Public law enforcers and political competition*

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Abstract

In this paper, we analyze how political competition affects the design of public law enforcement policies. The article arrives at two main conclusions (assuming that the cost of enforcement is linear, criminal's type is uniformly distributed, and the society is wealthy enough): 1) electoral competition entails no loss of efficiency at equilibrium for both minor and major offenses (e.g. minor offenses are not enforced, while major ones are fully deterred); 2) distortions arises at equilibrium only in the range of intermediate offenses: enforcement expenditure for small offenses is lower than at optimal level, such that the issue of under-deterrence is exacerbated; in contrast, for more serious offenses, enforcement measures are higher, and there is more (possibly, over) deterrence as compared to what efficiency requires. We show that these results also generalize under more general assumptions, except that full deterrence of major offenses is not achievable (a less wealthy society), or enforcement expenditure is bounded above (under convex enforcement costs).

Keywords : public law enforcement, deterrence, monetary sanctions, electoral competition.

JEL classification codes : D72, D73, H1, K14, K23, K4.

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1 Introduction

Political views are often at stake when the public law enforcer chooses the level of sanction, or the means given to the police. In real life, a public law enforcer might be a chief of police, a judge, a chief attorney, a regulator, a city mayor, etc. In many cases, a realistic view of the law enforcer is to consider that her/his decisions regarding the level of sanction and the means given to detection, apprehension and conviction are influenced by the political market, and as such, by citizens' preferences via electoral competition.

Enforcement expenditure may increase under the threat of (re)election, an intuition which seems to be supported by data. A large body of empirical literature has indeed documented the influence of election on the probability of detection, apprehension and conviction. Levitt (1997) shows that the number of sworn officers significantly increases during election years (and remains stable meanwhile). Berdejó and Yuchtman (2012) present evidence that elected judges (in the State of Washington) tend to respond to political pressure by increasing the severity of their judgment: sentences are around 10% longer at the end of a judge's political cycle than at the beginning. Dyke (2007) shows that the district attorneys are less likely to dismiss cases in the election year. Prosecutors running for elections tend also to take more cases to trial rather than plea bargain (Bandyopadhyay and McCannon, 2014).

By contrast, law enforcement severity may decrease under electoral interests. Examples are numerous. On traffic law enforcement, Makowsky and Stratmann (2009) shows that the probability of getting a ticket (rather than a warning) for excessive speed and the size of the fine is positively affected by the fact of residing out of the town (compare to live and vote in the town). To some extent, policemen tend to favor local constituents. Some legal rules on quite ordinary acts are weakly enforced, if ever. For instance, many Parisian cyclists do not abide by traffic law. Many citizens throw their cigarette butts on the street. The fines provided for by the law are respectively 90 euros (running red lights) and 68 euros (for throwing the cigarettes), but are almost never applied. Another common offense is illegal downloading. France has adopted the three-strike (Hadopi) law against digital piracy. Arnold and al. (2014) show empirically that the law has no substantial deterrent effect.

These observations undermine the link between elections and public law enforcement policies. The purpose of our paper is to understand why and how deterrence policies might be affected when the law enforcer is elected as compared to the standard case of a benevolent enforcer.[1] Mainly, our purpose is to characterize the distortions in enforcement policies chosen by elected enforcers, both in terms of intensity/severity, and in terms of adequacy to the seriousness of offenses (harm).

Our main results show that political competition entails no loss of efficiency

[1] More generally, our paper can be understood as an analysis of the penal code, its content and structure, as the result of the political process. In a democracy, the public debate will end up at the Congress level by a voting under the majority rule. In contrast, we do not discuss here the issue of the enforcer's reelection, which is beyond the scope of this paper.

at both the top and the bottom of the range of offenses, at least to the extent that the society is wealthy enough and enforcement measures develop with constant marginal cost. For minor offenses, the outcome of the political market is the *laissez-faire* attitude, which is the optimal policy; conversely, major offenses are fully deterred in political equilibrium, which also proves to be efficient. More precisely, we show that when offenses entail external harm to society which is lower (larger) than a threshold (that depends on the level of the marginal cost of enforcement measures), a benevolent enforcer and an elected enforcer will agree on the policy to enforce: for both, the best policy is no enforcement measures and zero deterrence (maximum enforcement measures, and full deterrence), since enforcement measures are financed by taxes and entail a marginal cost which is too high (low) when involving minor offenses. In contrast, for intermediate offenses (i.e. excluding the most minor and the most serious), we show that electoral competition promotes inefficient enforcement policies, since the preferences of the majority of voters depart from those of the benevolent enforcer. The distortions that appear can be classified according to the size of the external harm, in two areas (let us say: small and large). First, for small offenses for which the external harm is not negligible (compared to the marginal cost of enforcement) but limited, a "weak enforcement" equilibrium emerges from the electoral process: citizens vote for expenditure on enforcement which is lower than optimal, and the proportion of undeterred offenders is larger. Second, for large offenses inflicting higher external harm, a "strong enforcement" equilibrium prevails where citizens vote for high expenditure on enforcement; in this case, the policy reaches a level of deterrence which is higher than optimal.

Bearing this in mind, our paper addresses the point of the enforcers' motivations and objectives, an issue that has been rarely addressed in the literature since Becker's (1968). A first exception is Friedman (1999), who argues that the public law enforcer acts merely from self interest (like any other agent), and observes that the literature about law enforcement considers criminals as highly sophisticated and rational individuals, while the State is usually considered as a simple "proxy" (benevolent automate) or "a wise, benevolent and wholly altruistic organization"[2]. However, as Friedman emphasized, societies do not generally choose the most efficient way to enforce law in practice. One explanation lies with the objectives of law enforcers; they wish to maximize their own rents rather than the social welfare, thus departing from the socially optimal solution of the literature. Therefore, Constitutions should impose costly punishment (such as prison) to avoid excessive punishment. Starting from Friedman's seminal work, Garoupa and Klerman (2002)[3] analyze the issue of law enforcement and deterrence in the realm of the rent-seeking model of government. They assume that the objective function of the enforcer is to maximize the revenues minus the harm to the government and the cost of law enforcement.[4] Wickel-

[2]See Friedman, 1999, p. 262.

[3]See also Gradstein (1993), for an analysis of the impact of a rent-seeking government for the provision of public goods. Dittman (2004) addresses the case where the government puts some weight on the residual budget of the prosecution policy.

[4]This issue of self-interest has been raised for judges' decision making notably by Epstein

gren (2003) also builds onto the point made by Friedman (1999) and justifies the use of costly forms of sanctions (prison rather than corporal punishments), in a model with two enforcing authorities acting sequentially. However, in Wickelgren's work both levels of the enforcement system share a similar objective, i.e. maximizing a (weighted) social welfare function.

Our paper discusses a point similar to those of Friedman (1999), Garoupa and Klerman (2002) and Wickelgren (2003), although it adopts an alternative view. Specifically, rather than assuming that the enforcer's preferences are exogenously fixed, we consider here a case where the objective function of the elected public law enforcer is endogenous, resulting from the electoral game. Our aim is to discuss in a simple framework whether/how political competition may (or not) promote tough enforcement policies in the various fields of administrative and penal law.

