Public Protection and Private Extortion*

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Abstract

We explore how the presence of an extortionary mafia affects canonical political economy choices: the level of government corruption, voting decisions, and the optimal level of taxation. The mafia engages in a classic protection racket, demanding fees from a firm in exchange for "protection." Should the firm fail to pay, the mafia employs force to extract resources from the firm. The firm, however, can appeal to the government for protection. Moreover, we explicitly model the government's choices of both whether or not to use law enforcement to combat the mafia and whether to devote tax revenues toward these law enforcement efforts or whether to expropriate them. The firm uses the threat of electoral sanction to try to induce the government to spend resources on law enforcement. Two classes of equilibria emerge. In one, taxes and corruption are low, but the mafia dominates the political economy. In the other, taxes are higher, corruption is higher, and the mafia operates less frequently and demands lower fees. The level of government corruption is weakly increasing in the tax rate, but government spending on law enforcement is not monotonic in taxation, first increasing to a plateau and then decreasing. If the mafia and government can collude, then the tax rate is weakly lower and the mafia is weakly more pervasive.

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1 Introduction

Mafias play many roles in the economy. A major focus of the existing literature focuses on mafias as relatively benign competitors of the state, supplying comparable services at comparable terms to sustain an underground economy (Schelling 1984; Gambetta 1993; Grossman 1995; Johnson et al. 1997; Hay and Shleifer 1998; Skaperdas 2001; Varese 2001; Alexeev et al. 2003, Bandiera 2003).[1] While the enforcement of property rights is one of the essential public goods that governments typically provide, governmental weakness or corruption create an opportunity for mafias to compete successfully with governments to provide these services. Gambetta and Reuter (1995) conclude that mafias often provide real direct benefits, including "the enforcement of a variety of allocation agreements among independently owned firms, with racketeer income being payment for service." Systematic surveys of Russian shopkeepers on their interactions with rackets confirm this conclusion (Frye and Zhuravskaya 2000).

Despite the importance of the mafia's role as a competitor to the state, the emergence of a strong mafia, and the dependence of the economy on its services, also carries with it the risk of extortion, since a mafia is generally not accountable to the firms under its protection (Konrad and Skaperdas 1998).[2] In decentralized politico-economic environments, economic agents resist predation by engaging in conflict themselves (Hafer 2006, Skaperdas 1992), but in more centralized systems, with states that have developed their capacity for law enforcement, agents call upon the state to protect them.

In light of this, we focus on the relationship between the presence of an extortionary mafia and the endogenous, electorally derived incentives for the government to develop and use its capacity for law enforcement. In doing so, we abstract away from the mafia's role

[1] Some view the mafia and the state as analagous, recognizing not only that the mafia may provide valuable services but also that the state may be corrupt or extortionary itself (Tilly 1985, Konrad and Skaperdas 1999), Kugler et al (2005).

[2] The existence of a mafia may lead to economic inefficiency in other ways, as well. Its need to hide its identity and its actions limits its ability to operate efficiently relative to a legitimate state (Smith and Varese 2001, Baccara and Bar-Isaac 2005). There is also evidence that it undermines competition, creating numerous monopolies (Braguinsky 1999).

as a provider of contract enforcement and revenue protection, focusing on its role as an extortionist. This allows us to examine how the presence of an extortionary mafia affects canonical political economy choices: the level of government corruption, voting decisions, and the optimal level of taxation. Moreover, we can also address how political institutions, such as governments with electorally derived, endogenous incentives to engage in costly law enforcement, affect the strength and prevalence of mafias in the political economy.

The mafia in our model engages in a classic protection racket, demanding fees from a firm in exchange for "protection." Should the firm fail to pay, the mafia employs force to extract resources from the firm. The firm, however, can appeal to the government for protection from the mafia; if the government is successful, the firm suffers no harm. In these respects, our model is similar in spirit to the canonical model of extortion in Konrad and Skaperdas (1998). However, in our model, the government is both self-interested and, to some extent, electorally accountable to the firm, which chooses whether or not to keep it in office. Moreover, we explicitly model the government's choices of both whether or not to use law enforcement to combat the mafia and whether to devote tax revenues toward these law enforcement efforts or whether to expropriate them. Although the firm observes whether or not the government confronts the mafia and the outcome of that confrontation, neither the firm nor the mafia can observe directly the government's investment into its law enforcing capacity.

The intuition of our argument is as follows. The firm exists under the threat of mafia extortion. It funds the government through taxation. The taxes benefit the firm because law enforcement can mitigate the mafia's ability to demand protection payments. Government law enforcement can potentially make illegal activity so costly that it drives the mafia out of business. Even when the mafia is not entirely eliminated, law enforcement can reduce the fees the mafia is able to demand in a protection racket by decreasing the risk of expropriation that a firm faces should it refuse to pay off the mafia. Of course, the weakening of the mafia comes at a price to the firm—taxation. Moreover, the firm also has to worry about government corruption—the government may expropriate resources rather than spend them on law enforcement.[3] The firm uses electoral incentives to try to solve this moral hazard problem.[4]

These trade-offs drive several key results of our model. We demonstrate that government investment in law enforcement is not monotonic in tax revenue. For low revenue levels, the electoral incentives are sufficient to insure that the government invests all of the revenue into law enforcement activities. Hence, for low levels of taxation, increasing taxation results in higher levels of law enforcement, a higher probability of government success against the mafia, and a smaller proportion of the firms' after-tax profits going to the mafia. However, as government revenue grows, the temptation to be corrupt also grows, and (if the benefits of office remain the same) electoral incentives are no longer adequate to prevent government corruption. The government skims a larger and larger proportion of revenues as taxation grows. For intermediate levels of taxation, the level of investment in law enforcement and the probability of government success against the mafia plateau, but for high rates of taxation, government corruption becomes so extensive that investment into law enforcement, in absolute terms, decreases, and hence the government's ability to defeat the mafia actually decreases as well.

Ironically, the proximate cause of the decrease (in absolute terms) in law enforcement is the reduced presence of the mafia. While the amount that the mafia is able to demand from the firms is decreasing the level of law enforcement, the mafia itself remains ubiquitous at low and intermediate levels of taxation. But for sufficiently high levels of taxation and sufficiently punitive measures by the government, the mafia becomes more rare, choosing on some occasions to exit the market rather than to risk a confrontation with the govern-

[3]We initially focus our attention on the effects of the embezzlement of public funds on mafia activity and firm welfare, and in an extension we consider the effects of bribing government officials to neglect their duties. However, corruption can take many other forms with diverse consequences. See Shleifer and Vishny (1993) for a discussion of the effects of the illegal trade in government goods and services with and without embezzlement. Shleifer and Treisman (2000) and Bardhan (1997) survey the effects of corruption on economic development.

[4]For another view of why firms might be unwilling to fund a government when mafia enforcement of contracts is an option, see Sonin (2002).

ment. Because the mafia is less prevalent, the government has less occasion to use its law enforcement apparatus, and hence reduces its investment into it.

Thus, government corruption and the presence of the mafia emerge as strategic substitutes. The government only has an incentive to invest in law enforcement when there is a mafia to fight. And the mafia finds it most profitable to be in business when government investment in law enforcement is low. This intuition explains why if the firms are allowed to choose the tax rate, two classes of equilibria arise in the model. In one the government is cash starved (taxes are low) but not corrupt, and the mafia runs a protection racket all the time. In the other, the government is well funded (taxes are high), corruption is high, and the mafia's protection racket is diminished (i.e., it can only successfully demand payment from the firm some of the time, and when it does pay, the fee is lower).

These equilibria differ from standard intuitions. It is not simply the case that firm pays off the the mafia when it is strong and funds the government when it is efficient and honest. In particular, when the firm would like a high level of taxation in equilibrium, the government is particularly inefficient at providing law enforcement because it is highly corrupt. Moreover, even when the firm would choose a high tax rate, generally the mafia persists, albeit at a lower level of activity. The firm is willing to pay high taxes and endure government corruption in order to force the mafia to charge lower fees.

We conclude our analysis with an extension of the model. We show how the possibility of collusion between the mafia and the government weakly decreases taxation, weakly increases the mafia's success in extorting the firm, and, for some parameter values, increases the probability that the government will retain office.

2 The Model

There are three players: a firm, a mafia, and a government. The sequence of play is as follows. At the beginning of the game, the firm controls some resources, the total pre-tax value of which is normalized to 1. Taxes τ are imposed on those resources and turned over to the government. The government chooses a proportion of the tax revenue collected to commit to law enforcement, $\lambda \in [0, 1]$. Neither the firms nor the mafia observe λ. Next, the mafia can either choose not to become active or it can demand a fee (ϕ) that the firm must pay to it for protection. If the mafia makes a demand, the firm then decides whether to pay off the mafia. Let μ be the probability that the firm pays off the mafia. If the mafia makes a demand and the firm does not pay it off, the mafia attempts to extort all of the firms resources. In that case, the firm appeals to the government for protection, which the government is obliged to attempt to provide. [5] With probability p Nature reveals to the government the mafia's activities. This reflects the idea that when the firm does not alert the government to the mafia's presence, the government must rely on its own imperfect investigative capacity. In this case, the government can choose, on its own initiative, to engage in law enforcement to attempt to disrupt the mafia's protection racket. Denote the government's choice of a probability with which to challenge the mafia, given that the firm pays off the mafia and the government learns of the mafia's activities independently, by $\gamma \in [0, 1]$.

The probability that the government defeats the mafia when they are in conflict is a function of the government's level of investment in law enforcement ($\lambda\tau$), $f : [0, 1] \to [0, 1]$. We assume that $f(\cdot)$ is increasing, concave, and satisfies $\lim_{x \to 0} f'(x) = \infty$.

