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On the deterrent effect of individual *versus* collective liability in criminal organizations

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Summary: Our paper addresses the question of the deterrent effect of a monetary sanction associated to a collective rather than an individual liability, when crimes are realized within a hierarchical gang (defined as a criminal organization where the leader is a sleeping partner, and several agents are active partners in the illegal or criminal activity). We develop a model where the active gang members face contradictory incentives to commit a crime. On the one hand, public authorities try to deter each gang member by imposing sanctions; on the second, the leader of the gang try to keep his members enough active in the gang by threatening them of private sanctions. We show that sanctions based on individual liability are inefficient to deter gang's members since the leader overreacts on the public sanctions. In contrast, we show that a regime of collective liability, allowing the judge to sanction the sleeping partner even if he hasn't realized any crime himself, can reach enough deterrence of the members of the gang.

JEL Classification: K0, K42

Keywords: Gangs deterrence, individual and collective liability, optimal law enforcement.

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1. Introduction

There is a broad consensus in Law & Economics literature, since Becker's seminal work (1968), on the relevance to apply severe penal sanction on isolated criminal. However, the optimal enforcement of law in the context of criminal organization is still an open question. In fact, when applied to criminal organizations, the analysis of the optimal design of law enforcement is fuzzed by the welfare implications of the structure of the illegal market. Illegal activities develop on vertically integrated markets where a dominant firm aims at extracting a surplus from smaller business firms (Konrad and Skaperdas (1997, 1998), Poret (2002), Mansour and *al.* (2006)). Alternatively, the criminal organization emerges as a vertically structure, such as a Mafia or a gang, having the power to regulate the entry in the criminal activity of individuals who has to pay a license to engage in illegal business (Garoupa (2000)). The criminal organization may then induce fewer offenses either due to the vertical integration or to a cooperative or collusive behaviour of criminals (Reinganum (1993)). Consequently, it has been argued that mechanisms of internal control in criminal organization appear as close substitutes to public punishment, and finally allows the public enforcer to undertake tougher law enforcement policies. Moreover, Mansour and *al.* show that deterrence policy can have a pernicious effect on criminality. In fact, deterrence policy can produce the split of criminal organization and therefore the increase of criminal output and the reduction of criminal price (Buchanan (1973)). However, Garoupa (2000) emphasizes that when the Mafia exerts costly extortions on its members, it is not necessarily correct that tougher policies should be chosen by the public enforcer and/or that the existence of a criminal organization results in a higher social welfare.

The economic literature on law enforcement generally holds that the issue of the allocation of sanctions within a gang is irrelevant, given the vertical structure and/or institutional features of the market for crimes. It is generally recognized that the criminal organization has the main characteristics of an agency relationship, where the Principal (the leader or the Mafia) has to discipline the Agents (the dominated firms or the affiliated members) and considers an incentive constraint when proposing some contractual arrangements. Thus, the conclusion suggested by Shavell (1997) in his analysis of corporate liability also holds: the specific allocation of public sanctions is irrelevant since they can always be redistributed between the leader and the Agents through the contractual arrangement.

Nevertheless, the allocation of sanctions matters as soon as one of the parties is financially constrained (having a limited wealth) or the Principal has limited liability in controlling his affiliated members. Differences in risk perception between the gang leader and the active members (Privileggi and *al.* (2001)) may be another reason explaining why the allocation of sanctions is not indifferent.