The paper is organized as follows. Section 2 sets out the general framework and recalls the results obtained in two benchmark cases: one is the standard beckerian approach relying on a benevolent planner, the other corresponds to a rent-seeking government. Section 3 introduces the case where the enforcer is elected; we use a simple model of Downsian electoral competition. Section 4 shows how these results extend under more general assumptions (a less wealthy society, convex costs of enforcement, a general probability distribution for illegal benefits). Section 5 concludes.

2 Model and assumptions

We introduce here our basic framework, which elaborates on the model of law enforcement *à la* Becker[5]. Let us consider a population of risk neutral individuals, the size of the population being normalized to 1. Each individual considers the opportunity to engage in the legal activity (and earns 0), or to engage in the illegal activity which yields a benefit b that varies in the population. Public authorities do not observe the type b, but only know that benefits are distributed according to the uniform law on $[0, 1]$. The uniform distribution assumption makes easier the presentation of results.[6] The (external) loss/harm to the rest of the society in the event of an offense is $h > 0$, whatever the private benefit for the offender.

Monitoring the illegal activity entails a cost for public authorities, equal to $m(p)$, where for the sake of simplicity p is the probability of control (encompassing apprehension and conviction for an illegal behavior). The enforcement cost function writes as $m(p) = m.p$, with $m > 0$ $\forall p \in [0, 1]$. The paper highlights first this case with a constant marginal cost of enforcement, which has

(1990) and Posner (1993). Examining the case of ordinary tenured judges, Posner (1993) examines the case where their utility is affected by income, leisure, and judicial voting.

[5] See the surveys by Garoupa (1997) and Polinsky and Shavell (2000).

[6] See the last section for a more general assumption.

been often exemplified in the literature (Garoupa and Klerman, 2002). We will discuss alternative assumptions in the last section of the paper.

The maximal fine is the legal wealth of the population w, i.e. $f \in [0, w]$. The management costs (associated with the monetary penalty), as usual in the literature, are assumed to be negligible. For the moment, we make the next assumption:

Assumption 1. $w > 1 > m$.

Also, we assume that this enforcement cost is financed through a lump sum tax t plus the fine f levied on the detected (with probability p) offenders, such that the budget line writes as:

$$m(p) = t + qpf \tag{1}$$

where q is the proportion of non law-abiding people. As usual in the literature, we will show that the proportion of offenders equals $q = \left(1 - \bar{b}\right)$, with $\bar{b}$ the deterrence threshold.

2.1 Offenders and law abiding citizens

We assume that an offense hurts citizens through a pure external term affecting individuals' utility level, defined as qh. Note that both the criminals and the law-abiding people suffer from the externalities imposed by offenses.[7]

The population of citizens is distributed along the value of the potential illegal benefit $b \in [0, 1]$, but only those citizens who become offenders ("criminals") will effectively retain their b, whereas those who abide the law ("honest") will forgive their b. Let us denote the utility level of a risk neutral citizen b who considers the opportunity to become an offender, as:

$$u_c = w + b - t - pf - qh$$

whereas when he considers the opportunity to be law-abiding, he obtains a utility level written as:

$$u_h = w - t - qh$$

Hence, if $u_c > u_h$ the citizen b becomes an offender, i.e. he decides to undertake the illegal activity if the illegal benefit he receives from doing it is higher than the expected punishment: $b \geq pf$; and if $u_c < u_h$, he is law-abiding. As usual, the marginal offender $\bar{b} = pf$ is defined by $u_c = u_h$. Given that b is uniformly distributed on $[0, 1]$, we obtain that $q = 1 - \bar{b} = 1 - pf$.

[7] Examples of such offenses are numerous (see, for instance, Polinsky and Shavell, 1979): polluting the air (while non respecting a regulatory standard), speeding or double parking, car theft, throwing cigarettes butts, drug consumption, etc. Each of these offenses imposes a cost to the rest of the society.

2.2 Two benchmarks

Let us bear in mind the choice made by a public enforcer in two polar situations, yet analyzed in the literature. One corresponds to the tradition stemming from Becker, where the enforcer is a benevolent government. The second is the case of a rent-seeking government, and has been considered by Garoupa and Klerman (2002).

2.2.1 A benevolent enforcer

A benevolent law enforcer determines both the level of fine f and the probability of detection p by maximizing the following social welfare function:

$$S = \int_0^{\bar{b}} u_h db + \int_{\bar{b}}^1 u_c db = w - t + \int_{\bar{b}}^1 (b - pf - h) db$$

and substituting with (1) yields:

$$S = w + \int_{pf}^1 (b - h) db - mp \tag{2}$$

which is the standard formulation considered in the literature (Garoupa, 1997, 2001; Polinsky and Shavell, 2000). The first (integral) term of S corresponds to the expected private benefit associated with the illegal activity. The last one is the cost of monitoring for public authorities. The fine paid by the offender when arrested is a mere transfer.

We will denote the pair (p_u, f_u) as the optimal enforcement policy. Defining: $h_1 = \frac{m}{w}$ and $h_2 = h_1 + 1$, we have:

Proposition 1 *The optimal enforcement policy (p_u, f_u) may be one of the three following solutions: i) If $h < h_1$, then $p_u = 0$, i.e. no enforcement expenditures, and the policy is associated with zero deterrence. ii) If $h_1 < h < h_2$, then $p_u = (h - h_1)\frac{1}{w} > 0, f_u = w$, and the policy is associated with under deterrence. iii) If $h > h_2$, then $p_u = \frac{1}{w}, f_u = w$, and the policy associated with full deterrence.*

Proof. See appendix 1.

Proposition 1 is depicted in the next graph:

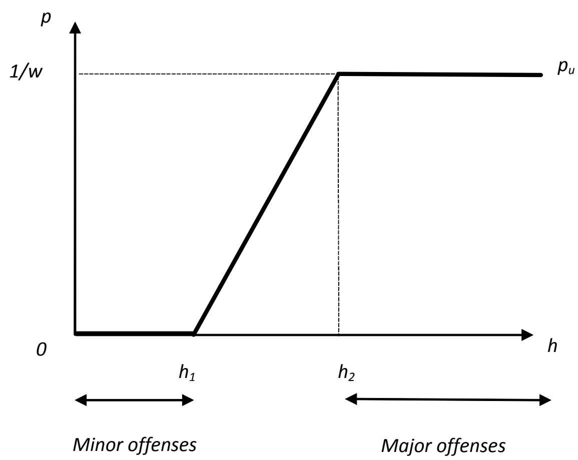

Figure 1: Optimal enforcement

It reminds us that the optimal enforcement policy for minor offenses ($h < h_1$) is the *laissez-faire* attitude. In contrast, for intermediate offenses ($h_1 < h < h_2$), the best policy is a positive level of enforcement expenditure combined with a maximum fine, the higher the offense, the higher the expenditures; in any case, under deterrence occurs. Finally, for the largest offenses ($h > h_2$), maximum enforcement measures allowing complete deterrence are optimal.[8]

2.2.2 A rent-seeking government

Garoupa and Klerman (2002) have addressed this issue of a self-interested government. They assume that the objective of the enforcer is to maximize a rent, defined as the revenues from fines collected from criminals, minus the fraction of the social harm it bears, and minus the enforcement cost:

$$R = \int_{\bar{b}}^{1} (pf - \alpha h)db - mp \tag{3}$$

where $\alpha \in (0, 1]$ is the fraction of the social harm directly borne by the enforcer.