If there is a conflict between the mafia and the government, and the mafia loses, the mafia bears a cost k, which we interpret as the punishment imposed by the government.

After the outcome of any conflict is determined, the firm, acting as a voter, chooses whether or not to reelect the government, which is understood to compete against an otherwise identical challenger. The probability of reelection $\boldsymbol{\rho}$ can be represented by a finite-dimensional vector specifying the probability of reelection in each observationally distinct

[5] One might argue that the mafia faces a commitment problem here, that is, that it could extort the firm for the rest of its resources, even if the firm does pay. However, in equilibrium, the fee the mafia demands is the maximum amount that it can extort from the firm before the firm seeks government protection. If the mafia attempts to take more, it will have to fight the government and suffer the risk of punishment– a risk it prefers to avoid.

(for the firm) situation. There are four observationally distinct situations under which the firm must decide whether or not to reelect:

1. There is conflict between the mafia and government and the mafia wins (M).
2. There is conflict between the mafia and government and the government wins (G).
3. The firm pays off the mafia and the government does not challenge, so there is no conflict (NG).
4. The mafia never makes a demand, so there is no conflict (NM).

Let M be the event that the mafia wins and G be the event that the government wins, given that there is conflict between the mafia and government. Let NG be the event that no conflict between the mafia and government occurs because the government does not challenge. Finally, let NM be the even that no conflict occurs because the mafia does not make a demand. The set $\{M, G, NG, NM\}$ can be thought of as the range of the outcome function, whose arguments include μ, γ, λ, and τ; to simplify notation, we suppress the functional representation below.

Let ρ_M, ρ_G, ρ_{NG}, and ρ_{NM} be the probabilities of reelection that correspond to each of the four outcomes enumerated above, respectively, where $\boldsymbol{\rho} = (\rho_M, \rho_G, \rho_{NG}, \rho_{NM}) \in [0, 1]^4$.

The government receives a positive payoff, R, if it is reelected and 0 if it is not reelected. The timeline of the game is summarized in Figure 1.

2.1 Payoffs

The mafia's payoff if it demands fee ϕ is the expectation of its net revenue (fee collected minus cost imposed in defeat).

$$E[u_M(\phi)|\mu, \lambda, \tau, \gamma, p] = \mu \left[\phi - \gamma p f(\lambda\tau)k\right] + (1-\mu)\left[(1 - f(\lambda\tau))(1-\tau) - f(\lambda\tau)k\right].$$

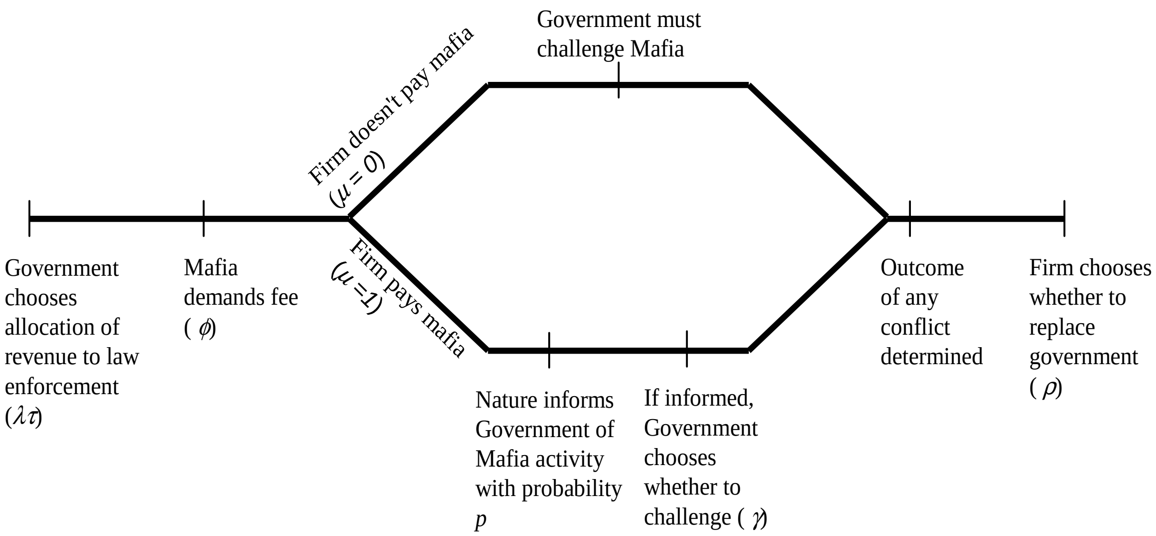

Figure 1: Timeline of the game

The mafia's payoff if it does not make a demand is:

$$E[u_M(\phi = 0)] = 0.$$

The government's payoff is the expectation of any tax revenue not spent plus any electoral payoff. Thus, for a given level of investment in law enforcement (λ) and a probability of challenging the mafia if the mafia runs a protection racket (γ), the government's expected utility is:

$$E[u_G(\lambda, \gamma)|\mu, \tau, p, \boldsymbol{\rho}] = (1-\lambda)\tau + \mu\left[\gamma p\left(f(\lambda\tau)\rho_G + (1 - f(\lambda\tau))\rho_M\right) + (1-\gamma p)\rho_{NG}\right] R$$
$$+ (1-\mu)(f(\lambda\tau)\rho_G + (1 - f(\lambda\tau)\rho_M)R.$$

The firm's utility is the expectation of economic resources it controls net of taxes, fees paid, or money extorted.

$$E[u_F(\mu, \boldsymbol{\rho})|\lambda, \tau, \phi] = \mu(1-\tau-\phi) + (1-\mu)f(\lambda\tau)(1-\tau).$$

3 Equilibrium

Our solution concept is subgame perfect Nash Equilibrium. We refine this equilibrium concept in two ways. First, we assume that players do not play weakly dominated strategies. Second, since the game ends with an election decision, the firm is indifferent over whether or not to reelect the government (there are no future actions to be taken). Thus, all reelection rules are sequentially rational. We adopt the standard approach taken in models of retrospective voting (e.g., Barro 1973, Ferejohn 1986, Austen-Smith and Banks 1989), assuming that the firm chooses the electoral rule that maximizes its *ex ante* expected utility.[6] One can think of this as the firm committing, at the beginning of the game, to the voting rule (selected from all sequentially rational voting rules) that induces behavior on the part of the other players in the game that makes the firm best off from the *ex ante* perspective.

3.1 A Benchmark

An instructive question, within this context, is whether it is important that the government have the independent ability to challenge the mafia even if the firm pays off the mafia rather than soliciting the government's help. What, for instance, would happen if the government could only engage in conflict with the mafia if appealed to by the firm? This would be equivalent to restricting γ to be equal to 0.

It turns out that if the government does not have the authority to challenge the mafia on its own, then regardless of tax policy or investment in law enforcement, the firm will pay off the mafia. Moreover, the combination of the firm's ability to appeal to the government for protection against the mafia and the arbitrarily stiff penalty that the government can impose on the mafia are never sufficient to induce the firm to finance the government if the government cannot also be expected to challenge the mafia when the firm does not appeal to the government directly.

[6]Bueno de Mesquita and Friedenberg (2006) formalize optimal retrospective voting in terms of *ex ante* equilibrium selection criteria.

Proposition 1 *If the government cannot challenge the mafia unless appealed to by the firm (that is, γ is restricted to be 0), the game has a unique equilibrium in which the mafia extracts fees from the firm and the government spends no resources on law enforcement. Moreover, in this equilibrium, the firm's most prefered tax rate is zero.*

Proof. For ease of exposition, we defer the proof of this Proposition until section 3.5. ■

As we will see in the remainder of the paper, allowing the government to challenge the mafia, unsolicited, significantly alters players' equilibrium play.

3.2 Whether to Reelect

As mentioned in the discussion of our equilibrium concept, the firm is indifferent over all reelection rules. As such, it chooses the reelection rule that makes it best off from an *ex ante* perspective—i.e., that induces behavior from the government that is good for the firm. In order to determine the optimal reelection rule, then, we need to know how the government responds to electoral pressure and how the mafia responds to government actions. Thus, we defer discussion of the optimal reelection rule until after solving for the rest of the equilibrium behavior.

3.3 Whether to Challenge the Mafia

If the firm refuses to pay off the mafia, the government is obliged to engage in law enforcement to try to protect the firm from extortion.[7] However, if the firm pays off the mafia, then the government has a choice of whether or not to challenge.

At this point in the game, the only way in which the decision of whether to challenge can affect the government's payoffs is through the firm's reelection rule. Hence, the government chooses its probability of challenging the mafia (γ) to maximize the probability of reelection,

[7] Note that we could allow the government to have a choice about whether or not to protect the firm here as well. The firm, in this case, would condition its electoral behavior on the government defending it, so in equilibrium the government would defend and everything would proceed as in our analysis. For simplicity, we do not introduce this additional strategic decision by the government.

given the level of investment in law enforcement ($\lambda^*\tau$) and the reelection rule ($\boldsymbol{\rho}$). With this in mind, we can characterize the government's best-response correspondence for its choice of γ. The government's expected utility from challenging with certainty, given that they have learned of the mafia's activities, is:

$$E[u_G(\gamma = 1, \boldsymbol{\rho}^*, \lambda^*, \tau|\mu = 1)] = (1 - \lambda^*)\tau + f(\lambda^*\tau)\rho_G R + (1 - f(\lambda^*\tau))\rho_M R.$$

That is, the government's expected utility from challenging is the revenue it retains, plus the probability it defeats the mafia times the probability it is reelected given that it defeats the mafia times the benefit of reelection, plus the probability it loses times the probability it is reelected given that it loses times the benefit of reelection.

