

Land Reform, the Market for Protection and the Origins of the Sicilian Mafia: Theory and Evidence.

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Abstract

Historical records show that the Sicilian mafia developed to protect land from predatory attacks, at a time when publicly provided security was scarce and banditry widespread. Using a common-agency model, the paper shows that: (i) it is optimal for each landowner to voluntarily buy protection even if this results in a worse equilibrium for the landowning class and (ii) other things equal, mafia profits are higher where land is more fragmented. The argument is based on the fact that protection involves an externality, in the sense that by buying protection each landowner deflects thieves on others' properties. Using qualitative data from a parliamentary survey (1881), the paper also shows that in 19th century rural Sicily mafia was in fact more likely to be active in towns where land was more divided.

Keywords: protection, property rights enforcement, common agency, Sicily-history

JEL Classification: O17, D23, C70, N43

The mafia is, essentially, nothing but the expression of a need for order, for the control of a State.

Giovanni Falcone¹

1. Introduction.

Historical records and recent scholarly writings² show that the Sicilian mafia first developed during the nineteenth century, in a context characterised by frequent predatory attacks on private property and insufficient public security. In such circumstances, the mafia sold what the State did not provide: protection and enforcement of property rights.³

One of the most significant events preceding the rise of the mafia was the abrogation of feudalism and, as a consequence, the division of large feudal estates that resulted in the establishment of modern property rights and in a dramatic increase of the number of landowners. This paper aims to assess whether and how the division of landholdings fostered the development of the mafia. The paper presents both a new theoretical framework and some original empirical evidence suggesting that land fragmentation did promote mafia activity through an increase in the demand for private protection. Using a common-agency model, the paper shows that an increase in the number of landowners for a given extension of land increases the competition for protection and hence the profits of the enforcer. This prediction is tested on a unique dataset compiled by the Author on the basis of parliamentary surveys⁴ that contain information on land fragmentation and mafia activity in late nineteenth-century Sicily. The results suggest that, in line with the theory, the mafia was more likely to be active in towns where land was more divided.

The theoretical argument rests on the fact that protection involves an externality because by buying protection each landowner deflects thieves on others' properties.⁵ For each landlord protection is therefore more valuable if he is one of the few to receive it, which implies that each landlord is willing to pay more if only a few receive protection. As the number of landlords

increase, there are more landlords who would pay to keep some out, which implies that the surplus received by the mafia increases with the degree of land fragmentation. Interestingly, the model shows that land fragmentation generates competition for protection even if the assets in need of protection are unchanged and that, as expected, mafia's revenues are higher if there are more assets in need of protection. The model also suggests that the mafia is "more active", i.e. it offers more protection, in areas where landholdings are more divided. Finally, the model shows that even if the cost of protection is low, mafia will optimally choose not to offer full protection. This implies that, as observed in reality, some thefts will take place and thieves go unpunished even if properties are under the protection of the mafia.

Although data on mafia's profits are, not surprisingly, unavailable, information on mafia's presence in different towns can be used to assess whether the predictions of model are consistent with the empirical evidence. To the extent that higher potential profits increase the probability that the mafia is active in a town, the variables that have a positive impact on profits increase the likelihood of observing mafia activity in that town. To this purpose, I have extracted and coded qualitative information from a 1881 parliamentary survey. The final dataset contains information on land fragmentation and on the intensity of mafia activity in seventy Sicilian towns. The estimates indicate that the mafia was more likely to be active in towns where land was more divided and that the intensity of mafia activity was positively correlated with the degree of land fragmentation. Although, due data limitations, a rigorous test of the theory is not feasible, the empirical evidence is at least clearly consistent with the theoretical predictions.

It is important to notice that, although it is the exclusive focus of this paper, protection of property rights was not the only activity the mafia was involved in. Noticeably, the mafia also provided cartel enforcement, for instance to millers in the neighbourhood of Palermo as early as 1876.⁶ Cartel enforcement is one of the few services that the mafia provided throughout its history, from the origins to Depression Era Chicago (Alexander, 1997) to contemporary U.S. and Sicily (Gambetta and Reuter, 1995). Finally the view of the mafia as enforcer is not inconsistent

with the fact that the mafia also practised extortion and that the class of landowners was ultimately damaged by its existence. The two views can be reconciled as follows. First, the mafia was both an enforcer and an extorter. It gained legitimacy through the enforcement services it provided to the upper classes and then exploited the power and violent reputation thus acquired to threaten others and extract rents via extortion. Second, that landowners bought protection from the mafia is not necessarily inconsistent with the landowning class as a whole to be worse off as a result. Indeed, protection entails a negative externality that individuals do not take into account. Due to the externality, every landlord was better off by purchasing protection even if that resulted in a Pareto-inferior equilibrium for the land-owning class as a whole. In other words, the landlords faced a classical prisoners' dilemma situation where everybody would have been better off if nobody had purchased protection and yet purchasing protection was a dominant strategy for each individual landlord.

The remainder of the paper is organised as follows. Section 2 discusses the related literature. Section 3 describes the market for protection in nineteenth-century rural Sicily and then draws from police reports and parliamentary inquiries to illustrate the role of the mafia as enforcer. The formal model is introduced in Section 4. Section 5 presents the empirical results, Section 6 concludes.

2. Related Literature.

The analysis in this paper builds on the work of Franchetti (2000)⁷ and Gambetta (1993), who present a detailed account of the origins of the Sicilian mafia. Both Authors argue that the mafia originally sold landowners protection from predatory attacks when State enforcement was not available. Both Authors also stress the fact the division of landholdings played a fundamental role for the development of the mafia. The core of the argument is that land fragmentation increased the supply of private protection since it led to the dismemberment of feudal armies and

to former soldiers becoming autonomous private enforcers. Franchetti (2000:81) writes: *“The difference in social relationships brought about by the abolition of feudalism came down to this: Just like wealth, tyrannical acts became accessible to a greater number of people, and the class of villains, who before had been at the service of the barons, became independent; so in order to obtain their services it became necessary to deal with them as equals.”*

This paper offers two contributions to the analysis of the origins of the Sicilian mafia as in Franchetti (2000) and Gambetta (1993). First it builds a theoretical framework to analyse the effect of land fragmentation on the demand for, rather than the supply of, private protection. Second, it collects and analyse previously unexplored data on mafia activity at the end of the nineteenth century.

The theoretical framework in this paper is closely related to that employed by Milhaupt and West (2000) and Varese (1994) to analyse the Japanese and the Russian mafias, respectively. Milhaupt and West (2000) show that the yakuza developed in post-feudal Japan, which, like Sicily and Russia, was characterised by a dramatic increase in private property rights unaccompanied by the necessary State enforcement. And again, there were groups, in this case hoodlums and disenfranchised samurai, willing and capable to supply private protection. Milhaupt and West (2000) also show that, due to the current deficiency of State-supplied enforcement, contemporary yakuza groups still provides private enforcement in areas such as dispute mediation, real estate foreclosure, corporate monitoring, lending and crime control.⁸ Compared to most studies of organized crime that are, due to obvious data limitation, exclusively theoretical, Milhaupt and West (2000) collect data to test their theory. The results shows that, over twenty-five years, yakuza membership (a direct proxy of the importance of organized crime) is negatively related to the number of civil cases filed in district court, thus providing support for the idea that the yakuza substitutes for State enforcement.