Let us define: $h_4 = \frac{1}{\alpha}(h_1 + 1)$. Garoupa and Klerman (2002) find that the best strategy (p_r, f_r) of such a rent-seeking enforcer is as follows:

[8] This last result is explained by the constant marginal cost of enforcement hypothesis. This outcome vanishes when this assumption is relaxed, assuming rather than $m'(p) > 0$, $m''(p) > 0$ with for example $m'(1) \to \infty$; as a result $p_u < 1$ for any $h > h_1$. See the last section of this paper.

Proposition 2 *The best enforcement policy* (p_r, f_r) *of a rent-seeking government may be one of the following solutions: i) If* $0 < h < h_4$*, then* $p_r = (1 + \alpha h - h_1)\frac{1}{2w} > 0, f_r = w$*, and the policy is associated with under deterrence. ii) If* $h > h_4$*, then* $p_r = \frac{1}{w}, f_r = w$*, and the policy is associated with full deterrence.*

Proof. See Garoupa and Klerman (2002).

The next graph displays the cases of both a benevolent and of a rent-seeking enforcer[9].

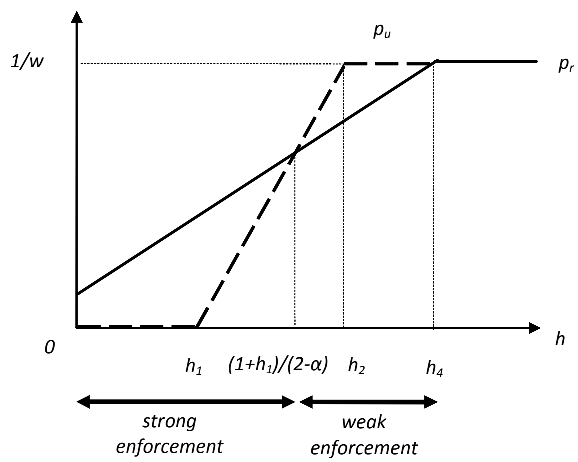

Figure 2 : Benevolent vs rent-seeking enforcers

Comparing the policy chosen by a renk-seeking government to the optimal one, we observe first that two opposite distortions occur respectively at the top and at the bottom of the range of possible values for the external harm of crime. In other words, focusing on the range of minor offenses that do not deserve to be enforced from the standpoint of a benevolent enforcer ($h < h_1$), a rent-seeking enforcer will prefer to invest in arresting, convincing and punishing; hence, a rent-seeking enforcer spends too much on deterring minor offenses. Symmetrically, in the range of major offenses that should be fully deterred with

[9] Garoupa and Klerman argued that it is reasonable to assume that the various parameters of the model are related by the condition: $1 - (2 - \alpha)w < (1 - \alpha)\frac{m}{w} < 1$; as a result, we obtain: $h_0 < h_1 < h_2 < h_4$.

maximum expenditure from the standpoint of a benevolent enforcer ($h > h_2$), a rent-seeking enforcer may not invest enough: under-deterrence occurs for some of the major offenses ($h_2 < h < h_4$).

Second, two other distortions occur in the range of intermediate offenses that a benevolent offense would find worth enforcing ($h_1 < h < h_2$): a rent-seeking government finds that i) a regime of strong enforcement is valuable for the low offenses ($h_1 < h < \frac{1+h_1}{2-\alpha}$), i.e. it uses more enforcement expenditure for small offenses; ii) a regime of weak enforcement is valuable for more serious offenses ($\frac{1+h_1}{2-\alpha} < h < h_2$), i.e. it uses less enforcement expenditure for serious offenses.

3 Law enforcement under political competition

In this section, we depart from the usual assumption that the enforcer is benevolent. Instead, we assume that he is elected; for that purpose, we introduce a simple model of electoral competition in the vein of the Downsian model (see Downs, 1957). Assume that there exist two candidates $i = 1, 2$ representating two political parties, and competing for national (presidential or legislative) or local (municipal) elections. Competing for elections here is like a rent-seeking contest, where V, the exogenous rent obtained in case of victory is attached to holding offices, ministries and so on.

The objective of politician i is to maximize the expected value of the rent $\alpha_i V$, where α_i is the probability that he wins the elections. To this end, candidate i proposes an electoral platform (f_i, p_i) to electors. We consider the (simple) majority rule for voting. All citizens are electors and participate: each voter simply votes for the candidate whose platform allows him to reach the highest utility level, and if he is indifferent, he tosses a coin to decide for whom he votes.

The electoral competition game between the candidates and the citizens/voters is as follows: after Nature moves at stage 0 (choosing the type of citizens, not observable for politicians), the electoral competition begins at stage 1, which is a simultaneous move (non cooperative) game between the candidates, where they both choose and announce their platforms (f_1, p_1), (f_2, p_2), both satisfying the balanced budget constraint (1); at stage 2, elections take place, and citizens simultaneously choose between the two candidates[10]; at stage 3, the elected candidate implements his policy[11] – it becomes law; at stage 4, citizens choose to abide by the law or not; at stage 5, the law is enforced.

In the next paragraphs, we solve for the equilibrium. To this aim, we specifically highlight two main stages: stage 2, where citizens vote (3.1), and stage 1 where candidates choose their policies (3.2).

[10] Citizens are dynamically consistent players here. Each citizen votes, anticipating his future behavior, i.e. whether he will behave as honest people or criminals.

[11] i.e., we assume that candidates commit to their own electoral platform – without specifying the reasons explaining neither why those platforms are credible announcements, nor how they become a law. These (obviously important) issues are beyond the scope of the paper.

3.1 Analysis of citizens' best policies

Solving backward, it comes that at stage 4, any policy (p, f) that is implemented after the elections will induce a screening of citizens among those who abide the law, and those who do not. The analysis of paragraph 2.2 still holds, and it is straightforward that the deterrence threshold at equilibrium is $\bar{b} = pf$.

At stage 2, each citizen depending on his type b consistently takes into account that in the future, either he will comply with the law or not, and vote for his preferred policy which maximizes his utility over the whole game.