The government's expected utility from never challenging is:

$$E[u_G(\gamma = 0, \boldsymbol{\rho}^*, \lambda^*, \tau|\mu = 1)] = (1 - \lambda)\tau + \rho_{NG} R.$$

That is, the revenue it retains plus the probability it is reelected given that it does not challenge times the benefit of reelection. Comparing these, we find that the government's best response correspondence is

$$\gamma^*(\lambda^*, \tau, \boldsymbol{\rho}; \cdot) = \begin{cases} 1 & \text{if } \rho_M(1 - f(\lambda^*\tau)) + \rho_G f(\lambda^*\tau) > \rho_{NG} \\ \gamma' \in [0, 1] & \text{if } \rho_M(1 - f(\lambda^*\tau)) + \rho_G f(\lambda^*\tau) = \rho_{NG} \\ 0 & \text{if } \rho_M(1 - f(\lambda^*\tau) + \rho_G f(\lambda^*\tau) < \rho_{NG}. \end{cases} \tag{1}$$

It is worth noting that, by properly choosing the reelection probabilities (ρ_{NG} low enough), the firm can always induce the government to challenge if the government discovers the mafia's activities.

3.4 Paying the Mafia

As noted earlier, the government makes two choices: the level of investment into law enforcement (λ) and the probability of challenging the mafia when the firm pays off the mafia and the government learns of the mafia's activities (γ). Somewhat surprisingly, the firm's induced preferences over γ at the time of the government's action are such that, once the firm has paid the mafia, it is expectationally indifferent between the government challenging with certainty ($\gamma = 1$) and the government not challenging ($\gamma = 0$). This does not, of course, mean that firm is indifferent over the government's strategy. Rather, it cares only to the extent that government behavior impacts the fee the mafia demands. This intuition is formalized in the following lemma which is instrumental in solving for equilibrium behavior.

Lemma 1 *The firm's preferences over government action γ are completely induced by the effects of that action on the mafia's choices.*

Proof. See the appendix. ∎

Because the firm is indifferent over all $\gamma \in [0, 1]$ at the time of the government's action, it can credibly commit to any electoral response to that action at an earlier point in the game, and thus can use electoral incentives to elicit that behavior on the part of the government that has the most desirable effect on the behavior of the mafia. Lemma 1 also implies that the firm's decisions to pay off the mafia and even the mafia's choice of what fee to demand, conditional on it choosing to enter the market, are independent of γ.

The firm will pay the fee named if and only if that fee is smaller than the expected loss associated with not paying it. By comparing the firm's expected utility from paying off the mafia to its expected utility from not doing so, we can find the upper bound on the fee that the mafia can charge such that the firm prefers to pay it off.

If the firm pays off the mafia, its expected payoff is $1-\tau-\phi$. If it refuses to pay the mafia, and instead appeals to the government for protection, its expected payoff is $f(\lambda^*\tau)(1-\tau)$.

Thus, the firm will pay off the mafia if and only if:

$$\phi \leq (1 - \tau)(1 - f(\lambda^* \tau)) \equiv \overline{\phi}. \qquad (2)$$

This maximal fee that the the mafia can extract ($\overline{\phi}$) highlights how government law enforcement spending can mitigate the threat of mafia extortion. When the government invests in law enforcement, the risk to a firm of not paying off the mafia is lowered. This is because high levels of law enforcement spending make it more likely that the government will successfully defend the firm if it refuses to pay off the mafia. Consequently, the fee that the firm is willing to pay (and that the mafia can, therefore extract) is decreasing in the level of government spending on law enforcement. This intuition is formalized in the following result.

Remark 1 *The maximal fee the mafia can extract is decreasing in the level of government spending on law enforcement.*

Proof. The result follows from inspection of $\overline{\phi}$. ■

3.5 The Mafia's Demand

Consider next the mafia's choice of what fee to demand from the firm (ϕ). If the mafia chooses ϕ such that the firm is willing to pay it off, its expected utility is

$$E[u_M(\phi \leq \overline{\phi};, \lambda^*, \gamma^*, \tau, p)] = \phi - \gamma^* p f(\lambda^* \tau) k.$$

Since this is increasing in ϕ, if the mafia is going to choose a fee that induces the firm to pay it off, it will clearly choose the highest such fee ($\phi = \overline{\phi}$).

The mafia's next alternative is to charge a fee high enough that the firm does not pay it off. In this case, the mafia will attempt to extort all of the firm's resources, yielding expected utility:

$$E[u_M(\phi > \overline{\phi};, \lambda^*, \gamma^*, \tau)] = (1 - f(\lambda^*\tau))(1 - \tau) - f(\lambda^*\tau)k.$$

Note that demanding a fee of $\overline{\phi}$, which the firm will pay, dominates demanding a higher fee and having to attempt to extort the firm. Thus, the mafia will never demand more than the firm is willing to pay.

The mafia's final option is to make no demand, exiting the market. Its payoff in that case is 0. Comparing these expected utilities, and substituting in for $\overline{\phi}$, the mafia prefers to demand its optimal fee rather than exit the market if and only if its expected punishment is less than the total fees it collects.

$$\gamma^* p f(\lambda^*\tau))k < \overline{\phi} = (1 - \tau)(1 - f(\lambda^*\tau)). \tag{3}$$

The following lemma formally summarizes the above argument characterizing the mafia's behavior.

Lemma 2 *If $\gamma^* pk \leq (1 - \tau)\frac{(1-f(\lambda^*\tau))}{f(\lambda^*\tau))}$, then the mafia demands $\phi = (1 - \tau)(1 - f(\lambda^*\tau))$, correctly anticipating that the firm will pay it off. If $\gamma^* pk > (1 - \tau)\frac{(1-f(\lambda^*\tau))}{f(\lambda^*\tau))}$, then the mafia makes no demand, exiting the market.*

We can now readily see why Proposition 1, which characterizes the equilibrium when γ is restricted to 0, holds. Recall that that modified game has a unique equilibrium in which the mafia completely replaces the government. To see why that is so, observe that the expected utilities in the modified game (i.e. when γ is restricted to 0) are identical to those in the unmodified game, so both the firm's strategy with respect to hiring the mafia and, hence, the mafia's expected utility, evaluated at $\gamma = 0$, are the same. The left-hand side of equation 3 evaluated at $\gamma = 0$ is always less than the right-hand side, so the first part of Lemma 2 describes the optimal choice of ϕ. On the equilibrium path, $\phi = \overline{\phi}$, and the firm pays off the mafia. This implies that the government never engages in law enforcement. Hence, the government has no incentive to invest in law enforcement ($\lambda^* = 0$, for all $\boldsymbol{\rho}$), which means that any revenues spent on taxes will be expropriated, so the firm's most preferred tax level is 0, completing the proof of Proposition 1.

3.6 Investment in Law Enforcement

The government chooses the amount of tax revenues to allocate to law enforcement (λ) such that

$$\lambda \in \arg\max E[u_G(\lambda, \gamma^*; \boldsymbol{\rho}^*, \mu^* p, \tau)]. \tag{4}$$

The following result is useful in finding the government's optimal allocation.

Lemma 3 *The government will never choose λ such that $\gamma \in (0, 1)$.*

Proof. See the appendix. ■

This lemma implies that we can restrict attention to cases where, if the firm pays off the mafia and the government becomes aware of the mafia's activities, the government never challenges ($\gamma = 0$) or challenges with certainty ($\gamma = 1$). Moreover, if the government never challenges in equilibrium, then it has no incentive to invest in law enforcement since it is never called upon to fight. Likewise, if the mafia makes no demands, the government has no incentive to invest.

In choosing how to allocate tax resources the government considers several factors. On the one hand, spending tax revenues on law enforcement is costly to the government because revenues directed toward law enforcement cannot be expropriated. On the other hand, investment in law enforcement may affect the government's probability of reelection.

There are three possible effects of electoral incentives on government spending on law enforcement. The voting rule might punish the government for defeating the mafia, be unrelated to whether the government defeats the mafia, or reward the government for defeating the mafia. In the first two cases, the government has no electoral incentive to invest in law enforcement. This, coupled with the desire to expropriate as much as possible, leads the government not to invest any resources in law enforcement. In the latter case, the government faces a trade-off between expropriation and reelection. How these various considerations balance out depends on the level of tax revenues the firms provide to the government.

Since the case where the firm provides electoral incentives for investing in law enforcement is the only case where the government faces any choice over the division of resources, we analyze this case. Later we demonstrate that the optimal behavior of the firm is to provide such incentives. The proportion of tax revenue that the government commits to law enforcement is formally derived in the appendix. We discuss the intuition below.

If the tax rate is sufficiently small, then the marginal increase in the government's probability of winning a conflict with the mafia, and hence being reelected, from committing the last unit of tax revenue to law enforcement is greater than the marginal benefit of misappropriating the funds. Thus the government commits all of the revenue to law enforcement when taxes are sufficiently low.

For somewhat higher tax rates, the government allocates revenue to law enforcement only until the marginal expected electoral benefit from increasing the probability of victory over the mafia equals the marginal benefit of misappropriating the funds. This absolute amount of law enforcement ($\lambda\tau$) is constant as the tax rate increases, so the proportion of revenue committed to law enforcement decreases as revenue increases.

As long as the tax rate is not too high, the mafia will prefer to collect its fee and risk punishment from the government; however, for sufficiently high tax rates, the fee that the mafia can demand from the firm is too small to warrant such risks. In such circumstances, if the government chooses a high level of law enforcement, so that the mafia's risk of punishment is high, the mafia will withdraw from the market, making no demand. But if the mafia withdraws, then the government's choice to commit resources to law enforcement is not optimal since it is never in conflict with the mafia. In this circumstance, the government should deviate to no investment in law enforcement. But, when it does so, the mafia faces little risk of punishment, and thus wants to demand a fee that leads the firm to pay it off, which again makes the government's resource allocation decision sub-optimal. Thus, for these moderately high tax rates, the government commits fewer resources to law enforcement and the mafia randomizes between demanding the maximal fee that induces the firm to pay and withdrawing from the market, making no demand. This strategy profile limits the mafia's risk of punishment by the government. Furthermore, the government's limited investment in law enforcement is rational because conflict with the mafia occurs relatively rarely (since the mafia sometimes withdraws) but not never.