Varese (1994) shows that the Russian mafia started during the transition to capitalism, at a time when, like in Sicily, institutional reforms caused the diffusion of private property without

matching State enforcement, thus creating a strong demand for private protection. Like the Sicilian feudal guards, ex-KGB officers and unemployed soldiers were available and able to satisfy such demand. Frye and Zhuravskaya (2001)'s survey shows that indeed Russian shopkeepers view protection rackets as substitutes for ineffective police protection.⁹

To the extent that the mafia had a monopoly over violence and its original function was to enforce property rights, the analysis of the origins of the mafia raises similar issues to that of the origins of the State. The literature on the topic is extremely vast and even a sketchy review goes well beyond the scope of this paper.¹⁰ It is however important to highlight two key issues. First the questions of the origins of the State and that about the origins of the mafia differ in one important dimension. The first is necessarily linked to the question of the origins of the rights that the State is meant to enforce (Sened, 1997). That the mafia, on the other hand, developed to enforce pre-existing rights simplifies the analysis considerably. Second, I follow the most recent literature, both in political science and economics, and assume that the enforcer, in this case the mafia, maximises its own welfare. A common assumption in this literature, however, is that the stability of such regimes ensues because all agents are better off than in anarchy. Quoting from Levi (1988): “*Policies are the outcome of an exchange between the ruler and the various group who compose the polity. Policies are a function of rulers’ terms of trade. Rulers negotiate contracts with their agents and constituents and each set of actors attempts to attain the best possible terms. **Contracts are possible only if they make each party better off.***” (p11, emphasis added). The economic literature has a similar flavour. Grossman (1997) provides a justification as to why a society might prefer protection from a “king” to decentralised protection, even if the king is “predatory”. He analyses a general equilibrium model in which the predators’ success rate depends on total resources devoted to protection. The result then follows because individual producers do not internalise this positive externality whereas the king does. Similarly, Olson (1993) argues that a predatory king would provide public goods that increase national output if doing so would allow him to extract more revenue. This paper, in contrast, shows that a predatory regime, the mafia, can emerge and last

even if all agents would be better off in anarchy. The result here follows from the fact that when buying protection each agent ignores the negative externality he imposes on others and that agents cannot co-ordinate to play the Pareto-superior equilibrium. DeMeza and Gould (1992) make a similar point by showing that because of the negative externality, decentralised purchase of protection might yield an inefficient outcome. Compared to theirs, this paper takes the argument further by analysing the impact of alternative distribution of property rights on the surplus received by the group that sells protection.

Finally, the paper relates to the large literature on collective action (Olson, 1965, Hardin, 1982, Ostrom, 1990, Calvert, 1995). Landlords face the standard prisoners' dilemma: everyone would be better off if nobody hired the mafia for protection, yet buying protection is a dominant strategy for each landlord.

In the same spirit as Olson (1965), this paper suggests that group size matters. The reason it matters, however, differs. Olson (1965) argues that small groups are more likely to solve the free-rider problem, hence to co-ordinate on the Pareto-superior equilibrium. In his formulation, however, group size only matters because is paired with some of the factors that affect the incentive to free ride.¹¹ The first of these is the distribution of benefits. That is, small groups are more likely to be "privileged" in the sense that there is at least one member for whom co-operation is a dominant strategy and who, therefore, provides the public good (which, in this case, could be an army, in substitution of the mafia). The second important difference between small and large groups is the effectiveness of punishment schemes. If the game is infinitely repeated the co-operative outcome can be sustained by equilibrium strategies whereby deviating players are punished for a number of periods either by the player they cheated upon, when they are paired again, or by the group as a whole if players share information. The punishment mechanism might therefore be less effective in large groups either because repeated encounters among a given pair of players are less likely or because communication is more costly (Calvert, 1995).

However, if “privilege” or reputation are not relevant in the case under study, group size does not affect the outcome. In the light of this discussion, it is not surprising that the available empirical evidence does not find a clear link between group size and the likelihood of co-operation. In the case studies analysed by Ostrom (1990:188-190) small group size was neither necessary nor sufficient for success. Similarly, experimental results suggest that group size does not affect the likelihood of observing the co-operative outcome if all other relevant factors are controlled for (see Isaac *et al.*, 1994, Ledyard, 1995).¹²

In contrast to Olson’s, in my model agents never co-operate, regardless of how many they are. In other words, the Pareto-inferior equilibrium “everybody buys protection” is always chosen.¹³ Groups size matters because, due to the specific nature of protection, it determines the equilibrium price landlords are willing to pay for protection hence the surplus received by the mafia and the level of mafia activity. That is, in my model group size matters *per se*, rather than through its effect on other variables.

3. The market for protection and the origins of the Sicilian mafia: historical evidence.¹⁴

At the beginning of the nineteenth century Sicily still had a feudal structure. Since the foreign governments that ruled the island during the previous centuries always relied on the local upper classes to manage public affairs, power resided traditionally in the hands of a few noble families. The barons enjoyed feudal lordship over about three quarters of the villages. Each baron ruled over vast extensions of land (fiefs) and maintained an army to protect the fields and police the peasants. Agriculture was the most important economic activity; the barons owned most of the land and farmed it on an extensive basis. Since most aristocrats lived in Palermo or Naples, they generally appointed large tenants “*gabelloti*” to manage their land.

The creation of a system of modern property rights began in 1812 when feudalism was officially abolished and common land privatised. The Bourbons, who ruled from 1816 to 1860, promulgated a number of laws to remove all remaining feudal institutions and to promote land

redistribution. The most relevant laws were promulgated in 1820 (abolition of primogeniture), in 1824 (seizure of land in settlement of debts) and in 1841 (order of giving to the peasants property rights over at least one fifth of the land where common rights were enjoyed before 1812). To the same purpose in 1862-3 the newly formed Italian State confiscated and redistributed to the private sector a large share of public and church landholdings. As a consequence of the abrogation of feudalism and of the land reforms that followed the number of landowners enjoying private property rights increased drastically. Mack Smith (1968) estimates that between 1812 and 1860 the number of large landowners increased from 2000 to 20,000.

Although huge fiefs were divided into smaller properties the land reform did not enhance production efficiency as the new owners kept the production methods previously adopted by the feudal lords. The plots were still farmed on an extensive basis and rented to *gabelloti*, who, since they were appointed for a short period of time, had no incentive to invest their earnings in the land.^{15,16}

The life standard of the peasants declined steadily during the 19th century; Mack Smith (1968) reports that between 1798 and 1861 population increased by 0.4 millions while, due to the unchanged production structure, agricultural output remained fairly constant. Many of the peasants turned to banditry, especially during the periods of high unemployment. Banditry strongly increased during the 19th century with six major risings in 1820, 1837, 1848, 1860, 1866 and 1893. The most common crime was cattle rustling, favoured by the lack of a permanent presence on the land, especially at night. In fact, one striking feature of the Sicilian countryside in the nineteenth century was the lack of settlements in the countryside. The new landowners, as the feudal barons before them, preferred to live in large cities. Peasants did not live in the countryside either. Indeed, since the farming techniques did not require permanent workers, most peasants were employed daily and had to live in the closest town to be physically present at the market for daily workers.

