. Asmundo and M. Lisciandra, “The cost of protection racket in Sicily,” *Global Crime*, vol. 9, no. 3, pp. 221–240, 2008.
- [15] G. D. Gennaro, “Racketeering in Campania: how clans have adapted and how the extortion phenomenon is perceived,” *Global Crime*, vol. 17, no. 1, pp. 21–47, 2016.
- [16] UNODC, *Estimating Illicit Financial Flows Resulting from Drug Trafficking and Other Transnational Organized Crimes*, 2011.
- [17] E. Groff and L. Mazerolle, “Simulated experiments and their potential role in criminology and criminal justice,” *Journal of Experimental Criminology*, vol. 4, no. 3, pp. 187–193, 2008.
- [18] D. Weisburd, A. A. Braga, E. R. Groff, and A. Wooditch, “Can hot spots policing reduce crime in urban areas? An agent-based simulation,” *Criminology*, vol. 55, no. 1, pp. 137–173, 2017.
- [19] L. G. Nardin, G. Andrighetto, R. Conte et al., “Simulating protection rackets: a case study of the Sicilian mafia,” *Autonomous Agents and Multi-Agent Systems*, vol. 30, no. 6, pp. 1117–1147, 2016.
- [20] L. G. Nardin, Á. Székely, and G. Andrighetto, “GLODERS-S: a simulator for agent-based models of criminal organisations,” *Trends in Organized Crime*, vol. 20, no. 1-2, pp. 85–99, 2017.
- [21] L. G. Nardin, G. Andrighetto, Á. Székely, and R. Conte, “Modelling extortion racket systems: Preliminary results,” in *New Frontiers in the Study of Social Phenomena*, F. Cecconi, Ed., pp. 65–80, Springer, Cham, 2016.
- [22] L. G. Nardin, G. Andrighetto, Á. Székely, V. Punzo, and R. Conte, “An agent-based model of extortion racketeering,” in *Social Dimensions of Organized Crime*, Computational Social Sciences, C. Elsenbroich, D. Anzola, and N. Gilbert, Eds., pp. 105–116, Springer, Cham, 2016.
- [23] C. Superti, “Addiopizzo: can a label defeat the mafia?,” *The Journal of International Policy Solutions*, vol. 11, 2009.
- [24] A. Vaccaro, “To pay or not to pay? Dynamic transparency and the fight against the Mafia’s extortionists,” *Journal of Business Ethics*, vol. 106, no. 1, pp. 23–35, 2012.
- [25] M. Santoro, “Introduction,” *The Mafia and the Sociological Imagination, Sociologica*, vol. 2, 2011.
- [26] P. Arlacchi, *Mafia Business: The Mafia Ethic and the Spirit of Capitalism*, Oxford University Press, Oxford, 1988.
- [27] A. Blok, *The Mafia of a Sicilian Village, 1860–1960: A Study of Violent Peasant Entrepreneurs*, Harper and Row, New York, 1974.
- [28] H. Hess, *Mafia & Mafiosi: The Structure of Power*, Saxon House, 1973.
- [29] L. Paoli, *Mafia Brotherhoods: Organized Crime, Italian Style*, Oxford University Press, New York, NY, USA, 2003.
- [30] J. Schneider and P. Schneider, *Culture and Political Economy in Western Sicily*, Academic Press Inc, New York, NY, USA, 1976.
- [31] J. Schneider and P. Schneider, “Mafia, antimafia, and the plural cultures of Sicily,” *Current Anthropology*, vol. 46, no. 4, pp. 501–520, 2005.

- [32] G. Fulveti, "The mafia and the 'problem of the mafia': organised crime in Italy, 1820–1970," in *Organised Crime in Europe*, C. Fijnaut and L. Paoli, Eds., vol. 4 of Studies Of Organized Crime, pp. 47–75, Springer, Dordrecht, 2004.
- [33] T. C. Schelling, "What is the business of organized crime?," *The American Scholar*, vol. 20, pp. 71–84, 1971.