Here, we argue that the allocation of sanctions is not neutral in hierarchical criminal organizations. The endogenous formation of gang has been investigated in the literature, focusing on the existence of social interactions within gangs. Sah (1991), Glaeser and *al.* (1996), Patacchini and Zenou (2005) develop an analysis of the formation of criminal groups where individuals are influenced by their peers when deciding to commit offenses. Criminologists (Baatin-Pearson and *al.* (1998), Thornberry and *al.* (1993)) also show that the criminal activity is more intensive in gangs than isolated. Gangs enroll agents that have a naturally greater propensity to commit crimes, explaining that more crimes occur. In addition, the organizational context of the gang facilitates the fulfillment of crimes, which increases the incentives of gang members to act illegally. Two mechanisms explain this pure effect of the gang on crime intensity. Firstly, the cost-benefit ratio of crime is decreased within a gang (economies of scale, sharing of illegal human capital, division of labour). Secondly, interactions within a gang create incentives to commit crimes. Gang members are in competition to obtain a leadership power, that generally imply to commit more crimes (Herbert and *al.* (1997)). Moreover, peers can reward or sanction the members of the gang when these last ones deviate from a behaviour norm. If the objective of the gang is the maximization of its reputation through a norm of realization of a given level of crime, members who would have committed a level of crime below the norm may be sanctioned by the gang. As a result, more crime is committed within the gang. As mentioned by Herbert and *al.* (1997, p. 56), a gang member is « *aggressor, because he commits violent acts on his name or on the behalf of the group, and the victim, because if he doesn't act violently, the gang which gives him the statute he needs the more, encounters the danger to lose his own statute and its identity* »⁴.

Our paper is not explicit with the issue of gang formation, and instead, we suppose that the existing hierarchy among the members is exogenously given. In a typical way, this corresponds for example to new forms of international criminal organizations with a leader

⁴ Translation from the authors.

operating outside of the territory where the crimes will be committed, but entering with local active criminals in a temporary association. In this setting, the paper addresses more specifically the central question of the deterrent effect of a monetary sanction based either on the individual liability or collective liability, when crimes are realized within a hierarchical gang, within which the leader is a passive actor and command several active partners. Our framework extends the usual approach of law enforcement to criminal teams when the leader of a gang has the opportunity to inflict a sanction to the gang members when they refuse to realise a crime for the gang. In this context, the choice of the member of the gang to commit a crime is twice influenced. On the one hand, the more the crime's benefit and the private sanction's risk, the more he commits crime. On the other hand, the more the public sanction, the less he commits crime. We show that sanctions based on individual liability, even if increased according to the principle of the "circonstance aggravante", are inefficient to deter gang's members, when the leader threatens them of a private sanction⁵. Sanctioning the leader in addition to the sanction of members can lead to optimal deterrence of the members of the gang. Our model is then an illustration of a case when sanctions based on collective liability are more deterrent than sanctions based on individual liability.

The paper is organised as follows. Section 2 presents the model and the main assumptions. Section 3 shows the conditions of inefficiency of individual sanctions when the leader of a gang can impose private sanctions to its members. Section 4 reveals the fundamental role of the sanction of the leader in addition to the one of gang members to achieve a deterrent effect of public policies. Section 5 discusses the various results and concludes.

2. Model and main assumptions

Assume the existence of a hierarchical gang monopolizing the market for crimes, with a leader who does not realize any crime and several members who are the active criminals. We consider a case where the gang members and the leader act cooperatively, in the sense that they share the illegal benefit and comply with the rules of the gang. The leader receives a part (1

⁵ Realizing a crime within a group is considered as a "circonstance aggravante" in the French criminal code, which results in an increase of the individual sanction ladder compared to the one that punishes the same individual act committed alone. For instance, « theft is punished with 3 years of imprisonment and a fine of 45 000 euros » when realized by an individual criminal (Art. 311-3 CPN), it is « punished with 5 years of imprisonment and a fine of 75 000 euros, when committed by several persons acting as authors or accomplice, without constituting an organized gang » (Art 311-4 CPN) and finally, « theft in organized gang is punished with 15 years of imprisonment and a fine of 150 000 euros » (Art. 311-9 CPN) [Translation from the French criminal code (CPN)].

$-\beta$) of the illegal benefit captured by a member of the gang (b), with β the part of the benefit kept by the gang member ($\beta \in]0,1[$)⁶. The authorities and the gang leader do not observe (neither *ex ante* nor *ex post*) the type of individual criminals, and just know that this type has a uniform distribution function defined on $[0,1]$.

Public authorities enforce an expected sanction (pf) to deter individual gang members to commit the crime : p is the probability of apprehension and conviction that each member faces when committing a crime and f is a monetary sanction imposed by public authorities in case of conviction; we will assume that $f \leq F$, where F represents the maximum possible sanction of the member of the gang (for example the own criminal wealth, which is a basic assumption in the literature). On the other hand, the leader could be punished with a monetary sanction $s \leq S$ where S is the maximum possible sanction for the leader.