Publicly provided security was quite insufficient: *"Twenty-five "Companies at Arms" policed the countryside, but altogether there were usually less than 350 policemen for the whole island. Two or three times a year a company of troops would arrive in each town and round up a token number of malefactors, but this would be followed by another few months of complete impunity."* (Mack Smith, 1968). A peculiar feature of the "Companies at Arms" was that they were mostly made up of former bandits and other criminals. The rationale behind this choice was that these individuals had better information at the local level. Their knowledge of former colleagues, however, often resulted in collusion rather than persecution.¹⁷ The situation did not improve when the Italian State took over. In fact, more than a decade years after unification (1874-5) the Parliament was still debating whether extreme measures should be adopted to fight crime in Sicily.¹⁸ Reports from Sicilian magistrates to the Ministry of Justice in 1874 present a clear picture of the state of Public Security : *"Why is it that in the rural areas of Western Sicily public security is so ineffective that can be considered non-existent? Why are people in the countryside more afraid of criminals' guns and knives than they are of the Law? The answer is: because public force is completely overcome by the strength of criminals"* (reprinted in Russo, 1964:32). Contemporary observers agreed that such state of affairs was essentially due to two factors. First, the large number of bandits had been accustomed, by direct experience and by tradition, to centuries of weak law enforcement. Second, the Italian law enforcement bodies lacked coordination¹⁹ and were, compared to the number of bandits, seriously understaffed.²⁰

In summary, widespread banditry, the inadequacy of publicly provided security and the lack of permanent settlements in the countryside generated a strong demand for private protection. The armed guards, formerly at the service of the feudal lords, had the skills and the willingness to meet such demand. Land reform was crucial for the development of the mafia: after the abrogation of feudalism the guards gained autonomy and offered their services to a larger number of clients.²¹

Police reports, parliamentary surveys and scholarly writings all present evidence that landowners hired the mafia to protect their properties from predatory attacks. The evidence also shows that

the services²² provided to the upper classes gave the mafia legitimacy and power, which it then used to start an independent career and pursue its own interests. The Bonfadini Report (1876) reads: *“Eventually the landowners preferred to hire the best and most violent bandits as guardians of their properties, thus using the criminal reputation of one as a defence against the crimes of others and creating a sort of profession or career for the most daring criminals.”* Russo (1964:196).

In a report to the Ministry of Justice, a Sicilian magistrate wrote: *“..at the same time the mafia gives and receives protection; and the more people ask for mafia’s help rather than for legitimate enforcement, the stronger it becomes.”* Russo (1964:34). Franchetti (2000) argues that landlords hired the mafia even if they ended up suffering from its rapidly acquired power: *“indeed, notwithstanding the fact that the industry of violence has its own interests and independent reasons to exist, it is the upper classes that put it in these conditions and allow it to survive. If the upper classes wished to destroy such industry, they would have both the means and the moral authority to do so. Nor it can be maintained that either the fact that the upper classes are occasionally damaged by the mafia or the fact that they complain about how much power it has acquired can be taken as a proof that it has by now overpowered them. Because if the ruling classes want to employ the violent groups for their own purposes, they must let them pursue their own independent interests.”* Franchetti (2000) p.113-4.

Finally, it is worth noting that the mafia was not, at least at its onset, a formal organisation regulated by rules or laws. The Bonfadini Report (1876) reads: *“The mafia is not an association that has established set forms or special structures; neither is it a temporary grouping of criminals with a transitory or precise aim; it does not have statutes, it does not pay dividends, it does not hold meetings, it does not have leaders.”*. Russo (1964), p.182 Similar evidence can be found in police reports and other Parliamentary inquiries.²³ Although a centrally coordinated organisation did not exist, *mafiosi* operated in small groups called “*cosche*”. Generally there was only one group in each village, with the exception of larger towns where two or more groups shared the territory. Groups hardly interacted with one another, except for occasional co-operation (e.g. recovery of stolen goods) or for border wars.²⁴

4. The model: land division and the rise of the mafia.

The analysis above suggests that the creation and diffusion of property rights on land, which followed the abrogation of feudalism, played an important role for the development of the mafia. This section builds a formal model to analyse the market for protection and the link between land fragmentation and mafia activity. It is assumed that each landlord faces a positive probability of getting his income stolen and that he can buy protection from the mafia to decrease that probability. The interaction between mafia and landlords is modelled as a game in two stages. In the first stage, identical landlords offer the mafia a monetary reward to protect their land income from theft. Since, as noted above, each landlord values protection more when he is one of the few to get it, the monetary reward each landlord offers will reasonably depend on how many other landlords receive protection. Landlords will thus propose a menu of offers, one for each combination of protected/unprotected landlords.²⁵ In the second stage, the mafia looks at the landlords' offers and decides how many to protect in order to maximise the sum of contribution. It will be shown that an equilibrium where each landlord buys protection always exist and land fragmentation --i.e. an increase in the number of landlords for a given extension of land-- generates competition for protection, which, in turn, promotes mafia activity.

4A. Set up.

Consider a fixed amount of land that yields income Y and that, after the reform, is equally divided among n landlords. Based on the evidence in section 3, I assume that there are constant returns to scale, that is, total income Y is independent of n .²⁶ Land is subject to predatory attacks by bandits, whose supply is assumed to be inelastic.²⁷

Furthermore I assume that:

- (i) if a landlord is not protected he is always attacked and all his income is stolen;

- (ii) the mafia can successfully protect an exogenously fixed share π^* of total land income.

Assumption (i) is without loss of generality.²⁸ (ii) is relaxed in Section 4.C where the mafia is allowed to choose π^* .

Denote by $\mathbf{p}=(p_1,p_2 \dots p_n)$ a “protection vector” where $p_j=1$, if landlord j is protected and $p_j=0$ if he is not. Let \mathbf{p}^k denote a protection vector such that $(n-k)$ landlords are protected and k are not. Let $(1-\mathbf{p}^{n-k}(\mathbf{p}^k))$ denote the probability that a landlord gets his income stolen if he belongs to the group of the $(n-k)$ protected landlords while $(1-\mathbf{p}^k(\mathbf{p}^k))$ denotes the probability that a landlord gets his income stolen if he belongs to the group of the (k) unprotected landlords. As shown in the Appendix, assumptions (i) and (ii) imply that

$$\begin{aligned} (1-\mathbf{p}^k(\mathbf{p}^{-k})) &= 1 \\ (1-\mathbf{p}^{n-k}(\mathbf{p}^{-k})) &= \max\left\{0, 1 - \frac{n}{n-k}\mathbf{p}^*\right\} \quad k = 0, \dots, n-1 \end{aligned} \quad (1)$$

That is, if a landlord is not protected his income is stolen with probability one. If a landlord is protected and there are many unprotected landlords (that is if $k > (1-\mathbf{p}^*)n$) then the probability of his income being stolen is zero. If many landlords are protected (that is if $k < (1-\mathbf{p}^*)n$) each protected landlord gets his income stolen with probability $(1-n/(n-k)\mathbf{p}^*)$ which is higher the lower the number of unprotected landlords. Note that each landlord values protection more if he is the only one or one of the few to be protected because thieves would rather attack unprotected property. This implies that landlords compete for protection because every protected landlord imposes a negative externality on the others, making their protection less valuable.²⁹

Since the mafia protects property income rather than people, the cost of providing protection only depends on the extension of land protected rather than on the number of landlords who own it. Without loss of generality³⁰ the model assumes that the cost of protection is negligible, on the grounds that protection offered by the mafia was a matter of reputation rather than of effective patrolling. Blok (1968)'s interview with an former estate manager provides an illuminating example: "...cattle rustling were rampant at the time (...) when we employed a *campiere-mafioso*³¹ the robberies stopped. We paid the man a regular yearly salary, but he only rarely inspected our farm. Now and again he would turn up. (...) he did not need to bother about much more than just these occasional visits, since he let it be known that he kept watch over that particular estate." Also: "...once the mafioso has succeeded in successfully playing the part of protector he is soon regarded as competent in those things...The smooth progress of his enterprise is guaranteed less by actual physical force and increasingly by this competence attributed to him" (Hess, 1973:146).

The model does not deal with the acquisition of reputation. The evidence suggests that this was exogenously determined by the previous activity of the *mafiosi* as armed guards of the baron on the same land. For instance: "...frequently a field guard enjoys the reputation of having already committed one or two murders. Once he is surrounded by this aura his career is made and he has become a person who must be feared... a necessary and therefore better paid person" (Cutrera, 1900)

4B. Solution Concept and Results.

Denote by $f_i(\mathbf{p})$ landlord i 's contribution schedules. Landlord i 's net payoff is then equal to $q(\mathbf{p}) - p_i(\mathbf{p}) - f_i(\mathbf{p})$ where $q(\mathbf{p})$ is defined by (1). The timing of the game is as follows: in the first stage each landlord chooses $f_i(\mathbf{p})$, in the second the mafia chooses p to maximise the sum of contributions.