- [34] D. Gambetta, "Fragments of an economic theory of the mafia," *European Journal of Sociology/Archives Européennes de Sociologie*, vol. 29, no. 01, pp. 127–145, 1988.
- [35] E. Fehr and H. Gintis, "Human motivation and social cooperation: experimental and analytical foundations," *Annual Review of Sociology*, vol. 33, no. 1, pp. 43–64, 2007.
- [36] D. H. Wrong, "The oversocialized conception of man in modern sociology," *American Sociological Review*, vol. 26, no. 2, pp. 183–193, 1961.
- [37] J. Elster, *Explaining Social Behavior: More Nuts and Bolts for the Social Sciences*, Cambridge University Press, Cambridge, 2007.
- [38] H. Gintis, "A framework for the unification of the behavioral sciences," *Behavioral and Brain Sciences*, vol. 30, no. 01, pp. 1–61, 2007.
- [39] S. Lindenberg and L. Steg, "Normative, gain and hedonic goal frames guiding environmental behavior," *Journal of Social Issues*, vol. 63, no. 1, pp. 117–137, 2007.
- [40] S. Lindenberg and L. Steg, "Goal-framing theory and norm-guided environmental behavior," in *Encouraging Sustainable Behavior*, H. Trijp, Ed., pp. 37–54, Psychology Press, New York, NY, USA, 2013.
- [41] S. Bowles and S. Polania-Reyes, "Economic incentives and social preferences: substitutes or complements?," *Journal of Economic Literature*, vol. 50, no. 2, pp. 368–425, 2012.
- [42] E. Fehr and U. Fischbacher, "Social norms and human cooperation," *Trends in Cognitive Sciences*, vol. 8, no. 4, pp. 185–190, 2004.
- [43] T. R. Tyler, "Psychological perspectives on legitimacy and legitimation," *Annual Review of Psychology*, vol. 57, no. 1, pp. 375–400, 2006.
- [44] R. C. Ellickson, *Order without Law: How Neighbors Settle Disputes*, Harvard University Press, Cambridge, MA, USA, 1991.
- [45] H. Aarts and A. Dijksterhuis, "The silence of the library: environment, situational norm, and social behavior," *Journal of Personality and Social Psychology*, vol. 84, no. 1, pp. 18–28, 2003.
- [46] G. Andrighetto, J. Brandts, R. Conte, J. Sabater-Mir, H. Solaz, and D. Villatoro, "Punish and voice: punishment enhances cooperation when combined with norm-signalling," *PLoS One*, vol. 8, no. 6, article e64941, 2013.
- [47] C. Bicchieri, "The fragility of fairness: an experimental investigation on the conditional status of pro-social norms 1," *Philosophical Issues*, vol. 18, no. 1, pp. 229–248, 2008.
- [48] C. Bicchieri and A. Chavez, "Behaving as expected: public information and fairness norms," *Journal of Behavioral Decision Making*, vol. 23, no. 2, pp. 161–178, 2010.
- [49] C. Bicchieri, J. W. Lindemans, and T. Jiang, "A structured approach to a diagnostic of collective practices," *Frontiers in Psychology*, vol. 5, article 1418, 2014.
- [50] C. Bicchieri and E. Xiao, "Do the right thing: but only if others do so," *Journal of Behavioral Decision Making*, vol. 22, no. 2, pp. 191–208, 2009.
- [51] R. Cialdini, R. R. Reno, and C. A. Kallgren, "A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places," *Journal of Personality and Social Psychology*, vol. 58, no. 6, pp. 1015–1026, 1990.
- [52] K. Keizer, S. Lindenberg, and L. Steg, "The spreading of disorder," *Science*, vol. 322, no. 5908, pp. 1681–1685, 2008.
- [53] E. L. Krupka and R. A. Weber, "The focusing and informational effects of norms on pro-social behavior," *Journal of Economic Psychology*, vol. 30, no. 3, pp. 307–320, 2009.