For very high tax rates, the fee that the mafia can obtain from the firm is too small to warrant risking confrontation with even the weakest government, i.e. one that invests nothing in law enforcement. As such, the mafia withdraws from the market and, hence, the government invests no tax revenues in law enforcement.

The absolute amount that the government spends on law enforcement, the fee charged by the mafia, and the likelihood of the mafia operating its optimal protection racket, rather than withdrawing from the market, are each represented as a function of the tax rate in Figure 2.

3.6.1 Taxation, Government Corruption, and Law Enforcement

Taxation, in this model, may benefit the firm by increasing law enforcement and, thereby, weakening the mafia. The question arises, then, whether increasing government funding will actually lead to an increase in law enforcement spending, given the potential for government corruption. We will refer to the percentage of total tax revenues that the government expropriates as the level of government *corruption*.

As already discussed, the government, in choosing how much to invest in law enforcement, balances two types of incentives. On the one hand, it is tempted to expropriate tax revenues. On the other hand, it has electoral incentives to invest in law enforcement. These electoral incentives come from the firm's threat not to reelect the government should it fail to challenge and defeat the mafia. The government will act in an increasingly uncorrupt manner as

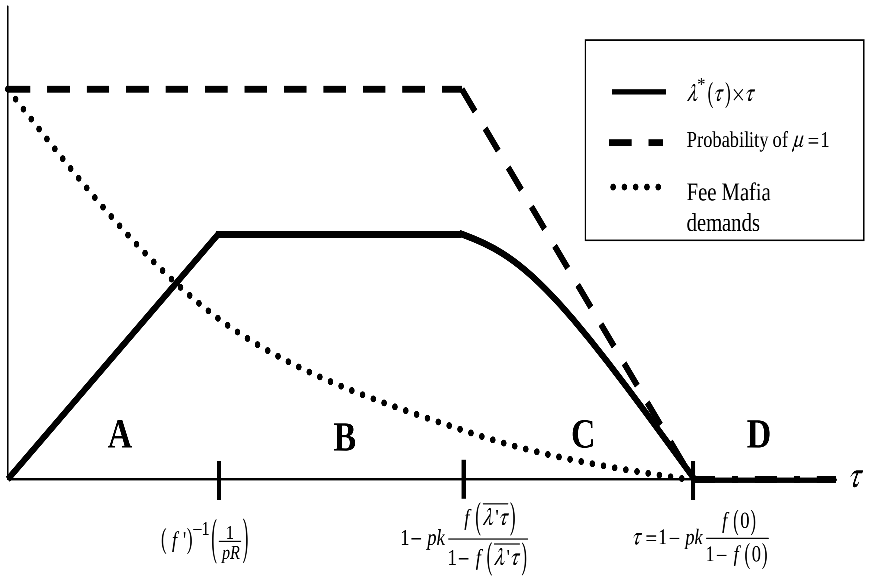

Figure 2: The effect of increasing taxes on law enforcement expenditures, the frequency with which the mafia is paid off, and the fee paid to the mafia, with the equilibrium values $\rho_G = 1$ and $\rho_M = 0$ (see Remark 2).

the electoral threat associated with losing to the mafia increases relative to the appeal of expropriating tax revenues.

Although it is not illustrated directly, Figure 2 makes clear that, somewhat surprisingly, the level of government corruption is weakly increasing in the amount of taxation. That is, the more money the government collects in taxes, the higher the *percentage* of the money it expropriates. In region A, there is no corruption. The government invests all revenues in law enforcement because the electoral incentives loom large when the size of the government budget is small. At a somewhat higher level of taxation, the incentives for corruption become sufficiently strong that the government begins to expropriate tax resources. Within this range (region B), corruption is increasing in the level of taxation—the government keeps total law-enforcement spending constant, expropriating the surplus. Once taxes become high enough (region C), the level of corruption increases even faster as tax revenue increases. This is because, as taxes increase in this range, the mafia makes demands of the firms less frequently. This weakens electoral incentives to invest in law enforcement because conflict between the government and mafia becomes less frequent. In this range, in fact, corruption is increasing so fast that total expenditures on law enforcement are actually *decreasing* in the level of taxation—the more resources the government has, the fewer resources (in absolute, not just percentage, terms) it spends on law enforcement. Finally, when taxes are high enough (region D), the mafia cannot extract a fee that make it worth being in business, so the government is never called on to challenge the mafia, and therefore it expropriates all tax revenues, spending nothing on law enforcement.

Proposition 2 *The level of corruption* $(1 - \lambda)$ *is weakly increasing in the tax rate.*

Although corruption is monotonic in the tax rate, the absolute level of spending on law enforcement ($\lambda\tau$) is not. This is because as taxes and the level of corruption increase, the absolute amount of spending on law enforcement may increase or decrease, depending on which effect dominates. In particular, as discussed above, in region C corruption increases so much as taxes increase that total spending on law enforcement actually decreases despite the fact that the size of the government's budget has increased.

Proposition 3 *Government spending on law enforcement* ($\lambda\tau$) *is not monotonic in the level of taxation. It is increasing in region A, positive and flat in region B, decreasing in region C, and 0 and flat in region D.*

Proof. See the appendix. ■

3.6.2 Taxation and Mafia Viability

The dashed line in Figure 2 shows that the frequency with which the mafia chooses to be in business is weakly decreasing in the tax rate. When taxes are low (in regions A and B), the mafia runs a successful protection racket in the sense that the firm always pays the fee the mafia demands. However, government policy in these regions does have an effect on the mafia. In particular, government investment in law enforcement and the threat of punishment decrease the mafia's fee. Thus, in these regions the firm uses electoral pressure to successfully limit the strength, if not the ubiquity, of the mafia, by pressuring the government to spend tax resources on law enforcement. As taxes increase even further, into region C, the mafia is weakened, in the sense that it sometimes withdraws from the market to avoid a confrontation with the government. Finally, if taxes become high enough (region D), the mafia is entirely eradicated. In order to achieve this outcome, the firm must turn over so much money to the state in the form of taxes that the fee that the mafia is able to demand is not sufficient to overcome the risk of punishment that the mafia faces, even when the government invests nothing in law enforcement.

The level of taxation that drives the mafia out of business is $\bar{\tau} = 1 - kp\frac{f(0)}{1-f(0)}$. Three comparative statics are evident. First, $\bar{\tau}$ is decreasing in the government's natural advantage relative to the mafia ($f(0)$). That is, in societies where existing government institutions make the government strong relative to mafias, it is relatively inexpensive to drive the mafia out of business. Second, $\bar{\tau}$ is decreasing in k. The larger the penalty the government is able to impose, the easier it is to eradicate the mafia. Third, $\bar{\tau}$ is decreasing in p. The more likely the government is to independently discover the mafia's activities, the easier it is force the mafia out of business.

Proposition 4 *The frequency with which the mafia runs a protection racket rather than not entering the market is weakly decreasing in the tax rate, with the mafia entirely removed from the market if taxes are high enough. The level of taxation necessary to force the mafia to withdraw is decreasing in the government's natural advantage relative to the mafia ($f(0)$), in the penalty the government is able to impose on the mafia (k), and in the probability the government independently uncovers the mafia's activities (p).*

Proof. See the appendix. ■

3.7 Optimal Electoral Incentives

Having solved for the optimal behavior of the mafia and the government, given an electoral rule, we can now go back and determine the firm's optimal voting rule.

Proposition 1 makes clear the importance of the firm's inducing the government to challenge the mafia ($\gamma > 0$) when it runs a protection racket, and Lemma 1 implies that the firm can credibly commit *ex ante* to any electoral response to achieve that goal. Lemma 1 also implies that the firm's optimal choice of electoral behavior depends not only on the government's response to the incentives created, but also on the incentives that that response creates for the mafia. From Remark 1, if the mafia expects its demands to be met by the firm, then the fee the mafia demands is decreasing in the government's investment in law enforcement ($\lambda\tau$), and hence the firm wants to induce the government to invest in law enforcement as much as possible. The firm also wants to induce the highest possible probability of the government challenging the mafia (γ), because the government has greater incentive to invest in law enforcement if it anticipates confronting the mafia more often.

In light of this, what reelection rule will the firm adopt? First, notice that the reelection probability conditional on the government not challenging when the firm has paid the mafia off (ρ_{NG}) affects the government's choice of whether to challenge, but does not directly enter into the government's choice of investment in law enforcement. In particular, from equation (1), the government will challenge the mafia only if $\rho_{NG} < \rho_M(1 - f(\lambda^*\tau)) + \rho_G f(\lambda^*\tau)$. Since the firm wants the government to challenge, it will electorally punish the government for not challenging by choosing a ρ_{NG} that satisfies this constraint (e.g., 0).

Next, consider the electoral responses when the government loses a conflict with the mafia (ρ_M) or wins a conflict with the mafia (ρ_G). Government investment in law enforcement (λ^*) is weakly increasing in ρ_G and weakly decreasing in ρ_M. That is, if the government is rewarded for winning and punished for losing, it has incentives to invest in law enforcement. Since the firm wants government law enforcement spending to be as large as possible, it will provide electoral incentives for government victory. Thus, the firm wants to make $\rho_G - \rho_M$

as large as possible, which implies $\rho_G = 1$ and $\rho_M = 0$. We summarize this argument in the following proposition:

Remark 2 *The firm chooses a reelection rule in which it reelects the government with certainty if the government challenges the mafia and wins, does not reelect the government if it challenges and loses, and reelects the government with a probability of no more than $f(\lambda^*\tau)$ if the government does not challenge the mafia.*

Proof. The proof follows from the argument in the text and the fact that $\rho_M^* = 0$. ■

Remark 2 shows that the firm adopts the intuitive electoral strategy. It rewards the government electorally if it challenges the mafia and wins and punishes the government if it fails to challenge or challenges but loses. The credible commitment to this retrospective voting rule provides the government with incentives to invest in law enforcement and challenge the mafia.