3.1.1 Best decision of a citizen who will comply

For a citizen who anticipates he will comply with the law, the policy he votes for at stage 2 is: $(f_h, p_h) = \arg\max_{(f,p)} \{u_h \text{ } under \text{ } (1)\}$. Substituting (1) in u_h leads to:

$$u_h = w + (1 - pf)(pf - h) - m.p$$

It is worth noting that law-abiding citizens and rent-seeking enforcers have a quite similar objective; indeed, they are equivalent once we assume that the rent-seeking government is harmed by the full burden of the external cost of crime ($\alpha = 1$). Neverthess, to the extent that $\alpha \neq 1$, law-abiding citizens demand very different levels of enforcement expenditure, as shown in the next proposition:

Proposition 3 *Law abiding citizens vote for a policy (p_h, f_h) which is one of the following solutions: i) If $h < h_2$, then $p_h = (1 + h - h_1)\frac{1}{2w} < 1$, $f_h = w$. ii) If $h > h_2$, then $p_h = \frac{1}{w}$, $f_h = w$.*

Proof. The derivatives of u_h with respect to f and p are:

$$\begin{aligned} \frac{\partial u_h}{\partial f} &= (1 + h - 2pf)\,p \\ \frac{\partial u_h}{\partial p} &= (1 + h - 2pf)f - m \end{aligned}$$

We have:

$$\left(\frac{\partial u_h}{\partial p}\right)_{|p=0} = (1 + h)f - m$$

Note that at $f = w$, $\left(\frac{\partial u_h}{\partial p}\right)_{|p=0}$ cannot be negative under assumption 1.[12] Furthermore, it is not rational for an individual to choose $f < w$ (i.e. such that

[12] Assuming that $w < m$, would imply that $\left(\frac{\partial u_h}{\partial p}\right)_{|p=0} > 0$ only for $h > \frac{m}{w} - 1$. However, this new threshold is not relevant for the equilibrium analysis.

$\frac{\partial u_h}{\partial f} = 0$) since this would imply that $\frac{\partial u_h}{\partial p} = -m < 0$ for any $p > 0$. Thus, for the maximal fine $f_h = w$, we obtain:

$$\left(\frac{\partial u_h}{\partial p}\right)_{|p=1/w} = (h-1)w - m$$

and as long as $h < h_2$, p_h is the solution to $\frac{\partial u_h}{\partial p} = 0$, or:

$$1 + h - 2p_h w = \frac{m}{w} \tag{4}$$

which implies $h - p_h w \gtrless 0$. Solving for p_h yields $p_h = (1 + h - h_1)\frac{1}{2w} > 0$.

On the other hand, when $h > h_2$, $\left(\frac{\partial u_h}{\partial p}\right)_{p=1/w} > 0$ meaning that the best policy is $(p_h = \frac{1}{w}, w)$ and full deterrence is achieved (since $p_h w = 1$). ∎

Note that compliant citizens prefer a positive probability of detection and conviction $p_h > 0$, even for minor offenses that would not be worth deterring in terms efficiency (i.e. for $h < h_1$, $p_u = 0$). Moreover, it can be shown that:

Proposition 4 *Law-abiding citizens vote for a policy with enforcement measures that are never lower than the optimal ones.*

Proof. Straightforward from the comparison of p_h and p_u, since: i) if $h < h_2$, then $p_h > p_u$; ii) if $h > h_2$, then $p_h = \frac{1}{w} = p_u$. ∎

The results of propositions 3 and 4 are represented in the following graph:

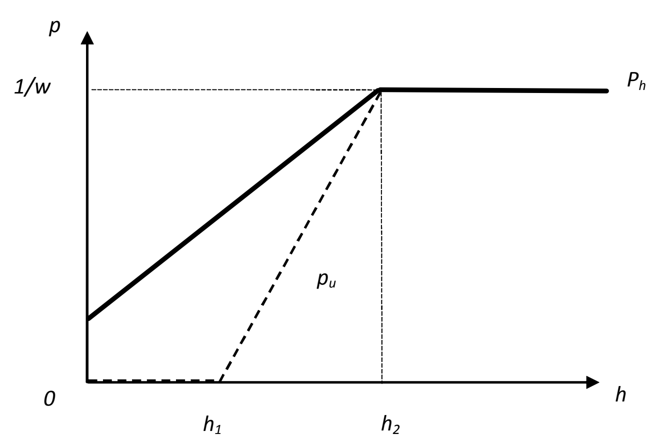

Figure 3 : Best policy for law-abiding citizens

The basic force explaining these results relies on a rent-seeking argument[13]: to what extent is the best policy preferred by law-abiding people mainly financed from the fines levied on non-compliant citizens? The argument runs as follows.

A benevolent government would not find it efficient to punish all offenses, except when the social benefit (in terms of avoiding the external cost) accruing from doing so is larger than the cost borne in apprehending and convicting offenders. Thus, minor offenses ($h < h_1$) representing a social harm small enough compared to the marginal cost of enforcement are not punished and not deterred by a benevolent government. At the other extreme, for major offenses ($h > h_2$) that represent a considerable harm compared to the marginal enforcement cost, law-abiding citizens will also choose enforcement expenditures which are the optimal ones.

In contrast, under political competition, citizens who expect to be law-abiding demand that any offense (the size being small or large) be punished in proportion to the social harm they inflict on society. The reason is that although all citizens do pay taxes, only those who do not comply with the law are facing the burden of fines. Thus for "honest" citizens, punishing the minor offenses yields a private benefit (net of the external cost of offenses) with two components: the higher rate to which the fine is collected, on the one hand, and on the other hand the lower tax pressure required to finance the policy. In other words, the cost of enforcement measures associated with a small but positive probability of control required by honest citizens to deter minor offenses is very easy to finance, thanks to low tax and large fines. Indeed, for compliant individuals the expected sanction is neither a cost, nor a mere social transfer, and the policy is financed mainly by the population of the non-compliant people (i.e. less tax, more expected fine).

By the same token, it is easy to understand that for intermediate offenses ($h_1 < h < h_2$) which would be worth deterring from a social point of view, law-abiding citizens require a policy entailing more enforcement expenditure and reaching a higher level of deterrence than would be required by efficiency. The private benefits they offer are still greater than the social benefit (the fine is a mere transfer for the benevolent enforcer, having no benefit and no cost) associated with their deterrence. In this area of intermediate values for the external harm, a medium size for the probability of control represents a reasonable enforcement cost, which is still easy to finance with taxes and a high rate of fine recovery.

[13] The argument is close to the one Garoupa and Klerman (2002) have developped for a rent-seeking government. Note however that $p_r = p_h$ only when $\alpha = 1$; othewise $p_r \neq p_h$. Moreover, proposition 3 does not give the *equilibrium* policy, but characterizes only the best response function of abiding citizens. Our equilibrium analysis (propositions 6,7,8) will show that, although electoral competition is consistent with the existence of rent-seeking behaviors (for both candidates and voters), the properties of the *equilibrium* are *opposite* to those found by Garoupa and Klerman.