The equilibrium concept used here is that of truthful Nash equilibrium (TNE). The analysis is based on Bernheim and Whinston (1986) and Laussel and Le Breton (2000).

Following Bernheim and Whinston, $(\{f_i\}_{i=1}^n, p^*)$ is a Nash equilibrium if and only if³²:

(i) $f_i(p) \geq 0$ for every i and p ;

(ii) $p^* = \arg \max \sum_{i=1}^n f_i(p)$;

(iii) $p^* = \arg \max \left(p_i(p)y_i + \sum_{j \neq i} f_j(p) \right), \forall i, p$;

(iv) there exists p_i that satisfy (ii) such that $f_i(p_i) = 0$ for all $i=1, \dots, n$.

Condition (ii) must hold since the mafia is assumed to maximise its payoff. Condition (iii) must hold otherwise landlord i could be better off by offering an infinitesimally bigger contribution for the p in which (iii) is violated. Finally condition (iv) is needed because if there was not such a value, landlord i could be strictly better off by lowering his offers for every choice without affecting the mafia's decision.

Bernheim and Whinston show that every truthful Nash equilibrium --defined as a Nash Equilibrium supported by truthful strategies³³-- is coalition-proof; that essentially truthful equilibria are the only coalition-proof equilibria; and that players can choose to play truthful strategies at no cost (i.e. every player's best response correspondence contains a truthful strategy). Formally, $f_i(\cdot)$ is a truthful contribution schedule if and only if:

$$f_i(p, W_i) = \max(0, p_i(p)y - W_i),$$

where W_i is some base level of welfare. A truthful strategy is such that for every p the landlords offer their "net willingness to pay" that is, for every p they offer an amount that is equal to the difference between their gross payoff at p and some base level gross payoff.

The following lemmas characterise the solution. Proofs are reported in the Appendix.

Lemma 1. *The TNE vector of protection must satisfy:*

$$p^* = \arg \max \sum_{i=1}^n p_i(p)y$$

Lemma 2. *Every landlord buying protection ($k=0$) is always a Truthful Nash Equilibrium. If n is small (i.e. $n < 1/(1-p^*)$), $k=0$ is the unique TNE. If n is large (i.e. $n \geq 1/(1-p^*)$) and $\mathcal{S}k$ s.t. for all $k < k'$ $p^* < (n-k)/n$; then all the vectors such that k ($< k'$) landlords are not protected are TNE protection vectors.*

Laussel and Le Breton (2000) show that if there is enough orthogonality between the interests of the principals the equilibrium payoffs are unique, even if the equilibrium is not (Proposition 3.3) Using their result, it can be shown that:

Lemma 3. *For any given n equilibrium payoffs are unique. Equilibrium contributions are equal to:*

$$f(p^*) = (n-1)(y - p^* y) \quad \text{for } n < 1/(1-p)$$

$$f(p^*) = (n-k-1) \left(\frac{n}{n-k-1} p^* y - \frac{n}{n-k} p^* y \right) \quad \text{for } n \geq 1/(1-p), \quad \forall k = 0..k'$$

Equilibrium contributions are such that in every TNE each landlord's net payoff is equal to the variation in total surplus that occurs when he joins the equilibrium coalition. Intuitively, the marginal landlord has to pay enough to make the mafia indifferent between protecting him or not. That is, he has to compensate for the fact that the protected landlords are willing to pay more to leave him out. The term on the RHS represents the difference between what the protected landlords would pay if the marginal landlord were left out and what the protected landlords would pay if the marginal landlord were protected as well. When $n < 1/(1-p^*)$ the $(n-1)$ protected landlords would receive y if the marginal landlord were not to be protected and p^*y if he were. When $n \geq 1/(1-p^*)$, each landlord is "too small" so that even if one landlord is left out,

something will be stolen from the protected landlords. It follows that when $n \geq 1/(1-p^*)$, the $(n-k-1)^{34}$ protected landlords would receive $\frac{n}{n-k-1} p^* y$ if the marginal landlord were not to be protected and $\frac{n}{n-k} p^* y$ if he were.

Lemma 1 to 3 yield the following:

Proposition 1: *The payoff of the mafia is always non-decreasing in the number of landlords. For given Y and p^* , the mafia's payoff is increasing in n until $n=1/(1-p^*)$, and constant thereafter.*

Proof:

The mafia's payoff in every TNE equals the sum of landlords' contribution. Using Lemma 3 it can be shown that:

$$S(p^*) = \sum_{i=1}^n f_i(p^*) = (n-1)(1-p^*)Y \quad n < \frac{1}{1-p^*}$$

$$= p^* Y \quad n \geq \frac{1}{1-p^*}$$

(2)

Taking the derivative of (2) with respect to n proves the result.

place Figure 1 here

Intuitively, the mafia's payoff depends on n in two ways. First, as n increases the number of landlords willing to pay to keep just one without protection increases (this is captured by the $(n-1)$ term in (2)). Second, the probability of getting one's income stolen when all but one landlord are protected is increasing in n for n large. That is, when the land is divided among a few, the share of

each is such that if only $(n-1)$ are protected they face zero probability of getting their income stolen. In other words the income of the unprotected landlord is greater than what the mafia can successfully protect. Then, the difference in gross payoff for each of the $(n-1)$ protected landlords in the case when the n^{th} is not protected and when he is, equals $(1-p^*)y_i$. For n sufficiently large the share of the last unprotected landlord is too small and something must get stolen from those who are protected. In this case the difference in gross payoffs is equal to $\left(\frac{n}{n-k-1}p^* - \frac{n}{n-k}p^*\right)y$, which is decreasing in n . Since when n is small relative to p^* the first effect prevails, for n small the mafia's payoff is increasing in n . When n is large the surplus received by the mafia is constant in n because the increase in the number of landlords who are willing to pay to keep just one out is exactly matched by the decrease in the difference of gross payoffs.

From (2) it follows that:

Fact 1. *Given n and p^* , an increase in land income (Y) increases the payoff of the mafia.*

Fact 1 implies that if, as a consequence of land fragmentation, land income increases, the effect of land fragmentation on the profits of the mafia is even stronger.

Finally, it is important to note that in this model setting protection costs equal to zero is just a normalisation. Indeed, since the mafia protects properties rather than people, the cost of protection is just a function of the extension of land protected, regardless of the degree of fragmentation. The division of landholdings would not, therefore, have any effect on costs and similar results would obtain even if providing protection were costly.

4c. Why does mafia tolerate (and may encourage) a positive level of thefts.

The model can be extended to take into account that, even if in the short run the mafia's policing technology has an exogenous upper limit, in the long run the mafia will choose π^* in

order to maximise its profits. Formally π^* can be endogenised by transforming the game into a three stage game in which the mafia chooses π^* in the first stage. It can be shown that:

Proposition 2. *For any Y , the mafia's payoff is maximised when $p^*=(n-1)/n$. Hence the mafia will offer more protection (higher p^*) when land is divided among many landlords.*

Intuitively, the mafia's surplus is increasing in the level of competition between landlords, which, in turn, is maximised when up to $(n-1)$ landlords can receive their full income. It is interesting to note that the optimal π^* is always less than one, implying that successful thefts will take place in equilibrium. In other words, it is optimal for the mafia to tolerate some positive level of stealing because this keeps the demand for its services high. This also implies that in equilibrium the mafia itself might commission some thefts.

4D. Related issues.

In this model, landlords "move first" by offering the mafia a menu of contributions. Reversing the order of moves, that is modelling the mafia as a monopolist that sells protection to maximise its profits, does not alter the results as long as the mafia internalises the fact that each landlord's willingness to pay depends on how many other landlords receive protection.