4 Taxation

4.1 Taxation and Welfare

In assessing social welfare, we focus on the resources controlled by the firm.[8] The socially optimal tax policy, from this perspective, is the one that leaves the firms with the most resources at the end of the game.

Because of the presence of the mafia, the productivity (social welfare) maximizing tax rate need not be zero. Higher taxes are welfare enhancing if their use in law enforcement lowers the fee the mafia can extract enough to more than compensate for the money spent on taxation. In what follows, we formally analyze the effect of taxation on social welfare.

[8] We focus on the firm because it, unlike the mafia and the government, is understood to be a (directly) productive actor, and the only one with a legitimate (in a democratic society) claim that the government should serve its needs.

The expected level of resources that the firm is left with, as a function of the tax rate, is given by:

$$E[u_F(\tau,\cdot)] = \begin{cases} (1-\tau)f(\tau) & \text{if } \tau < (f')^{-1}\left(\frac{1}{pR}\right) \\ (1-\tau)f(\overline{\lambda'\tau}) & \text{if } \tau \in \left[(f')^{-1}(\frac{1}{pR}), 1-kp\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}\right] \\ (1-\tau)\left(\pi + (1-\pi)f(\hat{\lambda}\tau)\right) & \text{if } \tau \in \left(1-kp\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}, 1-kp\frac{f(0)}{1-f(0)}\right) \\ (1-\tau) & \text{if } \tau > 1-kp\frac{f(0)}{1-f(0)}, \end{cases} \tag{5}$$

where $\overline{\lambda'\tau}$ is defined in equation (10) in the appendix, $\hat{\lambda}\tau$ is defined in equation (12) in the appendix, and π (the probability the mafia makes no demand) is defined in equation (13) in the appendix.

The expected resources left for the firm changes in each of the regions of Figure 2 because the government's allocation of the tax resources and the mafia's behavior are different in each region. In order to determine the socially optimal tax rate, we must compare the locally optimal tax rate in each of these regions. Label the locally optimal tax rate in each region (including the boundaries) τ_j^*, $j \in \{A, B, C, D\}$. The following result will be useful in finding the social optimum.

Lemma 4 *The socially optimal tax rate is never in regions B or D. It is always either* τ_A^* *or* τ_C^*.

Proof. See the appendix. ■

The intuition behind this lemma is that, because government investment in law enforcement is flat in regions B and D, the expected level of resources left for the firm is decreasing in the tax rate in those regions. Thus, the socially optimal tax rate can never be in the interior of B or D. It is feasible, however, for it to be in the interiors of A or C or on their boundaries. In order to determine which it is, we must find the local optima and compare them. This intuition is illustrated in Figure 3.

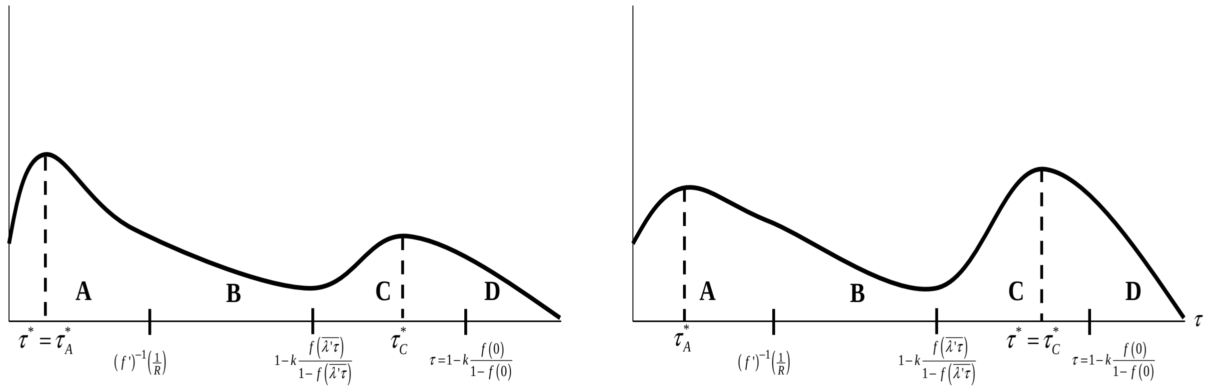

Figure 3: The firm's expected resources as a function of the tax rate. The socially optimal tax rate can be in region A (left-hand figure) or region C (right-hand figure), but never regions B or D.

In region A, if the local optimum is interior, it is given by the following first-order condition:

$$(1 - \tau_A^*) \frac{f'}{f} (\tau_A^*) = 1.$$

At the interior optimum, the locally optimal tax rate in region A balances the marginal benefit of increased law enforcement that comes with increased government funding against the marginal cost of increased taxation. If $(1 - \tau) \frac{f'}{f} (\tau) > 1$ for all $\tau < (f')^{-1} \left(\frac{1}{pR}\right)$, then there is a corner solution, denoted

$$\bar{\tau}_A^* = (f')^{-1} \left(\frac{1}{pR}\right).$$

Similarly, if the local optimum in region C is interior, it is given by the following first-order condition:

$$(1 - \tau_C^*) \left(\frac{\partial \pi}{\partial \tau} \left(1 - f(\hat{\lambda}\tau_C^*)\right) + (1 - \pi) f'(\hat{\lambda}\tau_C^*) \frac{\partial \hat{\lambda}\tau_C^*}{\partial \tau} \right) - \left(\pi \left(1 - f(\hat{\lambda}\tau_C^*)\right) + f(\hat{\lambda}\tau_C^*)\right) = 0.$$

Increasing the tax rate in region C has three effects on the expected level of resources left for the firm. First, it has the direct effect of taking away resources from the firm through taxation $\left(- \left(\pi \left(1 - f(\hat{\lambda}\tau_C^*)\right) + f(\hat{\lambda}\tau_C^*)\right) < 0\right)$. Second, it changes the probability that the mafia stays in business and extracts its fee $\left((1-\tau_C^*)\frac{\partial\pi}{\partial\tau}\left(1-f(\hat{\lambda}\tau_C^*)\right)\right)$. As shown in the proof of Proposition 4, this effect is positive—increasing taxes decreases the probability that the mafia remains in business, which increases the expected revenues left for the firm. In contrast, increasing taxes decreases total spending on law enforcement $((1-\tau_C^*)(1-\pi)f'(\hat{\lambda}\tau_C^*)\frac{\partial\hat{\lambda}\tau_C^*}{\partial\tau}<0)$, which increases the fee the mafia can demand, conditional on staying in business, which diminishes the firm's expected resources. The locally optimal tax rate balances these marginal benefits and marginal costs.

If the first-order condition does not hold with equality for any tax rate in region C, then the locally optimal tax rate is either the lower corner or upper corner, respectively denoted

$$\underline{\tau}_C^* = 1 - kp\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}$$

and

$$\overline{\tau}_C^* = 1 - kp\frac{f(0)}{1-f(0)}.$$

The socially optimal tax rate is found by comparing the expected total resources left for the firm at these local optima (see Figure 3). This gives rise to the following result.

Proposition 5 *The socially optimal tax rate is characterized by*

$$\tau^* = \begin{cases} \tau_A^* & \text{if } E[u_F(\tau_A^*)] \geq \max\{E[u_F(\tau_C^*)], E[u_F(\underline{\tau}_C^*)], E[u_F(\overline{\tau}_C^*)]\} \text{ and } \tau_A^* \leq (f')^{-1}\left(\frac{1}{pR}\right) \\ \overline{\tau}_A^* & \text{if } E[u_F(\overline{\tau}_A^*)] \geq \max\{E[u_F(\tau_C^*)], E[u_F(\underline{\tau}_C^*)], E[u_F(\overline{\tau}_C^*)]\} \text{ and } \tau_A^* > (f')^{-1}\left(\frac{1}{pR}\right) \\ \tau_C^* & \text{if } E[u_F(\tau_C^*)] > \max\{E[u_F(\tau_A^*)], E[u_F(\overline{\tau}_A^*)]\} \text{ and } \tau_C^* \leq 1 - kp\frac{f(0)}{1-f(0)} \\ \overline{\tau}_C^* & \text{if } E[u_F(\tau_C^*)] > \max\{E[u_F(\tau_A^*)], E[u_F(\overline{\tau}_A^*)]\} \text{ and } \tau_C^* > 1 - kp\frac{f(0)}{1-f(0)} \end{cases}$$

Proof. Lemma 4 implies that the social optimum must be in region A or C. The same Lemma implies that the expected resources are decreasing from the local optimum in region A until the boundary between region B and C. Further, if $\underline{\tau}_C^*$ is the local optimum in region

C, then the expected resources are decreasing for all tax rates greater than the local optimum in region A. Thus $\underline{\tau}_C^*$ can never be the social optimum. The rest of the proposition follows from the argument in the text. ■

According to Proposition 5, the socially optimal tax rate can be in either region A or region C. Thus, the model describes two possible scenarios that characterize the socially optimal equilibrium path. One scenario has low taxation, low corruption, and high mafia presence. The other scenario has higher taxation, more corruption, and less mafia presence. What determines whether the lower or the higher tax rate is socially optimal?