Two polar cases will be investigated in the paper: on the one hand, the situation corresponding to a limit case where $S = 0$; on the other hand, a case where the public authority can enforce a $S > 0$.

To begin with and as a matter of comparison, let us recall what are the basic predictions of a canonical framework *à la Becker* (i.e. setting $\beta=1$ and $\delta=0$; see Becker (1968) and Garoupa (2000, 2001)): in a competitive criminal market, maximal fines are always optimal, and the equilibrium values for the probability of sanction, the level of deterrence and the expected sanction are given by $p^B = \frac{1}{F} \left(h - \frac{c}{F} \right)$ and $b^B = p^B F = h - \frac{c}{F}$, implying as is well-known that some level of under-deterrence is optimal: $b^B < h$. Obviously, some restrictions such as $\left(h - \frac{c}{F} \right) \in]0,1[$ and $F > 1$ give sufficient conditions in order that the equilibrium value for b^B and thus for p^B are set in $]0,1[$. These conditions will be supposed to hold throughout the paper.

⁶ We assume that β is exogenously set. An endogenous determination of β during a bargaining stage between the leader and the other gang members would not affect the main conclusions of the paper, but instead would introduce secondary difficulties due to a lengthy analytical resolution of the model. Given our assumption that the leader does not observe the criminals' types (b), β is understood as corresponding to their mean type $E(b)$, w.l.o.g.

3. The failure of law enforcement with hierarchical gangs: an example

First, let us consider the case for an international criminal organization, for which the leader is neither a native nor a resident of the country where the crime is committed, while the active members are (obviously) residents. Thus, it is natural in such a case to set $S=0$, since when there exists no international mechanism of law enforcement, or in absence of a high level of cooperation between national enforcers allowing at least bilateral agreements concerning the extradition of criminals, then national enforcers have by no means the opportunity to punish the leader (neither to seize his personal wealth, not to use prison sentences)⁷.

In the following paragraphs, we study the characteristics of a monopolized market for crime with a hierarchical organization of the gang.

3.1 The members of the gang

Each risk neutral gang member decides to commit a crime or not depending on the monetary gain he gets (b) and on incentives he receives from the authorities on one side and from the leader on the other side. On the contrary, when the criminal refuses to commit a crime, the member suffers a private sanction imposed by the leader δ . The cost of the private sanction for the criminal is the monetary equivalent of psychological or physical hurts imposed by the leader of the gang to his deviant members, *ie* those who do not commit crime.

Given contrary incentives from public authorities and the leader of the gang, each member will commit a crime if:

$$(1 - p) \beta b + p(\beta b - f) > -\delta \quad (1)$$

Equivalently, there exists a threshold benefit $\tilde{b} = \frac{pf - \delta}{\beta}$ such that if the criminal is of type $b > \tilde{b}$, he commits the crime; otherwise he is honest and suffers the private sanction.

Thus, everything being equal, the existence of a gang modifies the deterrent equilibrium threshold by two different channels as compared to a competitive one (as compared to the threshold labelled $b^B = p^B F$). Firstly, the marginal criminal in a gang may be of a greater type

⁷ On the other hand, for national criminal organizations for which both the leader and the active criminals operate in the country where the crime is committed, it is relevant to assume that $S > 0$. This last case will be investigated in the next section.

than the marginal criminal without a hierarchical gang, as a result of the sharing of the illegal benefits between the active members and the leader (given that $\beta < 1$). Secondly, the marginal criminal in a gang may be of a smaller type than the marginal criminal without a hierarchical gang, since the higher the private sanction δ , the smaller the marginal criminal's type. The rest of the paper studies which of the first or of the second effect dominates at equilibrium.