The results of the model follow from the externality that characterises private protection, which, in turn, generates competition among landlords. Similar results would obtain if land reform were to increase land income as this would increase the demand for protection. This effect, however, was probably quite weak in 19th century Western Sicily. According to the historical evidence, in fact, the division of landholdings that took place after the abrogation of feudalism had little impact on productivity.³⁵

The mafia is modelled as a single agent, thus ruling out the analysis of the internal structure of the groups and of the competition among different groups. The internal dynamics of the group bear no consequence for the analysis since the group interacted like a single entity

towards other agents. Ruling out competition is of no consequence either. Indeed, although other groups sometimes tried to enter the market, disputes over territory would typically be resolved by violence rather than by price competition, implying that landowners would always deal with one group only, even if a different one from time to time.

Finally, since income is assumed to be fixed, the model does not deal with the impact of mafia on investment incentives and economic development. It is commonly accepted that the mafia deterred investment in Western Sicily since it would capture a considerable share of the potential returns. This has often been offered as an explanation for the lack of productive investments and the consequent economic under-development of Western Sicily. Still, if the increase in income was to be captured by the mafia, one should wonder why the mafia itself did not promote investment on the land. It is known that, instead, mafia members used the proceedings of their activity to rent land or to buy some of their own. Intuitively, investing might have been sub-optimal because it would have undermined the conditions that were at the basis of the mafia's existence. More productive farming methods required workers to reside permanently on the land: if these methods were adopted, patrolling needs and the demand for protection would have been reduced. Also, investment would have improved the living standards of the peasants thus reducing their need to steal. Since as a consequence of economic development the demand for its services would have fallen drastically, promoting development was not in the mafia's best interest.

5. Some Empirical Evidence.

The model predicts that the profits of the mafia depend positively on the number of landlords (n) and on land income (Y). Because of the negative externality that each landlord imposes on others when he buys protection, landlords compete for protection and the competition is stronger when there are many landlords. It follows that an increase in the number of landlords increases the mafia's profits for any level of income.

Data on profits are, not surprisingly, unavailable but since higher profits increase the probability that the mafia is active in a given town, the predictions of the model can be tested using data on the presence, rather than the profits, of the mafia.

The 1881 Parliamentary Survey (Damiani 1881) contains qualitative information on mafia activity and land fragmentation in seventy towns in Western Sicily. Based on that information, I have coded the following variables:

- (i) **mafia activity (*mafia*).** *mafia* equals 0,1,2,3 if there is no mafia activity, if mafia activity is very limited, if there is mafia activity and if mafia activity is very strong. Coded from interviews with the Chief Prosecutor of each town.³⁶
- (ii) **proxy for number of landlords (*land fragmentation*).** The information on the degree of land fragmentation is used as a proxy for the number of landlords in each town. Information on land fragmentation was extracted from interviews with town mayors, who were asked to report whether most of the land was concentrated in small, medium or large landholdings. The data is well suited for the purpose of this paper because it is possible to separate towns in which land was divided, that is where “small” and “medium” holdings prevailed, from towns in which land still belonged to a few – sometimes just one- noble families (“large” landholdings). Unfortunately, since different mayors had different opinions about the size of “small” and “medium” landholdings, the latter distinction might not be very reliable. In the regressions, *frag* = 1 if the mayor reported that most of the land was concentrated in small or medium holdings.³⁷
- (iii) **proxies for the need of protection (*vines*).** *Vines* is the ratio of vineyards to total cultivated land. Since vines are more valuable than grain crops and hence need more protection, the variable *vines* is thus used as a proxy for land income.
- (iv) **province dummies (*prov*)** The sample towns are located in four different provinces, hence under the jurisdiction of four different Governors. Governors were representative of the executive and responsible for administration and public security. Province

dummies are often included in the regressions to control for different service quality, especially public security.

Table 1 presents some descriptive statistics for the towns in the sample: it shows that mafia was active in more than half of the towns and very active in eleven cases. It also shows that mafia did not generally exist in towns where large landholdings prevailed. There is indeed evidence of significant activity only in 3 towns out of 15. Conversely, the mafia was quite active in about 50% of the towns with medium and small landholdings.³⁸

place table 1 here

The fact that the mafia was not active in 40% of villages where landholdings had been divided suggest that, as it is reasonable to expect, other factors also determine mafia activity. The analysis in section 3 suggests that, among other things, landlords' absenteeism, the number of bandits operating in the area and the quality of state provided enforcement are especially important. Unfortunately, quantitative measures of these phenomena are not available.

Table 2 presents linear estimates of mafia activity. In the first column, *mafia* is a function of land fragmentation alone. In line with the theoretical predictions, the results show that mafia activity was stronger where land was more divided. In the second column I add province fixed effects to control for differences in State services, especially publicly provided enforcement. The coefficient of land fragmentation is unaffected. The third column of table 2 includes the variable *vines*, a proxy for land income. The coefficient of fragmentation is now smaller³⁹ but still positive and significant. Moreover, the results suggest that, as expected, mafia activity is more intense in towns where the need for protection is stronger, the coefficient of *vines*, however, is not significant at conventional levels.

The analysis raises a number of econometric concerns. First, to the extent that mafia presence had spillovers onto neighbouring towns, so that the mafia was more likely to be active in a town if it was also active in nearby towns, the standard errors would be biased downwards, thus making it more likely to find a significant effect of fragmentation on mafia activity. To control for this, I have re-estimated the model allowing for clustering at the district level.⁴⁰ The results, shown in column (4) are robust to this alternative specification.

A second major issue is that all variables, except *vines*, are based on subjective judgements and might be measured with error. Measurement error in the dependent variable, however, does not affect the validity of the estimates. Measurement error in the explanatory variable, i.e. fragmentation, biases its coefficient downwards, implying that, if fragmentation is measured with error, the estimates in table 2 give the lower bound of the effect of land division on mafia activity. Measurement error can produce misleading results, in the sense that the estimate of the coefficient of land fragmentation is positive when the true coefficient is zero, only if the dependent variable is measured with error and the error is correlated to the explanatory variable or to its measurement error. This would happen if, for instance, prosecutors overstated mafia activity in towns where land was more divided and/or understated it in towns where land was less divided. Such correlation, however, seems quite unlikely: while it can be argued that prosecutors have an incentive to overstate or understate, there is no valid reason to believe that their incentives vary according to the degree of land fragmentation.⁴¹ As a further check I have also re-estimated the model using the dichotomous dependent variable “*mafia*”, which equals one if there is evidence of mafia activity in the town. The dichotomous variable is less likely to be “strategically” biased, that is prosecutors might overstate/understate the intensity of mafia activity but they should be less likely to claim (deny) the existence of mafia activity when there is none (some). The results, reported in column (5), are robust to this specification.

Third, the linear regression model might be much less efficient than discrete choice models, such as ordered probit, because it does not take into account the discreteness of the

dependent variables. The linear model, however, has a number of advantages. In particular, omitting relevant variables is of less consequence because the coefficients of the included variables are biased only if the two are correlated.⁴² This is especially important in this case as information on many relevant variables is not available.⁴³ As a robustness check, I have re-estimated all equations by probit (for *mafia*) and ordered probit (for *mafia*); the results are unchanged, indicating that the linear estimates are not invalidated by the discreteness of the dependent variable.

place table 2 here

A final concern is that omitted variables might be driving the results. The analysis in section 3 suggests that landlord absenteeism, the frequency of predatory attacks and the quality of alternative protection services are important determinants of mafia activity. Note that, however, omitting these variables from the regressions biases the coefficient of the variable of interest (land fragmentation) upwards only if this is positively correlated with the omitted variables. Land fragmentation and landlord absenteeism are likely to be negatively correlated if at all since large landowners are more likely to live far from their land. The relationship between land fragmentation and banditry is ambiguous. It could be negative if more fragmentation leads to less absenteeism and if the presence of people on the land discourages bandits. It could be positive if there is more to steal where land is more fragmented. To capture this effect I use *vines* as a proxy for the assets in need of protection. Finally, the province dummies should capture, at least in part, differences in publicly provided enforcement, since this was managed by the Governor in each province. However, similar estimates would obtain if publicly provided security

were systematically worse in towns where land was more divided, which might have occurred because larger landowners are more effective at lobbying for public resources, even if there were no competition among landlords. Conditional on these inevitable limitations, however, the available empirical evidence is consistent with the predictions of the model.