In region A, the firm pays relatively low taxes, all of which are directed by the government toward law enforcement. However, because taxes are low, the mafia can extract fairly high fees from the firms, with relatively little threat of successful law enforcement by the modestly funded government. Thus, a low tax rate confers the benefits of leaving resources in the economy and a non-corrupt government, but imposes the costs of a thriving mafia that runs a protection racket, extracting high fees.

In region C, the firm pays higher taxes, only some of which are directed by the government toward law enforcement. Because taxes are high, the mafia cannot extract as much in fees from the firm because the firm does not have as much to lose. Thus the benefits of doing business are lower for the mafia. The mafia also faces a substantial cost, in the form of the risk of punishment. In equilibrium, these costs and benefits are exactly equal and, as a result, the mafia sometimes chooses to withdraw from the market. Moreover, even when the mafia persists, the fee it demands is lower.

Thus, moving from region A to region C has a variety of effects on the social welfare. On the one hand, it increases the taxes the firms pay and increases government corruption, making society worse off. On the other hand, it decreases the fee the mafia can demand and decreases the frequency with which the mafia is active in the economy. Whether lower taxes (region A) or higher taxes (region C) are optimal depends on the relative magnitude of these tradeoffs.

4.2 The Firm's Willingness to Pay Taxes

The social welfare analysis can be reinterpreted in terms of the firm's willingness to pay taxes. In some economic environments the firm might be in a position either to instruct the government as to the proper tax rate (through electoral pressure) or simply to choose to pay only those taxes that it wants to. On either of these interpretations, the tax policy the firm will choose is the social optimum, since the social optimum was defined with respect to the firm's interests.

The firm is willing to fund the government because the threat of government challenge makes it relatively less attractive to the mafia to stay in business and diminishes the fee the mafia can demand. The firm always has the choice of driving the mafia out of business. It simply has to be willing to pay enough in taxes. However, funding the government sufficiently to achieve this goal is costly. Consequently, the firm will typically allow the mafia to persist. Either it will choose a very low tax rate (in region A) and resign itself to always paying off the mafia, or it will choose a higher tax rate and pay off the mafia every once in a while. This intuition is summarized in the following corollary of Proposition 5.

Corollary 1 *Although the firm can always choose a tax rate, $\tau = 1 - kp\frac{f(0)}{1-f(0)}$, that would drive the mafia out of business entirely, in equilibrium it chooses a lower tax rate, which allows the mafia to persist in running its protection racket.*

Proof. From equation (3), if $\tau > 1 - kp\frac{f(0)}{1-f(0)}$, the mafia withdraws from the market. Proposition 5 establishes the conditions under which they choose $\tau < 1 - kp\frac{f(0)}{1-f(0)}$ and Proposition 4 establishes that, at those tax rates, the mafia demands a fee that the firm is willing to pay with positive probability. ■

5 An Extension: The Possibility of Collusion

A common theme in the literature on crime and government corruption that we have not yet touched on is the bribery of government officials to overlook or ignore criminal acts.

In this section, we consider a simple extension of our model that allows us to explore the implications of introducing the possibility of collusion between the mafia and the government and the effectiveness of electoral sanctions in controlling it.[9]

Consider an extension in which, at the time when the government chooses whether or not to challenge the mafia, the mafia and the government also have the choice to enter into a credible agreement whereby the government does not challenge the mafia, in exchange for a payment from the mafia β. Thus, the mafia and the government can collude to prevent the government from breaking up the mafia's protection racket. How does this possibility affect equilibrium play?

Suppose that after the firm chooses whether to pay the mafia, the mafia can offer a bribe to the government not to challenge it. Such a bribe will only be in the mafia's interest if it is cheaper than the mafia's expected loss from fighting the government. Further, the government will only accept the bribe if its value is greater than the government's expected electoral reward from fighting.

First consider the case in which the firm has paid the mafia's demand of ϕ. The mafia's payoff from paying a bribe β, and avoiding potential conflict with the government, is $\phi - \beta$. Its expected payoff from not paying the bribe and risking conflict is $\phi - pkf(\lambda\tau)$. Hence, the mafia is willing to pay a bribe $\beta \leq pkf(\lambda\tau)$. The government is willing to accept β if

$$\rho_{NG}R + \beta \geq [p(1 - f(\lambda\tau))\rho_M + pf(\lambda\tau)\rho_G + (1 - p)\rho_{NG}]R.$$

Thus, the mafia offers the lowest β the government will accept,

$$\beta = [1 - f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G - \rho_{NG}]pR,$$

as long as that minimum bribe is small enough to make paying it in the mafia's interest.

[9]Whereas in other models the penalty for accepting bribes is exogenously fixed (Basu et al 1992, Bowles and Garoupa 1997, Garoupa and Jellal 2002, Kugler et al 2005, Polinsky and Shavell 2001), in ours it is determined endogenously by the firm's equilibrium voting behavior.

This will be true if and only if

$$[1 - f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G - \rho_{NG}]R < kf(\lambda\tau). \tag{6}$$

Next, consider the case in which the firm has refused to pay off the mafia. In this case the mafia attempts to extort the firm's entire revenue, but also knows with certainty that it will be challenged by the government. The payoff to the mafia from paying a bribe and avoiding conflict is $(1 - \tau) - \beta$. The expected payoff from not paying a bribe and, consequently, engaging in conflict with the government is $(1 - f(\lambda\tau))(1 - \tau) - kf(\lambda\tau)$. Comparing these, the mafia is willing to pay a bribe β if

$$\beta < f(\lambda\tau)(1 - \tau + k).$$

The government is willing to accept the bribe β if

$$\beta + \rho_{NG}R \geq [(1 - f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G]R.$$

Again, the mafia offers the smallest bribe that the government will accept,

$$\beta = [1 - f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G - \rho_{NG}]R,$$

as long as this minimum bribe is small enough to make paying it preferable to the risk of conflict. This will be true when

$$[1 - f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G - \rho_{NG}]R < f(\lambda\tau)(1 - \tau + k). \tag{7}$$

The mafia is more willing to pay bribes when the firm refuses to pay it off. This is because the stakes for the mafia are higher when it is trying both to expropriate the firms and to avoid punishment by the government than they are when it is only trying to avoid punishment. One can see this formally by comparing equations (6) and (7). The left-hand sides of the two equations are the same, and, since $(1-\tau) > 0$, the right-hand side of equation (7) is larger. Thus, if the mafia will bribe the government when the firm pays the mafia's fee, the mafia will certainly bribe the government when the firm refuses to pay the fee.

If the government is bribed not to challenge the mafia when the firm refuses to pay, then the mafia will take everything from the firm with certainty. Given this, if the mafia is expected to bribe the government, the firm will be willing to pay any fee up to its entire revenue (($\phi = (1-\tau)$.) Since this is the worst possible outcome for the firm, its top priority is to induce the government to challenge, i.e., making it prohibitively costly, if possible, for the mafia to bribe the government. The tool at the firm's disposal to attempt to accomplish this goal is its electoral threat. Thus, the firm's optimal reelection rule ($\boldsymbol{\rho}$) must first and foremost insure that the mafia cannot bribe the government when the firm appeals to it directly (i.e., equation (6) should not hold). If it can attain that goal, the firm, of course, also wants to induce the highest possible level of law enforcement spending by the government (λ).

Whether the firm can deter bribery, and what the optimal voting rule is, depend on other parameter values. First, consider the case where the rewards of reelection to the government are large relative to the punishment the government can impose on the mafia ($R > k$). In this case the government is disinclined to forgo reelection, which means the minimum acceptable bribe is high. Moreover, the mafia is not particularly afraid of conflict, so it is not particularly willing to bribe the government. Here, then, the intuitive electoral strategy is enough to deter bribery. If the firm rewards the government for challenging and succeed ($\rho_G = 1$) and punishes the government for challenging and failing ($\rho_M = 0$) or for failing to challenge ($\rho_{NG} = 0$), then the inequality is equation (6) will not hold and bribery will not occur.

On the opposite end of the spectrum, consider a situation in which reelection is not very valuable, the threat of punishment is large, and the government is very strong relative to the mafia ($R < f(0)k$). Here the government is quite open to being bribed relatively cheaply and the mafia wants to avoid conflict so is quite willing to pay a bribe. In this case there is nothing the firm can threaten to avoid the mafia bribing the government.

Most interesting is the interim case, where it is not trivial for the firm to deter bribery, but it is also not impossible (i.e., $R \in (kf(0), k)$). Here, choosing a reelectoral rule that rewards the government for challenging and succeeding ($\rho_G = 1$) and punishes the government for not challenging when appealed to ($\rho_{NG} = 0$) is consistent with both the goals of deterring bribery and encouraging investment in law enforcement. However, there may a tension between these two goals when it comes to what to do should the government challenge but fail. Rewarding the government for challenging, even if it fails ($\rho_M = 1$), increases the minimal acceptable bribe, making it more likely the mafia will not bribe the government and a challenge will occur. However, this electoral strategy also implies that the government has no incentive to invest in law enforcement ($\lambda = 0$), since it will be rewarded just for trying, regardless of performance. Thus, the firm must find a middle ground, rewarding the government probabilistically should it challenge and fail. Note that this strategy is significantly different from that found in the model without collusion, where the firm always punishes failure.