3.2 The leader of the gang

Assume that $\alpha \in [0,1]$ is the implementation cost of a level δ of private sanction⁸ to each member who decides not to commit a crime, implying that the total cost faced by the leader increases with the number of deviant members at a constant rate ($\alpha\delta$). Considering that $S=0$, the leader chooses the level of private sanction imposed to deviant members that maximises his expected benefit:

$$EB = \int_{\tilde{b}}^1 (1-\beta)b \, db - \alpha\delta \tilde{b} \quad (2)$$

meaning that the leader's net benefit, depending on the number of members deciding to commit a crime, equals the sum of benefits taken from the criminals (1st term) minus the cost he faces to punish deviant members (2nd term). The necessary and sufficient conditions for an interior solution to the leader's maximisation problem are:

$$\frac{pf}{\beta} - pf - \frac{\delta}{\beta} + \delta - \alpha pf + 2\alpha\delta = 0 \quad (3)$$

$$-\frac{1-\beta-2\alpha\beta}{\beta} < 0 \quad (4)$$

Since $\beta > 0$, the Second Order Condition (4) requires to hold that : $1-\beta-2\alpha\beta > 0$. From (3), the reaction function of the leader is reduced to:

$$\delta = \sigma pf \quad (5)$$

⁸ Throughout of the paper we focus only on the situations where the non negativity constraint $\delta \geq 0$ holds.

with $\sigma = \left(\frac{1 - \beta - \alpha\beta}{1 - \beta - 2\alpha\beta} \right) > 1$ as a result of the SOC once again. This means that the best response of the leader to the increase in sanctions by the enforcer, is also to increase (more than proportionally) his own private sanction. More precisely, we obtain the following result:

Proposition 1. *Whatever the level of public sanctions to punish the criminal members of a gang, its leader imposes a greater private sanction to inactive members ($\delta > pf$).*

As a result, remark that soon as the public enforcer chooses a $p > 0$, the associated level of deterrence satisfies : $\tilde{b} < 0$ given that according to (4) we obtain $\delta > pf$. Thus, everything else held equal, the threat that the authorities impose through the possible use of an individual sanction on gang members is inefficient, since none will be deterred to commit the crime; hence:

Corollary 1. *If $S = 0$, it is socially worth that public authorities do not monitor criminal activities ($p=0$ is efficient).*

The situation considered here is one where public authorities are deterred from investing in crimes control. When imposing individual sanctions to criminals affiliated to a gang, the public authorities fail to deter these members to commit crimes since at any level of (public) expected sanction, the leader of the gang in fact over reacts by imposing a private sanction greater than the public expected sanction ($\delta > pf$).

Thus, the main consequence is obvious:

Corollary 2. *When sanctioning the leader is not feasible ($S = 0$), the monopolized criminal market yields a larger (in fact, the maximal) number of crimes committed as compared to the competitive one ($\tilde{b} = 0 < b^B$).*

4. Recovering the effectiveness of public enforcement on criminal gangs

Suppose now that the leader can be sanctioned by authorities when gang members commit a crime ($S > 0$). Remark that this does not change the general definition of the threshold $\tilde{b} = \frac{pf - \delta}{\beta}$. However, we will show that this leads to alternative equilibria on the monopolized market which have sharp differences as compared both to the previous case and to the competitive market.

4.1 The leader of the gang

The net benefit function of the leader can now be written:

$$EB = \int_b^1 [(1-\beta)b - ps]db - \alpha\delta\tilde{b} \quad (6)$$

where s represents the sanction imposed by the authorities to the leader in case of conviction.

The reaction function of the leader is now⁹:

$$\delta = p(\sigma f - \mu s) \quad (7)$$

where according to the SOC $\mu = \frac{\beta}{1-\beta-2\alpha\beta} > 0$. The choice of the level of the private sanction depends on two effects: the level of expected sanction imposed to the members and the level of expected sanction imposed to the leader of the gang. The first one tends to increase the answer of the leader (over reaction) whereas the second tends to reduce the level of private sanction (δ) imposed¹⁰.

4.2 The public authorities

The objective of public authorities is to maximise the social welfare by adjusting their policy through the amount of monetary sanctions imposed to criminals, denoted as f , and to the leader, denoted as s , on the one hand, and the expenditures in monitoring and sanctioning, p ,

⁹ Using the FOC, and given that the same SOC still holds : $-\frac{1-\beta-2\alpha\beta}{\beta} \leq 0$.