6. Conclusions.

The Sicilian mafia developed soon after the abrogation of feudalism and the following establishment and diffusion of private property rights. It gained legitimacy and power by providing property enforcement services to the upper classes at a time when State provided security was scarce and predatory attacks very frequent. This paper has argued that, because of the negative externality that protection entails, every landowner rationally purchased protection even if this led to an inferior equilibrium for the land-owning class as a whole. Using a common agency model, the paper has shown that in equilibrium every landlord pays for protection and that land fragmentation –i.e. an increase in the number of landlords—increases mafia's profits and fosters its development. The evidence from a sample of 70 Western Sicilian towns in 1881 suggest that in fact the mafia was more likely to be active in towns where land was more divided.

Aside from historical interest, the analysis of the origins of the Sicilian mafia can provide valuable policy advice to societies that currently face similar institutional transitions. The Sicilian experience shows that when the establishment of private property rights is not matched by the establishment of an adequate enforcement mechanism, independent groups might emerge to fill the gap. These groups gain legitimacy, power and reputation from the enforcement services they provide and can then exploit the power thus acquired to their own advantage, engaging in other, typically illegal, activities.

The Sicilian experience also shows that by the time the State had put into place an alternative enforcement service, the mafia had gained far too much power to be easily destroyed. Interestingly, both the Russian and Japanese mafias developed under strikingly similar

circumstances. Like in post-feudal Sicily, both in post-communist Russia and in post-feudal Japan the creation of private property rights was not accompanied by effective law enforcement mechanisms. Like in Sicily, the groups that emerged to fill the void also exploited their power to gain from extortion and other illegal practices. Understanding the role of mafias as enforcers is crucial to devise effective policies, both in terms of prevention and confrontation. As Judge Giovanni Falcone, a devoted opponent to the Sicilian mafia, once said: *“Sicily is a land where unfortunately the structures of the State are very deficient. The mafia has worked out how to fill this void in its own way [...] On exchange for the services it has offered (in its own interest of course) it has continued to increase its own power. To deny this reality only makes the fight more difficult.”* (Falcone, 1991)

APPENDIX A

DERIVATION OF EQUATION (1)

Denote by p^k the vector of protection such that k landlords are not protected and $(n-k)$ are. Denote by $(1-\pi^{n-k}(p^k))$ the probability that one of the $(n-k)$ protected landlords gets his income stolen. Since landlords who are not protected get all their income stolen and since the mafia can at most protect a share π^* of total income, the income stolen from the unprotected landlords plus the income stolen from the protected landlords must be at least $(1-\pi^*)Y$. Thus when k landlords are not protected it must be true that:

$$ky + (n-k)(1-\pi^{n-k}(p^k))y \geq (1-\pi^*)Y$$

That is, what gets stolen from the unprotected landlords (ky) plus what gets stolen from the protected landlords must be at least $(1-\pi^*)Y$, since mafia can at most protect π^*Y . This implies that if $n-k$ landlords buy protection and k do not, each protected landlord gets his income stolen with probability:

$$\max\left\{0, 1 - \frac{n}{n-k}\pi^*\right\} \quad k = 0, \dots, n-1$$

PROOF OF LEMMA 1

From condition (ii) we know that $p^* = \arg \max \sum_{i=1}^n f_i(p)$ which implies: $\sum_{i=1}^n f_i(p^*) \geq \sum_{i=1}^n f_i(p)$. From the definition of truthful strategy we know that: $p_i(p^*)y_i - p_i(p)y_i \geq f_i(p^*) - f_i(p)$ for all i, p . Therefore the condition above implies that $\sum_i p_i(p^*)y_i \geq \sum_i p_i(p)y_i \Rightarrow p^* = \arg \max \sum_i p_i(p)y_i$.

PROOF OF LEMMA 2:

It must be proved that p^0 (that is, every landlord buys protection) satisfies $p^* = \operatorname{argmax} \sum_{i=1}^n p_i(p)y$.

That is, for every $k=1\dots n$ it must be true that:

$$\sum_{i=1}^n p_i(p^{-0})y \geq \sum_{i=1}^{n-k} (p_i^{n-k}(p^{-k})y) + \sum_{i=n-k}^n p_i^k(p^{-k})y$$

Using (1) and the fact that landlords are symmetric the expression simplifies to:

$$np^* y_i \geq (n-k) \min \left\{ 1, \frac{n}{n-k} p^* \right\} y_i \quad (\text{A1})$$

For $p^* \geq \frac{n-k}{n}$ (A1) reduces to $np^* \geq n-k$, which is verified.

For $p^* < \frac{n-k}{n}$, (A1) requires $np^* \geq np^*$

Then:

1. if $\pi^* > (n-1)/n$, $np^* y_i > (n-k) \min \left\{ 1, \frac{n}{n-k} p^* \right\} y_i$ for all $k \rightarrow p^0$ is the unique TNE.
2. if $\exists k'$ s.t. for all $k < k'$ $\pi^* < (n-k)/n$; then for all $k < k'$ (6) is verified with equality thus all the vectors such that $k (< k')$ landlords are not protected are TNE protection vectors.

PROOF OF LEMMA 3:**a. Uniqueness**

Define $W(Z) = \max_p \left[\sum_{i \in Z} (p(p)y_i - f_i(p)) - \sum_{i \in Z} f_i(p) \right] = \max_p [z p(p)y]$, that is, $W(Z)$ is the highest

possible joint monetary pay-off for the mafia and landlords in group Z (the last term on the RHS follows from symmetry). Laussel and Le Breton (2000) show that if W is strongly subadditive, the equilibrium payoffs are unique and equal to $q_i = W(N) - W(N \setminus \{i\})$ for all $i=1\dots N$, that is, each landlord

W is strongly subadditive if for all $S, T \subseteq N$ such that $S \cup T = N$, $W(N) \leq W(S) + W(T) - W(S \cap T)$. Since all landlords are the same, in this model a group of landlords is uniquely identified by its size. Thus for any two groups of size $s (\leq n)$ and $t (\leq n)$, strong subadditivity requires $W(n) \leq W(s) + W(t) - W(c)$ where $c = (s+t)-n$.