Proposition 6 *If $R > k$, then no bribery occurs in equilibrium, the level of investment in law enforcement is positive, and the government is re-elected only if it successfully challenges the mafia. If $R \in (kf(0), k)$, then no bribery occurs in equilibrium, the level of investment in law enforcement is positive but lower, and the government is re-elected with certainty if it successfully challenges the mafia and with positive probability if it unsuccessfully challenges it. If $R < kf(0)$, then in equilibrium bribery takes place with certainty and the government never challenges the mafia.*

It is worth noting one additional implication of this analysis. We have taken the level of punishment that the government can impose on the mafia (k) to be an exogenous parameter throughout the analysis. Thus, it might appear that by increasing the government's capacity for punishment, the firm can costlessly diminish the power and prevalence of the mafia. Proposition 6 demonstrates that this is not true. In particular, as the punitiveness of government punishment increases, the mafia is increasingly willing to pay bribes. Consequently, an increase in k can lead to an increase in bribery and a decrease in government law enforcement spending, both of which are bad for the firm. Hence, if the firm were in a position to choose the level of punishment that the government can impose on the mafia, it surely would not choose to make it arbitrarily large.

Corollary 2 *The likelihood of bribery and the level of corruption are weakly increasing in the severity the punishment the government can impose on the mafia (k).*

6 Conclusion

The presence of mafias in the political economy creates the possibility of extortion. This threat of extortion, we have argued, has important implications for the actions of firms and the government.

In our model, the firm pays taxes and uses electoral pressure to persuade the government to invest tax revenues in law enforcement. The firm is willing to bear the cost of taxation and the risk of government expropriation because law enforcement weakens the mafia—lowering the fees it demands by diminishing the risk of expropriation should the firm choose not to pay off the mafia. For some levels of taxation, in fact, law enforcement spending not only diminishes the fees extracted by the mafia but decreases the mafia's presence in the economy. However, the firm purchases this decreased mafia presence at the cost of increased taxation and greater government corruption.

This modeling approach suggests a variety of interesting avenues for future work. We consider a simple version of collusion between governments and mafias here. However, other forms of collusion might also be fruitfully explored in a similar framework. For instance, governments might have an incentive to "hold up" firms in exchange for law enforcement protection from an extortionist mafia. Such incentives would be further exacerbated if the costs governments bear for taxing different firms vary across firms or industries (Gehlbach 2003). If such rent extraction has efficiency implications, this might provide incentives for firms to sell themselves to the government, providing government officials with an equity stake in the firm in order to mitigate the hold up problem.

Another possibility would be to consider the effect of the presence of a mafia on new firms' willingness to enter the market. Suppose, for instance, that there is a tax rate that is low enough that the mafia's demands are always met (region A). Imagine that there is a firm that would like to enter the market at that tax rate in the absence of a mafia. However, the presence of the mafia might be enough to deter that firm. The mafia could thereby diminish growth. It might also be the case in such an environment that, if several firms were to enter at once, tax revenues would increase enough to shift the equilibrium to one where the mafia was much less prevalent (akin to region C in our model). Thus, one might think that the presence of the mafia might lead to incentives for several firms to enter together (and for the government to foster such coordination). Such an extension would surely have further implications for the level of corruption, mafia extortion, and the socially optimal tax rate.

Thus, within the context of the relationship between states, firms, and extortionary mafias, there are a rich variety of theoretical questions to be explored within the basic framework we propose. We leave them for future research.

A Appendix

A.1 Proof of Lemma 1

We compare the firm's expected utilities associated with $\gamma = 1$ and $\gamma = 0$, respectively.

$$E[u_i(\gamma = 1, \mu = 1), \cdot)] = (1 - f(\lambda\tau))(1 - \tau - \phi) + f(\lambda\tau))(1 - \tau - \phi) =$$
$$1 - \tau - \phi = E[u_i(\gamma = 0, \mu = 1), \cdot)]$$

■

A.2 Proof of Lemma 3

$$E[u_G(\lambda,\cdot)] = (1-\lambda)\tau + [(1-\mu^*(\cdot))((1-f(\lambda^*\tau))\rho^*_M(\cdot) + f(\lambda^*\tau)\rho^*_G(\cdot)) \\ + \mu^*(\cdot)(p\gamma^*(\cdot)((1-f(\lambda^*\tau))\rho^*_M(\cdot) + f(\lambda^*\tau)\rho^*_G(\cdot)) + (1-p\gamma^*(\cdot))\rho^*_{NG}(\cdot))]R. \quad (8)$$

From equation (1), the government's choice of whether or not to challenge the mafia given that the firm has paid the mafia off and the government has become aware of the mafia's activities (γ) is a function of the government's resource allocation decision (λ). There are two cases to consider:

1. $\rho_{NG} < (1-f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G$
2. $\rho_{NG} \geq (1-f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G$.

Since $f(\lambda\tau)$ is increasing in λ, we know from equation (1) that in case 1, $\gamma = 1$, regardless of λ.

Now consider case 2. There are two possibilities consistent with case 2. From equation (1) we know that if the inequality defining case 2 is strict, then $\gamma = 0$. Lemma 2 implies that if $\gamma = 0$, then $\lambda = 0$. As we will demonstrate in Remark 2, in equilibrium $\rho_M = 0$ and $\rho_G = 1$. Thus, if the inequality defining case 2 holds for some $\lambda > 0$, then it must hold strictly for $\lambda = 0$. Thus, one possibility in case 2 is that the government chooses $\gamma = 0$ and $\lambda = 0$, yielding an expected utility

$$E[u_G(\lambda = 0, \gamma = 0)] = \tau + \rho_{NG}R.$$

The other possibility is that the condition defining the case holds with equality for some $\lambda > 0$. In this case, equation (1) implies that the government will choose any $\gamma \in (0,1)$, in which case the government's expected utility is:

$$E[u_G(\lambda > 0, \gamma \in (0,1))] = (1-\lambda)\tau + p\gamma\left((1-f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G\right)R + (1-p\gamma)\rho_{NG}R.$$

Note from equation (1) that if $\gamma \in (0,1)$, then $\rho_{NG} = (1-f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G$. This implies that we can rewrite the expected just calculated as:

$$E[u_G(\lambda > 0, \gamma \in (0,1))] = (1-\lambda)\tau + \rho_{NG}R.$$

Consider, now, the deviation from $(\lambda > 0, \gamma \in (0,1))$ to $(\lambda = 0, \gamma = 0)$. We have that:

$$E[u_G(\lambda = 0, \gamma = 0)] = \tau + \rho_{NG}R.$$

which is clearly larger than $E[u_G(\lambda > 0, \gamma \in (0,1))]$. Hence, if $\lambda > 0$, then $\gamma \notin (0,1)$. Moreover, if $\gamma = 0$, then λ must be 0. Thus , if $\lambda > 0$, then $\gamma = 1$. ■

A.3 Derivation of λ^*

From Lemma 3, $\lambda > 0$ implies $\gamma = 1$, which, from equation (1) implies that $\rho_{NG} < (1 - f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G$. Recall from equation (3) that the mafia demands fee $\overline{\phi}$ only if $k < \frac{(1-\tau)}{p\gamma}\frac{(1-f(\lambda^*\tau))}{f(\lambda^*\tau)}$. If the mafia makes no demand then $\lambda = 0$. Hence, if $\lambda > 0$ we can further restrict attention to cases where equation (3) is satisfied. Given that $\gamma = 1$ if $\lambda > 0$, the government's expected utility is given by:

$$E[u_G|\lambda, \mu = 1, \cdot] = (1-\lambda)\tau + p\left[((1-f(\lambda^*\tau))\rho_M + f(\lambda^*\tau)\rho_G)\right]R.$$

At an interior solution, the optimal level of investment in law enforcement, labeled λ', satisfies the following first-order condition:

$$f'(\lambda'\tau) - \frac{1}{p(\rho_G - \rho_M)R} = 0, \tag{9}$$

which implies that, if it is interior, $\lambda' = \frac{(f')^{-1}(\frac{1}{p(\rho_G - \rho_M)R})}{\tau}$. Notice, further, that if λ' is interior, then

$$\lambda'\tau = (f')^{-1}\left(\frac{1}{p(\rho_G - \rho_M)R}\right) \equiv \overline{\lambda'\tau} \tag{10}$$

is invariant to the tax rate. We must also consider corner solutions. The assumption that $\lim_{x\to 0} f'(x) = \infty$ rules out $\lambda' = 0$. However, if $f'(\lambda\tau) > \frac{1}{p(\rho_G - \rho_M)R}$, for all $\lambda \leq 1$, then there is a corner solution at $\lambda' = 1$.

λ' is the optimal choice of investment in law enforcement, given that the government challenges. However, no investment in law enforcement ($\lambda = 0$) could be optimal if the government chooses not to challenge. In order to determine when λ' is preferred to $\lambda = 0$, we need to consider two cases.

Case 1: $\rho_{NG} < (1 - f(0))\rho_M + f(0)\rho_G$.

In this case, if the government chooses to deviate from $\lambda = \lambda'$ to $\lambda = 0$, γ nonetheless remains equal to 1. From the concavity of $f(\cdot)$ and the definition of an optimum, it follows that $\lambda = 0$ cannot be optimal in this case unless λ' is itself equal to 0, which is never true.

Case 2: $\rho_{NG} \in ((1 - f(0))\rho_M + f(0)\rho_G, (1 - f(\lambda'\tau))\rho_M + f(\lambda'\tau)\rho_G)$.

In this case, if the government chooses to deviate from $\lambda = \lambda'$ to $\lambda = 0$, this will also lead it to switch from $\gamma = 1$ to $\gamma = 0$. Thus, comparing

$$E[u_G(\lambda', \gamma = 1)] = (1 - \lambda')\tau + p\left((1 - f(\lambda'\tau))\rho_M + f(\lambda'\tau)\rho_G\right)R + (1 - p)\rho_{NG}R$$

to

$$E[u_G(0, \gamma = 0)] = \tau + \rho_{NG} R,$$

we find that the government will choose $\lambda = \lambda'$ in this case only if

$$p\left((1 - f(\lambda'\tau))\rho_M + f(\lambda'\tau)\rho_G - \rho_{NG}\right) R > \lambda'\tau. \tag{11}$$

Otherwise it will choose $\lambda = 0$.