- [54] E. L. Krupka and R. A. Weber, "Identifying social norms using coordination games: why does dictator game sharing vary?," *Journal of the European Economic Association*, vol. 11, no. 3, pp. 495–524, 2013.
- [55] A. Schram and G. Charness, "Inducing social norms in laboratory allocation choices," *Management Science*, vol. 61, no. 7, pp. 1531–1546, 2015.
- [56] C. Bicchieri, *The Grammar of Society: The Nature and Dynamics of Social Norms*, Cambridge University Press, Cambridge, 2006.
- [57] R. Conte, G. Andrighetto, and M. Campenni, Eds., *Minding Norms: Mechanisms and Dynamics of Social Order in Agent Societies*, Oxford University Press USA, New York, NY, USA, 2013.
- [58] J. Elster, "Social norms and economic theory," *The Journal of Economic Perspectives*, vol. 3, no. 4, pp. 99–117, 1989.
- [59] G. M. Hodgson, "What Are Institutions?," *Journal of Economic Issues*, vol. 40, no. 1, 2006.
- [60] J. E. Anderson and D. Dunning, "Behavioral norms: variants and their identification," *Social and Personality Psychology Compass*, vol. 8, no. 12, pp. 721–738, 2014.
- [61] Á. Székely, G. Andrighetto, and L. G. Nardin, "Social norms and extortion rackets," in *Social Dimensions of Organised Crime*, Computational Social Sciences, C. Elsenbroich, D. Anzola, and N. Gilbert, Eds., Springer, Cham, 2016.
- [62] J. Realpe-Gómez, G. Andrighetto, L. G. Nardin, and J. A. Montoya, "Balancing selfishness and norm conformity can explain human behavior in large-scale prisoner's dilemma games and can poise human groups near criticality," *Physical Review E*, vol. 97, no. 4, article 042321, 2018.
- [63] D. Helbing and A. Johansson, "Cooperation, norms, and revolutions: a unified game-theoretical approach," *PLoS One*, vol. 5, no. 10, article e12530, 2010.
- [64] M. Schlüter, A. Tavoni, and S. Levin, "Robustness of norm-driven cooperation in the commons," *Proceedings of the Biological Sciences*, vol. 283, no. 1822, p. 20152431, 2016.
- [65] C. J. Tessone, A. Sánchez, and F. Schweitzer, "Diversity-induced resonance in the response to social norms," *Physical Review E*, vol. 87, no. 2, article 022803, 2013.
- [66] S. Gavrilets and P. J. Richerson, "Collective action and the evolution of social norm internalization," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 114, no. 23, pp. 6068–6073, 2017.
- [67] T. Fent, P. Groeber, and F. Schweitzer, "Coexistence of social norms based on in- and out-group interactions," 2007, May 2018 <http://arxiv.org/abs/0708.4155>.
- [68] F. C. Santos, F. A. C. C. Chalub, J. M. Pacheco et al. F. Almeida e Costa, L. M. Rocha, E. Costa et al., "A multi-level selection model for the emergence of social norms," in *Advances in Artificial Life. ECAL 2007*, vol. 4648 of Lecture Notes in Computer Science, pp. 525–534, Springer, Berlin, Heidelberg, 2007.

- [69] F. P. Santos, F. C. Santos, and J. M. Pacheco, "Social norm complexity and past reputations in the evolution of cooperation," *Nature*, vol. 555, no. 7695, pp. 242–245, 2018.
- [70] D. Centola, R. Willer, and M. W. Macy, "The emperor's dilemma: a computational model of self-enforcing norms," *American Journal of Sociology*, vol. 110, no. 4, pp. 1009–1040, 2005.
- [71] C. Gräbner, "Agent-based computational models– a formal heuristic for institutionalist pattern modelling?," *Journal of Institutional Economics*, vol. 12, no. 01, pp. 241–261, 2016.
- [72] K. G. Troitzsch, "Distribution effects of extortion racket systems," in *Advances in Artificial Economics*, F. Amblard, F. J. Miguel, A. Blanchet, and B. Gaudou, Eds., vol. 676 of Lecture Notes in Economics and Mathematical Systems, pp. 181–193, Springer, Cham, 2015.