¹⁰ However, it is obvious that when the enforcer monitors illegal activities, a necessary condition for leader to use his own threat of sanction ($\delta > 0$) is $\sigma f - \mu s > 0$ - otherwise, it is not effective. This point will be more detailed when we will study the equilibria.

on the other hand. We assume that the monitoring and sanctioning cost is represented by a constant marginal cost $c > 0$. The choice of the optimal policy for (p, f, s) is obtained through the maximisation of the social welfare function:

$$W = \int_{\tilde{b}}^1 (b-h)db - \delta(1 + \alpha)\tilde{b} - cp \quad (8)$$

under two constraints: $f \leq F$ and $s \leq S$. The social welfare is the sum of benefits less harms from the crime (1st term) reduced on one side by the cost of the private sanction (2nd term) and on the other side by the cost of law enforcement (3rd term). Following Becker (1968) it is easy to see that the constraints on fines will bind, *i.e.* the public authority will choose to impose the maximum monetary sanctions. The reason is that f and s are costless in this model – the social welfare is independent of s . Thus, if $f < F$, it is possible to reduce the cost of enforcement and to increase the amount of the sanction, by maintaining the expected sanction. Knowing that in any equilibrium we must have $f^* = F$, $s^* = S$, we can now focus on the FOC for the enforcer which writes as¹¹:

$$h - \tilde{b} - \delta(1 + \alpha) = \frac{\beta c}{F} \quad (9)$$

This implies the following result:

Proposition 2. *In any interior equilibrium where it is socially efficient that the public enforcer chooses to control the illegal activity (i.e. $p > 0$), there exists some level of under-deterrence (i.e. $\tilde{b} < h$).*

The proof is straightforward. Let us write (9) as : $h - \tilde{b} = \delta(1 + \alpha) + \frac{\beta c}{F}$. Given that the RHS of this new equality is positive, it is obvious that the LHS is also positive and thus that in equilibrium: $h > \tilde{b}$.

Finally, denoting $\bar{h} \equiv \frac{\beta c}{F}$ and $\lambda = \frac{1}{1 - \beta - \alpha\beta} > 1$ and solving (9) for the reaction function of the public authorities leads to:

¹¹ Once again, the SOC holds: $\frac{\partial^2 W}{\partial p^2} = -\frac{F^2}{\beta^2} < 0$

$$pF = \frac{\delta}{\lambda} + \beta(h - \bar{h}) \quad (10)$$

where $h - \bar{h} > 0$ (given that $h > \frac{c}{F}$ according to the competitive equilibrium). This implies that as the leader increases the level of his private sanction, the public authorities react also by increasing the probability of control of the gang members.

4.3 The equilibria

Several alternative equilibria may occur for a monopolized market for crime. To see this, first remark that since we must have $f^* = F$ and $s^* = S$ in any equilibrium, the system (7)-(10) now writes equivalently as:

$$\delta = p(\sigma F - \mu S) : \text{Reaction Function of the gang leader}$$

$$\delta = \lambda p F - \lambda \beta (h - \bar{h}) : \text{Reaction Function of the enforcer}$$

Thus two kinds of equilibrium may exist depending on the sign of $\sigma F - \mu S$, which is the slope of the leader's reaction function.

- Let us assume first that the leader's reaction function is negatively sloped, *i.e.* $\sigma F - \mu S \leq 0 \Leftrightarrow \frac{S}{F} \geq \frac{\sigma}{\mu}$. It is straightforward to see that in such a case, it is individually efficient for the gang leader to never punish the inactive criminals: $\delta^* = 0$; in contrast, it is efficient for the public enforcer to choose a positive level of monitoring $p^* = \frac{\beta}{F}(h - \bar{h}) > 0$, in order to enforce a level of deterrence $\tilde{b}^* = h - \bar{h}$. This kind of equilibrium has the following properties:

Proposition 3. Assume that $\frac{S}{F} \geq \frac{\sigma}{\mu}$. Then, the NE of the monopolized criminal market ($\delta^*=0, p^*$) yields a higher level of deterrence (thus, a smaller number of crimes) than the competitive one.

Moreover, if the maximum fine on active criminals is large enough, i.e. $F > \frac{c}{h}(1 + \beta)$, then both the expected sanction and the cost of monitoring for the enforcer are smaller than in a competitive market. However, as $F < \frac{c}{h}(1 + \beta)$, then both the expected sanction and the cost of monitoring for the enforcer are larger than in a competitive market.