Note that $s \leq n$ and $t \leq n \Rightarrow c < s$ and $c < t$. Note also that for any group of size r ,

$$W(r) = \begin{cases} ry & \text{if } r < n\pi^* \\ n\pi^*y & \text{if } r \geq n\pi^* \end{cases}$$

That is, if the group is sufficiently small (i.e. the combined incomes of landlords in the group is less than what the mafia can successfully protect) the group's highest possible monetary pay-off is its total income (ry). If the group is large (i.e. the combined incomes of landlords in the group is larger than what the mafia can successfully protect) the group highest possible pay-off is the maximum income the mafia can successfully protect ($n\pi^*y$). Note that, since $\pi < 1$, $W(n) = n\pi^*y$. In what follows I show that for every possible group size combinations, W is strongly subadditive. Note that the group sizes such that $(s < n\pi, t < n\pi, c > n\pi)$; $(s > n\pi, t < n\pi, c > n\pi)$ and $(s < n\pi, t > n\pi, c > n\pi)$ can be ruled out because c cannot be larger than s or t . This leaves five cases:

1. $s < n\pi, t < n\pi, c < n\pi$. In this case $W(s) + W(t) - W(c) = (s+t-c)y = ny > W(n) = n\pi^*y$ (since $\pi^* < 1$)
2. $s > n\pi, t > n\pi, c > n\pi$. In this case $W(s) + W(t) - W(c) = (s+t-c)\pi^*y = n\pi^*y = W(n)$
3. $s > n\pi, t > n\pi, c < n\pi$. In this case $W(s) + W(t) - W(c) = 2n\pi^*y - cy > W(n) = n\pi^*y$ (since $c < n\pi^*$)
4. $s > n\pi, t < n\pi, c < n\pi$. In this case $W(s) + W(t) - W(c) = n\pi^*y + ty - cy > W(n) = n\pi^*y$ (since $c < t$)
5. $s < n\pi, t > n\pi, c < n\pi$. In this case $W(s) + W(t) - W(c) = sy + n\pi^*y - cy > W(n) = n\pi^*y$ (since $c < s$)

b. Equilibrium Contributions.

Laussel and Le Breton (2000) show that W is strongly subadditive, the unique equilibrium payoffs are equal to $q_i = \mathbf{p}(p)y - f_i(p) = W(N) - W(N \setminus \{i\})$ for all $i = 1 \dots N$, where $W(N)$ is the highest payoff attainable by the mafia and all landlords while $W(N \setminus \{i\})$ is the highest payoff attainable by the mafia and all landlords excluding i . This implies that, in equilibrium, each landlord receives his marginal contribution, that is the variation in total surplus due to his entering the coalition. Using the fact that landlords are symmetric and that the mafia's payoff is exactly equal to the sum of landlords' contributions, in this model we have:

$$W(N) = n\pi^* y$$

and

$$W(N \setminus \{i\}) = \begin{cases} (n-1)y & \text{if } n < 1/(1-\pi^*) \\ (n-k-1)(n/n-k-1)\pi^* y & \forall k=0..k', \text{ if } n > 1/(1-\pi^*) \end{cases}$$

Substituting in the expression for q gives the equations in the text.

APPENDIX B

DATA SOURCES

I have coded the information contained in the “Inchiesta Iacini: Atti della Giunta per l’inchiesta agraria e sulle condizioni della classe agricola” Vol XIII part I and II, books 1 to 5 Relazione del delegato tecnico per la Sicilia Abele Damiani.

Pages and volumes number as reported below.

1. DATA ON MAFIA ACTIVITY, MAFIA ACTIVITY INTENSITY, AND THEFTS

Vol XIII, part 2, book A: pp 373-85 (Caltanissetta), pp 421-443 (Girgenti), pp 473-93 (Palermo), pp 509-520 (Trapani), pp 521-543 (summary tables).

2. DATA ON LAND FRAGMENTATION

Vol XIII, part 2, book A: pp 135 (Caltanissetta), pp 95-147 (Girgenti), pp 205-267 (Palermo), pp 313-351 (Trapani).

Vol XII, part 1, book B: summary tables.

3. DATA ON VINEYARDS

Vol XII, part 1, book B: summary tables.

FOOTNOTES

I would like to thank James Anderson, Richard Arnott, Diego Gambetta, Dilip Mookherjee, Fabio Schiantarelli and seminars participants at the World Bank, Boston College, LSE and at the Latin American Economic Association Conference (LACEA 2000) for useful comments and suggestions on previous versions of the paper. Three referees from the Journal of the Law, Economics, & Organization provided valuable advice.

1. Judge Giovanni Falcone devoted most of his career to fighting the mafia, often very successfully. He was killed on May 23rd, 1992. The quote is from Falcone (1991).
2. See in particular Gambetta (1993) and the discussion in sections 2 and 3 below.
3. The word “mafia” was first used in a theatrical play written by Giuseppe Rizzotto (1863) “I mafiosi de la Vicaria” which describes the behaviour and the activities of a group of “*mafiosi*”, momentarily imprisoned in Palermo’s jail (the Vicaria). In 1838 the chief prosecutor in Trapani, don Pietro Ulloa, notified the Minister of Justice of the existence of mafia-like activity. The word itself, however, made its first official appearance in a report by the chief prosecutor in Palermo, Filippo Gualtieri, in 1865. (See Pezzino (1987) and Gambetta (1993, chap. 4).
4. The parliamentary surveys were designed to investigate the state of agriculture in different regions of Italy. They were undertaken by a parliamentary commission directed by senator Jacini and published between 1881 and 1886. The volumes about Sicily, compiled by Abele Damiani, contain an extremely detailed account of many dimensions of Sicilian rural areas ranging from the economy to social customs and crime.
5. Car alarms provide a simple illustration of this externality: two identical cars face the same probability of being stolen, if one owner installs the alarm the probability of his car getting stolen decreases while for the other owner it increases, if the second owner also installs the

alarm the value of the first alarm falls because now both cars will again get stolen with the same probability.

6. See Franchetti (2000 [Previously published: 1876]).
7. A decade after unification, the Italian Parliament devoted much attention to the issue of law enforcement in Sicily. After an intense debate, in 1875 the Lower Chamber appointed a Parliamentary Survey Commission to collect direct evidence on crime and law enforcement in Sicily. The conclusions were presented to the Parliament in 1876 by R. Bonfadini (Bonfadini Report reprinted in Russo (1964). At the same time, L. Franchetti and S. Sonnino, two social scientists both members of parliament, organised a parallel survey with the purpose of collecting and conveying information which, due to political constraints, the official survey was likely to omit. Franchetti (2000) presents the conclusion of that survey regarding crime and law enforcement.
8. The available evidence suggests that throughout their history both the American and the Sicilian mafia have been enforcing illegal agreements, which, by definition, are not protected by the State. Examples include enforcement of cartels in public procurement auctions, and property rights protection in the drugs trade. See Alexander (1997), Falcone (1991), Firestone (1997), Gambetta (1993) and Gambetta and Reuter (1995).
9. The survey collected information from 203 small shopkeepers in three Russian cities. See Frye and Zhuravskaya (2001) for details.
10. The topic has attracted the attention of scholars, from political philosophers to economists, starting in the seventeen century with the works of Hobbes (1651) and Locke (1690). See North (1981), Taylor (1987), Knight (1992) and Sened (1997) for recent analyses.
11. For a clear discussion of the effects of group size on the likelihood of success, see Hardin (1982).
12. Note that this result is in line with Olson (1965)'s theory. As argued above size matters only if (i) it affects the distribution of benefits and/or (ii) the game is infinitely repeated and co-

operation can be sustained in equilibrium. None of these conditions were satisfied in the experiments.

13. Strictly speaking, “everybody buys protection” is not the unique equilibrium for some parameters values. Equilibrium payoffs are, however, unique. See section 4 for details.
14. The main sources for this section are: 1. Reports from Sicilian Magistrates to the Ministry of Justice (1874); 2. Conclusions of the Parliamentary Inquiry 1875-6 (Bonfadini Report); 3. Parliamentary Debates on the introduction of extreme measures to fight crime in Sicily (1875-6)—all reprinted in Russo (1964)— 4. Franchetti (2000); 5. Lorenzoni (1911) 6. Mack Smith (1968) and 7. Finley, Mack Smith and Duggan (1986).
15. For a very detailed account of the conditions of Sicilian agriculture see Damiani (1881) and Lorenzoni (1911).
16. Improvements like irrigation and land manuring, would have increased land value (up to twenty times, according to Mack Smith, 1968), still tenants would not invest since they would be able to reap the returns. Similarly, shifting from cereals to more profitable cultivation (like vines or oranges) was not an attractive option for the tenants since these cultivation would not bring any income for about four years.
17. “*Companies at Arms*” were first instituted by the Bourbon government in the 18th century. They were abolished in 1860 but basically reinstated in 1863 as “*Militi a Cavallo*” (“Cavalry”) by the Italian State. Their role and effectiveness as enforcement agents was often discussed in Parliament as many maintained that the risk of collusion was higher than any informational advantage. The Bonfadini Report (1876) acknowledged that collusion with criminals was indeed a problem (see Russo, 1964:206).
18. In December 1874 the Minister for Internal Affairs presented a Law proposal whose aim was to allow the use of “exceptional measures” to fight crime in Sicily. After a long debate (some of which is reprinted in Russo, 1964) the proposal was however rejected as “too extreme”.