3.1.2 Best decision of a citizen who will not comply

For a citizen who anticipates he will not abide by the law, let us denote the stage 2 preferred policy as: $(f_c, p_c) = \arg\max_{(f,p)} \{u_c \ under \ (1)\}$. Substituting (1) in u_c yields:

$$u_c = w + (1 - pf)(pf - h) - m(p) + b - pf$$

Let us define $h_3 = h_1 + 2$. We have now:

Proposition 5 *Non-compliant citizens vote for a policy (p_c, f_c) which may be one of the following solutions: i) If $h < h_1$, then $p_c = 0$. ii) But if $h_1 < h < h_3$, then $p_c = (h - h_1) \frac{1}{2w}, f_c = w$. iii) If $h > h_3$, then $p_c = \frac{1}{w}, f_c = w$.*

Proof. We have:

$$\begin{aligned} \frac{\partial u_c}{\partial f} &= (h - 2pf)p \\ \frac{\partial u_c}{\partial p} &= (h - 2pf)f - m \end{aligned}$$

We obtain:

$$\left(\frac{\partial u_c}{\partial p}\right)_{|p=0} = hf - m$$

Thus, if $hw - m < 0 \Leftrightarrow h < h_1$, then $\left(\frac{\partial u_c}{\partial p}\right)_{|p=0} < 0$ and it must be that $p = 0$. On the other hand, if $h > h_1$, then it is not rational to choose $f \neq w$ (such that $\frac{\partial u_c}{\partial f} = 0$), since this would also imply that $\frac{\partial u_c}{\partial p} = -m'(p) < 0$ for any $p > 0$. Thus it must be that $f_c = w$, implying that:

$$\left(\frac{\partial u_c}{\partial p}\right)_{|p=1/w} = (h - 2)w - m$$

As long as $h < h_3$, p_c is defined as the solution to $\frac{\partial u_c}{\partial p} = 0$, or:

$$h - 2p_c w = \frac{m}{w} \tag{5}$$

Solving for p_c yields $p_c = (h - h_1) \frac{1}{2w} > 0$, such that $h - p_c w > 0$.

Finally, when $h > h_3$, $\left(\frac{\partial u_c}{\partial p}\right)_{p=1/w} > 0$, the best policy is $p_c = \frac{1}{w}$, and full deterrence is achieved. ■

The results of proposition 5 are represented in the following graph:

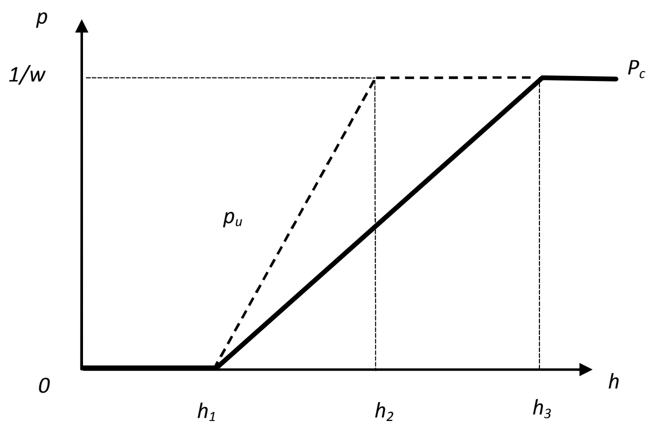

Figure 4 : Best policy for not abiding citizens

Note that for minor offenses ($h < h_1$), non compliant citizens prefer the *laissez-faire* which is the efficient policy in this area. Moreover, for the largest offenses ($h > h_3$), they also prefer full deterrence which is still efficient. But for intermediate levels of harm ($h_1 < h < h_3$), offenders always prefer a level of enforcement expenditures lower than the efficient one (since $p_c = \frac{p_u}{2}$). The underlying intuition is that – in contrast both to the law-abiding citizens for whom the fine paid by criminals is a benefit – offenders have to consider the additional cost (over the tax) represented by the fines they pay, when choosing their best policy. As the level of enforcement measures is raised, the probability of getting caught and fined increases, and the burden of the policy is mainly borne by the population of offenders rather than the whole population of taxpayers.

Finally, a straightforward result is also that the deterrence level is at least as high in an equilibrium where (p_h, f_h) is chosen, as compared to an equilibrium where (p_c, f_c) arises, since: $p_h \geq p_c$.

3.2 Equilibria

Now, we turn to the stage of electoral competition, where candidates announce their policy, and characterize the (subgame perfect) equilibrium.

At stage 1, candidates propose a policy for which the number of voters is maximized, anticipating that when implemented, this policy will induce a screening of citizens. We show in the next propositions that the political equilibrium that emerges depends on the size of the external cost of the offense h we consider. We start with the range of minor offenses ($h < h_1$).

Proposition 6 *Assume that $h < h_1$. The unique equilibrium is such that both candidates announce the laissez-faire policy: $p_c = 0$.*[14]

Proof. We have to compare the proportion of citizens voting for the policy (p_h, w), which is $p_h w = \frac{1}{2}(1 + h - h_1)$, to the proportion voting for $(p_c = 0, f)$ given by: $1 - p_c f = 1$. The result is straightforward since $p_h w < \frac{1}{2}$ on the domain where $h < h_1$. ■

In words, electoral competition creates no distortion in the area of minor offenses, where the external cost to society is small enough: the equilibrium policy emerging from elections is the optimal policy that a benevolent enforcer would choose, with no enforcement expenditure and zero deterrence.

Let us consider now the case of larger offenses (but less than major offenses: $h < h_2$).

Proposition 7 *Assume that $h_1 < h < h_2$. The equilibrium may be one of the following: i) If $h < h_1 + \frac{1}{2}$, then both candidates announce the policy $(p_c = (h - h_1)\frac{1}{2w}, w)$. ii) If $h_1 + \frac{1}{2} < h < h_2$, then both candidates announce the policy $(p_h = (1 + h - h_1)\frac{1}{2w}, w)$.*

Proof. Consider the area of offenses $h_1 < h < h_2$. It is easy to verify that the proportion of citizens voting for (p_h, w) satisfies now $p_h w = \frac{1}{2}(1 + h - h_1) > \frac{1}{2}$ since $h > h_1$. On the other hand, the proportion voting for (p_c, w) is $1 - p_c w = 1 - \frac{1}{2}(h - h_1)$ and satisfies $1 - p_c w > \frac{1}{2}$ as long as $h < h_2$, or $1 - p_c w < \frac{1}{2}$ as long as $h > h_2$. Thus in the range $h_1 < h < h_2$: either $p_h w > 1 - p_c w$ and thus both candidates maximize their chances to win the election soon as they propose (p_h, w); or $p_h w < 1 - p_c w$ and thus both candidates maximize their chances to win the election when they propose (p_c, w). Note that substituting for p_h and p_c, the condition $p_h w < 1 - p_c w$ writes equivalently as $h < h_1 + \frac{1}{2}$, and vice versa ($p_h w > 1 - p_c w \Longleftrightarrow h > h_1 + \frac{1}{2}$).[15]