- [73] K. G. Troitzsch, "Extortion racket systems as targets for agent-based simulation models. Comparing competing simulation models and empirical data," *Advances in Complex Systems*, vol. 18, no. 05n06, article 1550014, 2015.
- [74] K. G. Troitzsch, "Extortion rackets: an event-oriented model of interventions," in *Social Dimensions of Organised Crime*, Computational Social Sciences, C. Elsenbroich, D. Anzola, and N. Gilbert, Eds., pp. 117–131, Springer, Cham, 2016.
- [75] B. Sonzogni, F. Cecconi, and R. Conte, "On the interplay between extortion and punishment. An agent based model of "Camorra"," *Sociologia e Ricerca Sociale*, vol. 33, no. 99, pp. 65–77, 2012.
- [76] C. Elsenbroich, "The Addio Pizzo movement: exploring social change using agent-based modelling," *Trends in Organized Crime*, vol. 20, no. 1-2, pp. 120–138, 2016.
- [77] C. Elsenbroich and J. Badham, "The extortion relationship: a computational analysis," *Journal of Artificial Societies and Social Simulation*, vol. 19, no. 4, p. 8, 2016.
- [78] B. Müller, F. Bohn, G. Dreßler et al., "Describing human decisions in agent-based models – ODD + D, an extension of the ODD protocol," *Environmental Modelling & Software*, vol. 48, pp. 37–48, 2013.
- [79] R. Albert and A.-L. Barabási, "Statistical mechanics of complex networks," *Reviews of Modern Physics*, vol. 74, no. 1, pp. 47–97, 2002.
- [80] A. Voinov and F. Bousquet, "Modelling with stakeholders," *Environmental Modelling and Software*, vol. 25, no. 11, pp. 1268–1281, 2010.
- [81] A. M. Ramanath and N. Gilbert, "The design of participatory agent-based social simulations," *Journal of Artificial Societies and Social Simulation*, vol. 7, no. 4, 2004.
- [82] B. P. Zeigler, *Theory of Modeling and Simulation*, John Wiley, New York, NY, US, 1976.
- [83] A. Scaglione and R. mafiose, *Cosa Nostra e Camorra: organizzazioni criminali a confronto*, Franco Angeli, Milano, Italy, 2011.
- [84] G. D. Cagno and G. Natoli, *Cosa nostra ieri, oggi, domani: la mafia siciliana nelle parole di chi la combatte e di chi l'ha abbandonata*, Edizioni Dedalo, 2004.
- [85] A. Dino, *Gli ultimi padrini*, Indagine sul governo di Cosa Nostra, Laterza, Roma, 2011.
- [86] S. Palazzolo and M. Prestipino, *Il codice Provenzano*, Laterza, Roma, 2007.
- [87] K. G. Troitzsch, "Survey data and computational qualitative analysis," in *Social Dimensions of Organised Crime*, Computational Social Sciences, C. Elsenbroich, N. Gilbert, and D. Anzola, Eds., Springer, Cham, 2016.
- [88] V. Militello, "Legal norms against the Italian mafia," in *Dimensions of Organised Crime*, Computational Social Sciences, C. Elsenbroich, N. Gilbert, and D. Anzola, Eds., Springer, Cham, 2016.
- [89] L. Orlando, *Fighting the Mafia and Renewing Sicilian Culture*, Encounter Books, San Francisco, CA, USA, 2001.
- [90] R. Godson, "Guide to developing a culture of lawfulness," *Trends in Organized Crime*, vol. 5, no. 3, pp. 91–102, 2000.
- [91] R. Godson, D. J. Kenney, M. Litvin, and G. Tevzadze, "Building societal support for the rule of law in Georgia," *Trends in Organized Crime*, vol. 8, no. 2, pp. 5–27, 2004.
- [92] F. Varese, "Protection and extortion," in *The Oxford Handbook of Organized Crime*, L. Paoli, Ed., Oxford University Press, 2014.



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