The proof is straightforward, since simple calculations show that:

$$\begin{aligned} \text{sign}(\tilde{b}^* - b^B) &= \text{sign}(1 - \beta) \\ \text{sign}(p^* - p^B) &= \text{sign}(p^* F - p^B F) = \text{sign}\left((1 + \beta)\frac{c}{F} - h\right) \end{aligned}$$

As a result, $\tilde{b}^* > b^B$ is always true, but we obtain both that $p^* > p^B$ and $p^* F > p^B F$ soon as $(1 + \beta)\frac{c}{F} > h$ whereas $p^* < p^B$ and $p^* F < p^B F$ hold soon as $(1 + \beta)\frac{c}{F} < h$.

Remark that when $\delta = 0$, the equilibrium is still different from the competitive one *à la* Becker.

- Let us assume now that the condition $\frac{S}{F} < \frac{\sigma}{\mu} \Leftrightarrow \sigma F - \mu S > 0$ holds; then any

equilibrium of the criminal market is associated with a $\delta^* > 0$. Now, private sanctions and public monitoring are *strategically complement* decision variables (both reaction functions are positively sloped): the best response for any of the two parties to an increase in the level of the control of his opponent, is to also increase his own control. Explicitly solving the system (7)-(10) gives us¹² the couple (p^{**}, δ^{**}) such that:

$$p^{**} = \frac{\lambda\beta}{(\lambda - \sigma)F + \mu S}(h - \bar{h}), \quad \delta^{**} = \frac{\lambda\beta(\sigma F - \mu S)}{(\lambda - \sigma)F + \mu S}(h - \bar{h})$$

which leads to an associated level of deterrence equal to: $\tilde{b}^{**} = \frac{\lambda((1 - \sigma)F + \mu S)}{(\lambda - \sigma)F + \mu S}(h - \bar{h})$.

¹² Moreover, it can be verified that this equilibrium is asymptotically stable (see Funderberg and Tirole (1991)). On the other hand, in the appendix we give some conditions required in order that $\tilde{b}^{**} \in]0, 1[$ and $p^{**} \in]0, 1[$.

This equilibrium has some remarkable properties as compared both to the case of a competitive market for crimes, and to the previous case of the monopolized one:

Proposition 4. *Assume that $\frac{S}{F} \leq \frac{\sigma}{\mu}$. Then, the NE equilibrium of the monopolized criminal market (δ^{**}, p^{**}) may correspond to a smaller level of deterrence (thus, a larger number of crimes), a higher expected sanction and a larger cost of monitoring for the enforcer than in a competitive market. But the opposite results may also hold.*

The result is straightforward: on the one hand, it is obvious that b^{**} may be larger than $b^B = p^B F = h - \frac{c}{F}$, since $\lambda > 1$ and $h - \bar{h} > h - \frac{c}{F}$; but on the other hand, it may be smaller as well since $\frac{(1-\sigma)F + \mu S}{(\lambda - \sigma)F + \mu S} < 1$. The same line of reasoning applies to the comparison of $p^B = \frac{1}{F} \left(h - \frac{c}{F} \right)$ and p^{**} . Hence the net effect both on the level of deterrence and on the cost of public monitoring at equilibrium will depend on the specific value of the technological and behavioral parameters of the model (which is of secondary interest for our purpose).

5. Discussion and conclusion

The specific organisational context of the gang, apprehended here through the threat of private sanction in case of deviation from the gang objective, shows how individual public sanctions may become inefficient. The possibility for the leader to threaten the gang members reduces to null the deterrent effect of the public policy so that no member is deterred to commit a crime in the gang. As a consequence, one may consider the possibility that the organizational context of the gang increases the number of criminals.