Moreover, it is easy to verify that $(p_u = \frac{1}{w}(h - h_1), w)$ is not an equilibrium, since:

- on the range $h_1 + \frac{1}{2} < h < h_2$, $(p_u = \frac{1}{w}(h - h_1), w)$ does not destroy (p_h, w), since: $p_u w = h - h_1 < p_h w = \frac{1}{2}(1 + h - h_1) \Leftrightarrow h < h_2$, which holds;

- on the range $h < h_1 + \frac{1}{2}$, $(p_u = \frac{1}{w}(h - h_1), w)$ does not destroy (p_c, w), $p_u w = h - h_1 < 1 - p_c w = 1 - \frac{1}{2}(h - h_1) \Leftrightarrow h < h_1 + \frac{2}{3}$, which also holds. ■

In the case of illegal acts for which society suffers from external costs with intermediate values, $(h_1 < h < h_2)$, we find that political competition may lead to a weak or strong enforcement equilibrium. A "weak" enforcement equilibrium

[14] Note that at equilibrium, each candidate wins with probability $\frac{1}{2}$ (this remark applies to all propositions).

[15] One may verify that when $h \neq h_1 + \frac{1}{2}$, then $p_h w \neq 1 - p_c w$.

occurs for moderate levels of harm $(h < h_1 + \frac{1}{2})$, where the maximal fine is associated with enforcement's expenditures which are lower than the optimal ones $(p_c < p_u)$. This means that where the weak enforcement prevails, the electoral competition leads to less deterrence than at the optimum. In contrast, enforcement expenditures are higher than the efficient level, when the "strong enforcement equilibrium" emerges $(h_1 + \frac{1}{2} < h < h_2)$, and a higher level of deterrence is obtained, which may be characterized by a situation with over-deterrence.

Last, we come to the range of major offenses.

Proposition 8 *Assume that $h > h_2$. The unique equilibrium is such that both candidates announce the policy $(p = \frac{1}{w}, w)$.*

Proof. When $h > h_2$, the proportion of citizens voting for $(p_h = \frac{1}{w}, w)$ is 1. On the other hand, as long as $h < h_3$, the proportion voting for $(p_c = \frac{1}{2w}(h - h_1), w)$ is $1 - p_c w < \frac{1}{2}$; while for $h > h_3$, the proportion voting for $(p_c = \frac{1}{w}, w)$ is 0; hence the result. ■

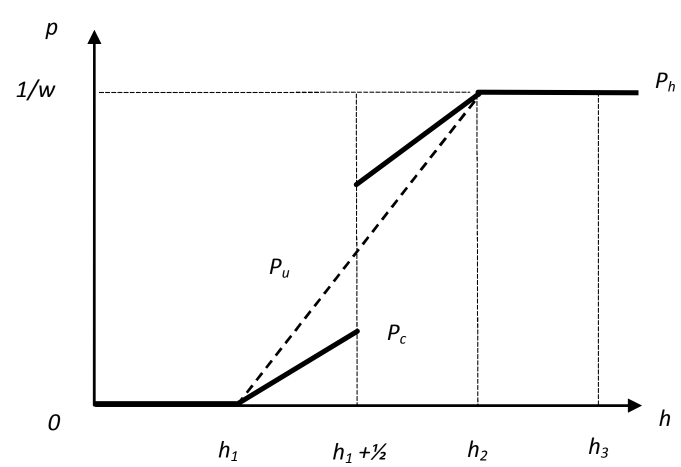

Figure 5 : Equilibrium enforcement

Figure 5 shows the optimal probability of detection (p_u), the probability preferred by law-abiding citizens (p_h) and the probability prefered by not compliant citizens (p_c), as a function of h. Finally, the bold lines represent the probability of detection emerging at the voting equilibrium.

Propositions 6 to 8 focus on the existence of a unique, symmetrical equilibrium. The next proposition discusses the existence of multiple equilibria, with some of them only being asymmetric:

Proposition 9 *Assume that $h = h_1 + \frac{1}{2}$; then any combination of platforms where each candidate announces indifferently either $(p_c = \frac{1}{4w}, w)$ or $(p_h = \frac{3}{4w}, w)$ is an equilibrium.*

Proof. Straightforward since for $h = h_1 + \frac{1}{2}$ then we obtain $p_h w = 1 - p_c w$. Moreover, at $h = h_1 + \frac{1}{2}$ we have: $p_c = \frac{1}{2w}(h - h_1) = \frac{1}{4w}$ and $p_h = \frac{1}{2w}(1 + h - h_1) = \frac{3}{4w}$. ■

Figure 6 illustrates the case with multiple equilibria.

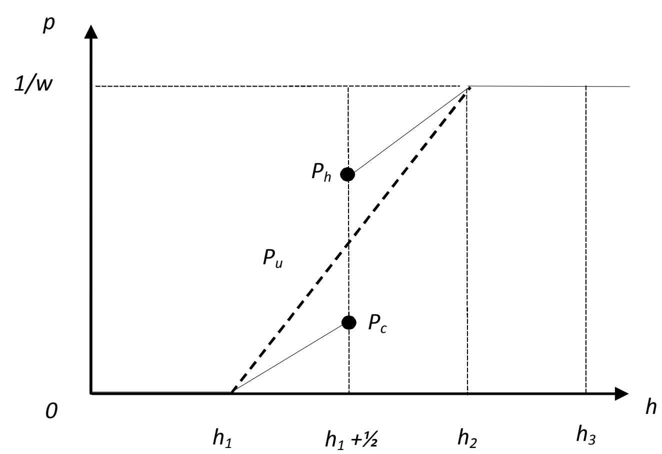

Figure 6 : Multiple equilibria in enforcement

A noticeable consequence for enforcement policies, attached to the existence of multiple equilibria in a political set up, is as follows. For the same given severity of offenses, the equilibrium may be characterized by enforcement policies that result in opposite effects, i.e. either strong enforcement or weak enforcement:

one of the equilibrium policies leads to a situation that aggravates the issue of under deterrence (when $p_c = \frac{1}{4w}$ is elected), while the other may yield over deterrence (when $p_h = \frac{3}{4w}$ arises as the equilibrium).

3.3 Comparisons

For minor offenses (below h_1), there is no deterrence at the political equilibrium as shown in proposition 5. This result is efficient, since $p_u = 0$ for all $h < h_1$. The intuition is that the harm is so small relative to the marginal cost of enforcement that it is not worth spending some money on deterrence. Conversely, the major offenses (above h_2) are always and fully deterred, the rational being the reverse.

For intermediate offenses (between h_1 and h_2), the characteristics of the equilibrium may be of two opposite kinds. The first one occurs for moderately harmful acts (between h_1 and $h_1+\frac{1}{2}$), where the "weak enforcement" equilibrium prevails as shown in proposition 6; there is less deterrence than at optimum, such that the issue of under-deterrence is aggravated. A majority of citizens decide to not abide the law. Therefore, enforcement expenditure is lower than that of social welfare maximizing, and the proportion of offenders exceeds that of social welfare maximizing.