We have established the conditions under which λ' is preferred to $\lambda = 0$, conditioned on the firms hiring the mafia. Notice that, given equation (10), the condition in equation (11) is purely a function of parameters, so that the case where λ' is optimal and the case where $\lambda = 0$ is optimal are mutually exclusive.

Now it remains to consider the consistency of these conditions with the conditions under which the mafia makes a demand. There are three possibilities. From equation (3), if $k > (1 - \tau)\frac{1-f(0)}{pf(0)}$, then the mafia withdraws, making no demand. If so, the government never challenges, and so $\lambda = 0$. If $k < (1 - \tau)\frac{1-f(\lambda\tau)}{pf(\lambda\tau)}$, then the mafia demands $\overline{\phi}$ and the firm pays; the government challenges and chooses $\lambda = \lambda'$ if equation (11) is satisfied and the government does not challenge and does not invest in law enforcement if it is not satisfied. Finally, we need to consider the case $k \in \left((1 - \tau)\frac{1-f(\lambda\tau)}{pf(\lambda\tau)}, (1 - \tau)\frac{1-f(0)}{pf(0)}\right)$. In this case, there is no pure strategy equilibrium.

Define the critical value $\hat{\lambda}$ as the choice of λ such that the mafia is exactly indifferent between demanding $\overline{\phi}$ and making no demand.

$$k = (1 - \tau)\frac{1 - f(\hat{\lambda}\tau)}{pf(\hat{\lambda}\tau)}. \tag{12}$$

Let π be the probability that the mafia makes no demand and $1 - \pi$ be the probability that the mafia demands $\overline{\phi}$. Then, in equilibrium the mafia must choose this probability such that

$\hat{\lambda}$ is optimal for the government. The government's expected utility is:

$$E[u_G(\lambda|\tau,\pi)] = (1-\lambda)\tau + [\pi\rho_{NM} + (1-\pi)(p((1-f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G) + (1-p)\rho_{NG})]\,R.$$

The mafia chooses π such that the following holds:

$$\pi = 1 - \frac{1}{pRf'(\hat{\lambda}\tau)(\rho_G - \rho_M)} \tag{13}$$

Combining all these cases, we can formally characterize the proportion of tax revenue invested in law enforcement in the following lemma:

Lemma 5 *If* $p\left(((1-f(\lambda'\tau))\rho_M + f(\lambda'\tau)\rho_G) - \rho_{NG}\right)R > \overline{\lambda'\tau}$, *then*

$$\lambda^* = \begin{cases} 1 & \textit{if } \tau < (f')^{-1}(\frac{1}{p(\rho_G-\rho_M)R}) \\ \frac{(f')^{-1}(\frac{1}{p(\rho_G-\rho_M)R})}{\tau} & \textit{if } \tau \in \left[(f')^{-1}(\frac{1}{p(\rho_G-\rho_M)R}), 1-pk\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}\right] \\ \hat{\lambda} & \textit{if } \tau \in \left(1-pk\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}, 1-pk\frac{f(0)}{1-f(0)}\right) \\ 0 & \textit{if } \tau > 1-pk\frac{f(0)}{1-f(0)} \end{cases} \tag{14}$$

where $\hat{\lambda}$ *is implicitly defined by (12). If* $p\left(((1-f(\lambda'\tau))\rho_M + f(\lambda'\tau)\rho_G) - \rho_{NG}\right)R < \overline{\lambda'\tau}$, *then when have that* $\lambda^* = 0$ *for all tax rates.*

A.4 Proof of Proposition 2

We will make use of the following result.

Lemma 6 $\hat{\lambda}\tau$ *is decreasing in* τ.

Proof. From equation (12), $\frac{f}{1-f}\left(\hat{\lambda}\tau\right) = \frac{1-\tau}{pk}$. Since the right hand side is obviously decreasing in τ, the left-hand side must be as well. Define $g(\cdot) = \frac{f}{1-f}(\cdot)$. Then $g' = \frac{f'}{1-f} + \frac{ff'}{(1-f)^2} > 0$. Thus, in order for the left-hand side to be decreasing in τ, $\hat{\lambda}\tau$ must be decreasing in τ. ∎

The optimal government resource investment is given by equation (14). The level of corruption is $1-\lambda^*$. Thus, it suffices to show that λ^* is weakly decreasing in τ.

For $\tau \in [0, (f')^{-1}(\frac{1}{p(\rho_G-\rho_M)R})]$, $\lambda^*=1$, which is constant and, therefore, weakly decreasing. For $\tau \in \left[(f')^{-1}(\frac{1}{pR}), 1-pk\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}\right]$, $\lambda^* = \frac{(f')^{-1}(\frac{1}{pR})}{\tau}$, which is strictly decreasing in τ. For $\tau \in \left(1-pk\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}, 1-pk\frac{f(0)}{1-f(0)}\right)$, $\lambda^*=\hat{\lambda}$. Lemma 6 demonstrates that $\hat{\lambda}\tau$ is decreasing in τ, which implies that $\hat{\lambda}$ is decreasing. If $\tau \in \left(1-pk\frac{f(0)}{1-f(0)}, 1\right]$, then $\lambda^*=0$ which is constant and, therefore, weakly increasing in τ. ■

A.5 Proof of Proposition 3

The optimal government resource investment is given by equation (14).

In the first region, $\lambda^*\tau=\tau$, which is increasing in τ. In the second region, $\lambda^*\tau=\overline{\lambda'\tau}$, which is constant in τ, by equations (14) and (10). In the third region, $\lambda^*\tau=\hat{\lambda}\tau$, which is decreasing in τ by Lemma 6. In the fourth region, $\lambda^*\tau=0$, which is constant in τ. ■

A.6 Proof of Proposition 4

From equation (3), if $\tau < 1-pk\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}$, the mafia demands $\overline{\phi}$. If $\tau \in \left(1-pk\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}, 1-pk\frac{f(0)}{1-f(0)}\right)$, the mafia demands $\overline{\phi}$ with probability $1-\pi$, where π is given by equation (13 From the concavity of f, $f''<0$, and from Lemma 6, $\frac{\partial\hat{\lambda}\tau}{\partial\tau}<0$; it follows that $\frac{\partial\pi}{\partial\tau} = \frac{f''(\hat{\lambda}\tau)\frac{\partial\hat{\lambda}\tau}{\partial\tau}}{p(\rho_G-\rho_M)R(f'(\hat{\lambda}\tau))^2}>0$, and hence $1-\pi$ is decreasing in τ. By equation (3) if $\tau > 1-pk\frac{f(0)}{1-f(0)}$, the mafia makes no demand. ■

A.7 Proof of Lemma 4

From equation (5), if $\tau \in \left[(f')^{-1}(\frac{1}{pR}), 1-pk\frac{f(\overline{\lambda'\tau})}{1-f(\overline{\lambda'\tau})}\right]$, the expected utility is $(1-\tau)f(\overline{\lambda'\tau})$. Equation (14) shows that $\lambda^*\tau=\overline{\lambda'\tau}$, which from (10) is constant in τ. Thus, it is clear that the expected utility is decreasing in τ, so $E[u_F(\tau_B^*)] \leq E[u_F(\tau_A^*)]$.

From equation (5), if $\tau > 1-pk\frac{f(0)}{1-f(0)}$, the expected utility is $(1-\tau)$, which is decreasing in τ, so $E[u_F(\tau_D^*)] \leq E[u_F(\tau_C^*)]$. ■

A.8 Proof of Proposition 6

If $R > k$, then $\rho_G = 1$, $\rho_M = \rho_{NM} = 0$ guarantees that (6) fails (and thus, bribery does not occur) and that the government has the highest incentives to invest in law enforcement. If $R \in (kf(0), k)$, then $\rho_G = 1$, $\rho_{NG} = 0$, and ρ_M is the lowest value that insures the failure of (6) and so that bribery does not occur. That value is

$$\rho_M = (\frac{k}{R} - 1)\frac{f(\lambda\tau)}{1 - f(\lambda\tau))}.$$

Because $k > R$, $\rho_M > 0$. Because $\rho_G > \rho_M$ and the government challenges the mafia in equilibrium, the government has incentive to choose $\lambda > 0$. In particular, government maximizes

$$E[u^G(\cdot)] = (1-\lambda)\tau + [p(1 - f(\lambda\tau))\rho_M + pf(\lambda\tau)\rho_G + (1-p)\rho_{NG}]R.$$

The first-order condition is

$$-\tau + [-pf'(\lambda\tau)\tau\rho_M + pf'(\lambda\tau)\tau\rho_G]R = 0. \tag{15}$$

Solving for λ, we get

$$\lambda = \frac{1}{\tau}(f^{-1})'\frac{1}{pR(\rho_G - \rho_M)} > 0. \tag{16}$$

If $R < kf(0)$, then $\forall\rho$ (including $\rho_G = \rho_M = 1$, $\rho_{NG} = 0$), the condition (6) holds. Because the mafia bribes the government, the government will not fight on behalf of the firm and thus the mafia can expropriate everything (that is, $1-\tau$) from the firm. The firm is thus indifferent over all values of ρ. If $\rho_G = \rho_M$, then β is independent of $\lambda\tau$, and the government will choose $\lambda = 0$. If $\rho_M > \rho_G$, β is decreasing in $\lambda\tau$, and the government will choose $\lambda = 0$.

If $\rho_G > \rho_M$, then β is increasing in $\lambda\tau$ and the government will choose λ to maximize

$$(1-\lambda)\tau + [(1-f(\lambda\tau))\rho_M + f(\lambda\tau)\rho_G - \rho_{NG}]pR.$$

The first-order condition for this problem is identical to (15), and so the equilibrium choice of λ is also given by (16). ■

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