19. As of 1875 there were five law enforcement bodies: the Cavalry, the Carabinieri (a special group of the army), the Army, the Country Guards and the Police. See Bonfadini Report (Russo,1964:207)
20. More evidence on this can be found in the Reports from Sicilian Magistrates to the Ministry of Justice (1874) and in the Bonfadini Report (1876) both reprinted in Russo (see especially 1964:35,46,48,49,204-5,207-9).
21. The importance of autonomy is thoroughly discussed by Franchetti (2000) and Gambetta (1993).
22. The evidence also suggests that the ruling classes used the services of the mafia to other more or less legal purposes. For instance the mafia soon became involved in political elections and was paid to guarantee votes. In a report to the Ministry of Internal Affairs, the prefect of Palermo wrote: “ *The upper classes use it (the mafia) to protect themselves and their property from bandits but also as a mean to preserve their overbearing influence and preponderance, which they are afraid to lose as a consequence of liberal progress*” (Russo, 1964:12).
23. See reports from the prefects of Palermo, Trapani, Girgenti and Caltanissetta (reproduced in Russo,1964:14,18,21,25). See also Franchetti (2000) and inspector Alongi’s report (Russo, 1964:388)
24. See, e.g., Mosca (1900) in Russo, 1964:450 and Gambetta (1993).
25. For instance, in the case of two landlords there are 4 such combinations: 1. A and B protected, 2. only A protected, 3. only B protected, 4. neither protected.
26. Note that if, as a consequence of land fragmentation, total income were to rise, this would open an additional channel through which fragmentation would increase the demand for protection.
27. The assumption is consistent with the historical evidence discussed in section 3. If bandit supply were elastic, the protection choice of the mafia would affect the number of bandits in

- equilibrium. This, in turn, would affect the equilibrium outcome but not the maximisation problem of the mafia, unless the latter were to internalise its effect on the supply of bandits.
28. It is assumed that this is true for every choice of the other landlords. Assuming that when nobody buys protection, everybody is stolen with the same probability (different than one) yields similar results.
 29. As an example, consider the case of two landlords. If landlord A buys protection and landlord B does not, bandits are more likely to attack B than A. If B buys protection as well, bandits are equally likely to attack him or A. It follows that when B buys protection, the value of the protection purchased by A decreases since his probability of being attacked increases.
 30. Note that the model does not crucially hinge this assumption; all the results carry through under the alternative assumption of increasing costs, see discussion below.
 31. “Campiere” is the traditional name for the armed guard.
 32. For the formal proofs of this and other general results see Bernheim and Whinston (1986).
 33. Formally, $(\{f_i\}_{i=1}^n, p^*)$ is a Truthful Nash Equilibrium (TNE) if it is a Nash equilibrium and $(\{f_i\}_{i=1}^n)$ are truthful strategies with respect to p^* .
 34. Recall that in this case all protection vectors such that $k < k'$ landlords are not protected are TNE protection vectors.
 35. The empirical results show that, in fact, land fragmentation affects mafia activity even after controlling for asset value.
 36. Chief Prosecutors were responsible for the administration of justice in the towns. They were asked to report whether the mafia was active and if so, to what extent. For instance the prosecutor in Caltabellota wrote: “the mafia exists but to a very limited extent” whereas the prosecutor in Favara reported that “the mafia rules as a king”. The first was coded as 1 (limited mafia activity), the second as 3 (intense mafia activity).

37. The author of the survey reports that on average small landholdings were smaller than 20ha, medium were larger than 20ha and smaller than 200ha and large were larger than 200ha (often larger than 1000ha). Unfortunately many of the mayors who used a different criterion did not report it precisely enough. In the regressions the coefficients of *small* and *medium* are never statistically different.
38. That the mafia was not active in 40% of villages where landholdings had been divided suggest that, as it is reasonable to expect, there are other factors that determine mafia activity. The analysis in section 3 suggests that, among other things, the level of absenteeism and the number of bandits operating in the area are especially important. Unfortunately data for these variables are not available.
39. The difference is not statistically significant. The 95% confidence intervals for *fragmentation* are [.1193627; 1.273499] and [-.0145931; 1.185985] when *vines* is and is not included in the regression, respectively.
40. There were 4 districts (circondari) within the province of Palermo and 3 districts within the other 3 provinces. Districts consisted mostly of clusters of towns so that most towns were more likely to be close to a town in the same district rather than to a town outside of it. Details on clustering can be found, e.g., in Deaton (1997).
41. A referee suggested that, for instance, prosecutors might want to overstate the intensity of mafia activity to attract more public funds. Alternatively, they might want to understate it out of reputational concerns. In both cases, however, the incentives to under/overstate are not related to the degree of land fragmentation. That is, results would be biased if and only if prosecutors in towns where land had been divided had an incentive to overstate, while prosecutors in towns where land had not been divided had an incentive to understate.
42. Due to the non-linearity of the probit model, omitted variables create a bias in the coefficient of the included variables even if the two are not correlated. Also, in contrast to the linear

model, heteroskedasticity causes the estimator to be inconsistent. See Yatchew and Griliches (1985).

43. The drawback of the linear model is that it might yield estimates outside the feasible range. This is not an issue in this case, i.e. predicted values are always in the feasible range.

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TABLE 1 – MAFIA ACTIVITY AND LANDSIZE

Land Distribution ® mafia Activity -	Small or Medium	Large	TOTAL
None	22 (40%)	9 (60%)	31 (44.3%)
Limited	5 (9%)	3(20%)	8 (11.4%)
Medium	17 (31%)	3(20%)	20 (28.6%)
Strong	11 (20%)	0 (0%)	11 (15.7%)
TOTAL	55 (78.6%)	15 (21.4%)	70 (100%)

TABLE 2 – ESTIMATES OF MAFIA ACTIVITY

Linear Regression with Robust Standard Errors (in parenthesis)

	(1)	(2)	(3)	(4)	(5)
LHS Variable:	<i>mafia</i>	<i>mafia</i>	<i>mafia</i>	<i>mafia</i>	<i>mafia_d</i>
land fragmentation	.71** (.26)	.70** (.29)	.59* (.30)	.70** (.26)	.29** (.13)
vines			1.56 (1.12)		
prov ₁		.22 (.37)	.33 (.39)	.22 (.22)	.06 (.11)
prov ₂		-.46 (.38)	-.49 (.36)	-.46 (.25)	-.35** (.09)
prov ₃		-.45 (.38)	-.55 (.38)	-.45 (.36)	-.25 (.17)
Cluster (District)	no	no	no	yes	yes
R ²	0.06	0.13	0.17	0.13	0.16
NOBS	70	70	70	70	70

Columns (1) to (4): Dependent Variable *mafia*, =0,1,2,3 if there is no mafia activity, if there is some mafia activity, if there is mafia activity and if mafia activity is very strong, respectively. **Column (5)** *mafia_d*=1 if *mafia*>0, =0 otherwise.

**Significant at the 5% level or better; *Significant at the 10% level or better.

FIGURE 1: Mafia's Payoff as a function of the number of landowners