The second kind, associated with more deterrence than at optimum, occurs in the range of more harmful acts (between $h_1+\frac{1}{2}$ and h_2) where the "strong enforcement" equilibrium emerges; the resulting probability of detection is higher than the social welfare maximizing. In this case, a majority decides to abide by the law. Enforcement expenditure is higher than the efficient level, and consequently the proportion of offenders is lower than what would be required by efficiency. [16]

To sum up, electoral competition in our setup yields zero distortion both at the top (major offenses) and the bottom (minor offenses) of the distribution of social harms. Distortions only occur in the range of intermediate harms, and typically correspond to under (over) enforcement for small (large) offenses. Moreover, these distortions are the opposite of those analyzed in Garoupa and Klerman (2002), for a rent-seeking government (see proposition 2: strong enforcement for some minor offenses combined with low enforcement of some major offenses).

Note that when a rent-seeking enforcer entirely suffers the harm generated by the offense ($\alpha = 1$), the probability of detection equals that set by an elected

[16] Note that the comparative statics of the model are very simple, and depend mainly on the marginal cost of enforcement's expenditures relatively to society's wealth ($\frac{m}{w}$). All else equal, the lower $\frac{m}{w}$: (1) the higher p_h and p_c, (2) the higher (smaller) the number of voters for p_h (p_c). On the other hand, a change in $\frac{m}{w}$ also modifies the thresholds of harms associated with the different equilibria: as $\frac{m}{w}$ decreases, then h_1, $h_1 + 1/2$ and h_2 shift to the left. This means that some of the (initially) minor offenses are now deterred with a positive probability, while some of the (initially) major offenses become under-deterred. Similarly, in the range of intermediate offenses, some of the low offenses being initially under-deterred, become now over-deterred and so on.

enforcer under the "strong enforcement" equilibrium case $p_r = p_h$. Indeed, the rent-seeking enforcer does not take into account the criminal benefits and fully bears the harm done by the offense. In this case, there is no difference between a rent-seeking law enforcer and an elected enforcer. When it is not the case ($\alpha < 1$), enforcement expenditures under rent-seeking are higher than under the "weak" enforcement equilibrium $p_h < p_c$ (for $h < h_1 + \frac{1}{2}$) and lower than $p_r < p_h$ (for $h > h_1 + \frac{1}{2}$).

4 Extensions

We consider here some simple developments around our analysis. Considerable discussion is related to assumption 1. In a sense we have assumed that citizens were rich enough, i.e. their personal wealth was larger than the highest illegal benefit ($w > 1$). A straightforward implication of this assumption is that it allows full deterrence of major offenses (those requiring maximum enforcement expenditures, $p = \frac{1}{w}$). Relaxing this assumption, it is easy to verify that full deterrence is never obtained (see paragraph 4.1). On the other hand, the mix of the uniform distribution for the illegal benefit, and a constant marginal cost for enforcement expenditures, has the main expositional interest of allowing us to fully characterize the equilibria, but also yields full deterrence for major offenses. We will relax both in paragraph 4.2.

4.1 Enforcement, wealth, and political competition

Let us substitute assumption 1 with the next one:

Assumption 2. $1 > w > \frac{3}{4} > m$.

In such a case, we have to introduce new thresholds for the external cost of crime (see appendix 2):

$$\hat{h}_2 = h_1 + w; \quad \hat{h}_3 = h_1 + 2w; \quad h_4 = h_1 + 2w - 1$$

It is straightforward to verify that $1 > w > m$ implies: $h_4 < \hat{h}_2 < \hat{h}_3$, while $w > \frac{3}{4}$ gives: $h_1 < h_1 + \frac{1}{2} < h_4 < h_1 + 1 < \hat{h}_3$. As a result,[17] proposition 6 still holds, while propositions 7 and 8 are substituted with the next one:

[17] The analysis of the optimal policy is changed in two ways, compared to proposition 1: in part ii) h_2 is replaced with $\hat{h}_2$; in part iii), $p_u = 1$ and partial deterrence occurs; see appendix 1. Regarding the analysis of a rent-seeking government when $w < 1$, Garoupa an Klerman (2002) have shown that similar results hold although the definition of the threshold h_4 must be adapted.

Proposition 10 *A/ Assume that $h_1 < h < h_4$, the equilibrium may be one of the following: i) If $h_1 < h < h_1 + \frac{1}{2}$, then both candidates announce the policy $(p_c = (h - h_1)\frac{1}{2w}, w)$. ii) If $h_1 + \frac{1}{2} < h < h_4$, then both candidates announce the policy $(p_h = (1 + h - h_1)\frac{1}{2w}, w)$.*

B/ Assume $h > h_4$, the unique equilibrium is such that both candidates announce the policy $(p = 1, w)$ and incomplete deterrence occurs.

Proof. See appendix 2. ■

Thus this case where $1 > w > \frac{3}{4}$ is qualitatively very similar to the former one, the exception being that some of the larger offenses (but not the major, i.e. only for $h_4 < h < h_2$) are drastically deterred with maximum enforcement expenditure, although incomplete deterrence occurs.[18]

4.2 More general distributions and technologies

Let us assume that b is distributed according to a general, continuous law represented by a density $g > 0$ at any b and a cumulative function G defined on $[0, 1]$. Without loss of generality, we will assume that $\frac{1-G}{g}$ is decreasing on $[0, 1]$.[19] Regarding the monitoring costs associated with the control of illegal activities, we will assume the following conditions hold: $\forall p \in [0, 1]$, $m' > 0$, $m'' > 0$, and $m'(1) \to \infty$. This means that the enforcement activity runs with decreasing returns to scale. Our main results are summarized in the final proposition:

Proposition 11 *Assume that b follows a continuous probability distribution represented by a density $g > 0$ at any b and a cumulative function G defined on $[0, 1]$, and that $\forall p \in [0, 1]$, $m' > 0$, $m'' > 0$, with $m'(1) \to \infty$. The political equilibrium may be one of the following solutions: i) If $h < \frac{m'(0)}{wg(0)}$, then both candidates propose the laissez-faire policy, $(p_c = 0)$. ii) If $h > \frac{m'(0)}{wg(0)}$, there exists a threshold $\hat{h} > \frac{m'(0)}{wg(0)}$ such that both candidates propose the policy $(p_c < 1, w)$ if $\frac{m'(0)}{wg(0)} < h < \hat{h}$; in contrast, both candidates propose the policy $(p_h < 1, w)$ if $\hat{h} < h$.*

Proof. See appendix 3. ■

In appendix 3, we also show that the optimal enforcement expenditures are characterized as follows: for $h < \frac{m'(0)}{wg(0)}$, then $p_u = 0$; but, for $h > \frac{m'(0)}{wg(0)}$ then $p_u < 1$ and is larger than the ones for which offenders vote, but lower than

[18] It is straightforward to verify that when $w < \frac{1}{2}$, an equilibrium may fail to exist in some cases; we do not persue the analysis.