The conclusions in proposition 1 and corollaries 1, 2 differ from the one in Garoupa (2000) who shows that the number of criminals when gangs exist is the same than when it doesn't. These different results are based on two elements. On one hand, in Garoupa (2000) the agents have to pay a rent to the principal to enter on the illegal market, corresponding to a fixed price independent from the illegal benefit of the crime. In our model, principal and agents act in

cooperation because each one of them receives a part of the benefit from the crime and because agents bear the private sanction of the principal only if they deviate from the norm. On the other hand, in Garoupa (2000), the principal invests *ex ante* in an enforcement mechanism to be sure that the agents pay the rent. The private enforcement cost in the gang is independent of the number of inactive criminals on the illegal market. On the contrary, in our model, the private enforcement cost in the gang is a function of the number of deviant criminals.

As a consequence, public individual sanctions may fail to reach a deterrent effect in a monopolized market for crime where criminals operate in a hierarchical gang. Specifically, soon as the gang leader has the opportunity to escape from public punishment but may inflict to the active members a private sanction which inflates the public sanction once they are caught, the threat of punishment by the legal enforcer ceases to maintain an effective deterrence.

Proposition 3 exhibits a situation which is the dual of the one of corollary 1, in the sense that the leader is now deterred from exerting the threat of sanction on the members of the gang. As a result, it appears that the monopolized market leads to a smaller number of crimes than the competitive one soon as the ratio $\frac{S}{F}$ is large enough, *i.e.* $\frac{S}{F} \geq \frac{\sigma}{\mu}$. Another consequence is that, generally speaking, it is not necessary for public authorities that the sanction imposed to the leader be larger than the sanction inflicted to a gang member ($S > F$) to reach a positive level of deterrence: in a sense, this depends on the sharing rule of the criminal benefits. To see this, remark that $\sigma < \mu$ is obtained soon as $\beta > \frac{1}{2}$. Thus, when gang members retain a large proportion of their illegal benefits ($\beta > \frac{1}{2}$), it is sufficient (although not necessary) that $S > F$ for public authorities to reach an efficient control of criminal activities; but public authorities also fulfil this objective even when $S < F$. In contrast, when gang members retain a small proportion of their illegal gains ($\beta < \frac{1}{2}$), public authorities cannot deter criminals when $S < F$, and $S > F$ is not sufficient to yield enough deterrence.

At the same time, proposition 3 shows that despite a smaller number of crimes (a smaller probability of crime) the expected sanction and the cost of public monitoring are not necessarily smaller in a monopolized market than in a competitive one. This depends on the size of the maximal fine which is applied to the members of the gang (all else held equal, and specifically, given the size of h the external cost of the illegal act), and the monopolized market allows a smaller monitoring cost of the illegal activities for public authorities only when the

maximal fine on active members is large enough. Otherwise, the larger level of deterrence obtained in the monopolized market requires a higher enforcement cost.

The main consequence of proposition 4 is that the common view according to which the concentration of the criminal market improve the social welfare, since it enhance the efficiency and effectiveness of public control regarding illegal activities (allowing a smaller number of crime realizations and saving on the cost of public monitoring) cannot be generally sustained. Specifically, soon as the ratio $\frac{S}{F}$ becomes small enough, then the monopolized market may lead to a smaller level of deterrence. Remark that the ambiguity which appears in proposition 4 cannot be easily ruled out in contrast to proposition 3.

Empirical studies have shown that, everything being equal, criminals affiliated to gangs are more involved in criminal activities than those who are not (Thornberry and *al.* (1993), Battin-Pearson and *al.* (1998)). This difference of behaviour may be explained by the fact that criminal organisations create incentives to commit crime. Then, members of gangs fearing to be victims of private sanction are more likely to commit crime when affiliated to criminal organizations. These incentives from the gang must be taken into account by the public authorities to efficiently deter gang members from crime. We show that an individual expected sanction may lead to a null deterrence when criminals are affiliated to gang, although the same expected sanction is efficient for isolated criminals. In fact, the leader of the gang over reacts on the public policy by imposing a level of private sanction greater than the public expected sanction. Punishing the members of the gang and their leader may create efficient deterrence.

The French criminal law proposes two answers to deal with crimes committed in groups. Firstly, each criminal is convicted on the basis of the acts he realized himself, even if the criminal action was a collective one. Nevertheless, realizing a crime within a group is considered as a “*circonstance aggravante*” witch results in an increase of the individual sanction ladder compared to the one that punishes the same individual act committed alone. Secondly, following the actual tendency to prosecute for a collective liability all members of a group, the liability for the criminal act is extended to the person who “*intentionally, helping or assisting, makes easier the preparation or consumption of the criminal act [or] by promise, threat, order, authority abuse or*

power brings about the criminal act or gives instructions to commit it” (Art 121-7 CPN)¹³. As a consequence, the gang’s leader can be convicted as author of the crime at the same level of sanction as the members of a gang even if he hasn’t committed the crime himself (Art 121-6 CPN). This second solution challenges the principle of individualisation of the sanction, which states that each person is responsible for his own actions, and its legitimacy has been hotly discussed since the XVIIth century on the basis that, in the context of crimes in groups, it reduces the liability (Fauconnet, 1920 p. 330).

The argument in proposition 1 and corollaries 1 and 2 implies that the French law based on the “*circonstance aggravante*” may be inefficient in creating any deterrence when the leader of a gang, or its peers, have the possibility to impose private sanctions that thwart the incentives created by the public ones. The public authorities should then apply the second type of law relative to crimes in gang: convicting the leader of the gang for complicity even if he hasn’t committed any crime. It might be possible to influence the incentives inside the gang and create, by the way, an efficient deterrence for the members of the gang.

On the other hand, the adoption in France of the “loi Perben II” (March, 9th, 2004) which was presented as the adaptation of the French criminal code to the modern forms of criminality has raised many criticisms. Contradictors insisted that it promotes a sharp reduction of privacy rights which would by no way be compensated by the uncertain gains of effectiveness in the control and deterrence of criminal activities. A close controversy emerged in United Kingdom in 1998, at the time where the European Convention of Human Rights has been incorporated into the English & Welsh criminal law. Opponents to the reform argued that it would lead to a weakness in the penal code effectiveness, while promoters such as advocates of human rights rejected on principle any arguments based on efficiency analysis. But as the arguments pro collective liability is imprecise, it opens a window for law and economics to justify the use of collective responsibility. Our paper takes an agnostic view on such an issue, and tries to assess the circumstances under which such a repressive law fulfils its objective. In some sense, the two French laws of “*circonstance aggravante*” and leader liability for acts realised under his influence cannot be imposed separately when the leader (or the peers) have means to incite members to

¹³ Translation of the French criminal code from the authors : La personne qui « *sciemment, par aide ou assistance, en a facilité la préparation ou la consommation [ou] qui par don, promesse, menace, ordre, abus d'autorité ou de pouvoir aura provoqué à une infraction ou donné des instructions pour la commettre* » (Art 121-7 CPN).

crimes. Although our model cannot pretend to full generalisation, it illustrates the legitimacy of collective sanctions from a deterrent point of view.

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APPENDIX

Let us have a look at the conditions required in order that $\tilde{b}^{**} \in]0,1[$ and $p^{**} \in]0,1[$ in proposition 4.

It is easy to see that $p^{**} > 0$ requires that $\frac{S}{F} > \frac{\sigma - \lambda}{\mu}$ with a trivial case $\frac{S}{F} > 0$ obtained when $\sigma < \lambda$. On the other hand, $b^{**} > 0$ needs that $\frac{S}{F} > \frac{\sigma - 1}{\mu} \left(> \frac{\sigma - \lambda}{\mu} \right)$.

But, we also have $p^{**} < 1$ when $\frac{S}{F} > \Delta \equiv \frac{\sigma - \lambda}{\mu} + \frac{\lambda\beta}{\mu F}(h - \bar{h})$ and $b^{**} < 1$ soon as

$\frac{S}{F} > \Omega \equiv \left(\frac{\sigma - \lambda}{\mu} - \frac{\lambda}{\mu}(\sigma - 1)(h - \bar{h}) \right) \left(\frac{1}{1 - \lambda(h - \bar{h})} \right)$, assuming that the conditions required to

have $\Omega > 0$ are met. To summarize, the solution in proposition 4 is supported by a set of conditions which can be expressed (for example) as both an upper and a lower values for the

ratio $\frac{S}{F}$: we must have $\frac{\sigma}{\mu} > \frac{S}{F} > \max\left(\frac{\sigma - 1}{\mu}, \Omega, \Delta\right)$.