[19] In order to avoid discussions regarding the second order condition.

those chosen by law abiding citizens: $p_c < p_u < p_h$. In words, in a strong (weak) enforcement equilibrium, there are more (less) deterrence than at the optimum.

5 Concluding remarks

The central research question of our paper is the relationships between the political market, the enforcers' objectives, and the design of public policies in the area of law enforcement. From a normative point of view, two issues are worth clarifying: 1/ Does electoral competition lead to a regime of strong enforcement or on the contrary, to weak enforcement? 2/ Since enforcement strategies, like many other public decisions, may be the result of a majority rule, are there any reasons explaining that they should be efficient, or what kind of distortions may be supposed?

Regarding the first issue, our results suggest that both under-deterrence and over-deterrence may occur, in a political equilibrium, but: i) a strong enforcement equilibrium (with high levels of enforcement expenditure - higher than the optimal levels) is more likely in the range of severe enough offenses (external cost of offenses large enough); while ii) a weak enforcement equilibrium (with low levels of enforcement expenditure - lower than the optimum levels) is more likely in the range of the less serious offenses (external cost of offenses small enough). Roughly speaking, this is consistent with the available evidence, as well as casual observation. For instance in the case of traffic law enforcement, police officers are permitted significant discretion when stopping a car.[20] Makowsky and Stratmann (2009) empirically shows that the probability of incurring a fine rather than a warning depends on the place of residence, among other determinants such as speed or age.[21] As explained by Lichtenberg (2003), a reason for this low enforcement is the "lack of public support received for traffic enforcement". Our model provides a rationale for this empirical observation. The harm generated by traffic offenses is (most of the time) quite moderate (perception of the population) relative to the benefits. Anticipating that a majority of the population will vote for low enforcement policies and chooses not to abide by the law, the city mayor might tend to favor local constituents through relative leniency. On the contrary, fining non-residents provides rent without political costs. As shown in the paper, a rent-seeking law enforcer is likely to propose a more severe law enforcement policy than an elected one, for minor or moderate offenses (which is the case of speeding).

As for the second issue, our analysis finds that minor offenses as well as major offenses in the sense of a benevolent enforcer, are still considered as minor and major offenses by the majority of voters arising in a political equilibrium; in other words, for minor and major offenses, electoral competition leads to

[20] Makowsky and Stratmann (2009) report than only in 46,3 percent of the cases, a citation is issued.

[21] The authors show that race or gender are also significant determinants.

an efficient level of enforcement (respectively, zero enforcement, and maximum enforcement). However, it is more likely that distortions concentrate on intermediate offenses. Then in a weak enforcement equilibrium, with enforcement expenditure lower than at optimum as regards low offenses, the issue of underdeterrence aggravates; in contrast, in a strong enforcement equilibrium, despite serious offenses being punished thanks to higher-than-optimum expenditure, over-deterrence may occur. Indeed, minor offenses are considered as such because many citizens may be prone to engage in them since the individual benefit is higher than the external cost to society - as a result, a majority of citizens agree to moderately punish them; but more serious offenses are considered as such because many citizens may be prone avoid committing them, as the individual benefit is lower than the external cost it incurs to society - accordingly, a majority of citizens agree to strongly enforce them.

Our paper also contribute to the literature focusing on the relationship between democracy, law enforcement, and criminality (Dušek 2005; LaFree and Tseloni 2006). Lin (2007) attempted to verify empirically whether differences arise in criminal law enforcement policies (in particular fighting minor and major crimes) according to the level and quality of democracy. Using an index of political liberty from the comparative freedom survey to distinguish "low democracies" from "high democracies", he shows that countries characterized by a low level of democracy tend to punish minor crimes more severely relative to major crimes as compared to countries with a higher level of democracy. He shows that democracy has a positive impact on less serious crimes such as burglary, robbery, and car theft, and a negative impact on serious crimes like homicide. Note that such empirical findings may be easily explained with arguments that borrow from those developed in the current paper, and at the same time on those developed in Garoupa and Klerman (2002). Let us interpret the analysis performed by Garoupa and Klerman as illustrating what occurs in a country with weak institutions allowing no balance of power in government, and where there are considerable opportunities of capture by the Government and generally civil servants/public agents, with low oversight by citizens ("low" level of democracy). In contrast, let us associate our framework with cases where there are stronger institutions, and a better oversight of the State by citizens ("high" level of democracy). As a result, in a country with a high level of democracy, a "weak (strong) enforcement" equilibrium will more probably be observed for minor (serious) offenses relative to the marginal cost of enforcement. It is very likely that the harm generated by car theft is quite low relative to the marginal cost of detecting, apprehending and convicting the offenders, therefore leading to relatively weak enforcement. In contrast, in a country with a low level of democracy, a "strong (weak) enforcement" equilibrium would more probably be observed, for minor (serious) offenses relative to the marginal cost of enforcement. The reverse being true for serious crimes like homicide; a "strong" enforcement equilibrium in democratic countries is likely to emerge.

Lastly, the paper contributes to the debate on the limits of the Beckerian approach, and mainly the early criticisms that focused on the inclusion of crime benefits in the social welfare function. Dau-Schmidt (1990) argued that it is morally shocking to include criminal benefits in the social welfare function, and more generally that criminals' preferences should not be considered as belonging to social preferences, since criminals are those people that society wants to exclude.[22] Moreover, according to Lewin and Trumbull (1990), including criminal benefits in the social welfare function lowers the deterrence threshold. Our paper suggests a way to bridge the gap between the Beckerian position and its criticisms. Social preferences regarding the means addressed to law enforcement and the deterrence of wrongdoings and illegal acts are not exogenously given. We show that what emerges from the political process does not maximize utilitarian social welfare (the social welfare is lower under democracy than in the implausible utilitarian social planner). When the "strong enforcement" equilibrium emerges, the preferences of offenders (and thus, crime benefits) are no longer taken into account - in a sense, criminals' preferences are not representative of social preferences, the majority of citizens that emerges in a political equilibrium being law-abiding. But, it cannot be ignored that a "weak enforcement" equilibrium might also emerge, in which the criminals' preferences become representative of social preferences.

A limitation of the model is the assumption regarding the commitment of elected law enforcers to enforcing their electoral platform. Here, we deal with pre-election politics, and assume that electoral promises are binding and enforceable. A significant extension would be to study the case where politicians could decide not to implement their policy despite re-election concerns.[23] We also abstract from the existence of lobbying activities that yield other kinds of imperfections on the political market. We leave for future research the analysis of public enforcement when partisan pressures exist, which will allow us to study the effects of different assumptions departing from that of a benevolent enforcer.

To complete the picture, two extensions might develop. First, the interplay of the voting model with social norms (Acemoglu and Jackson 2015) might be worth investigation. For instance, some moral or social reasons can cause people to avoid committing illegal acts, even if the law is not enforced in practice (for instance, illegal downloading or throwing away cigarette butts in France). Second, another significant extension of the paper might be to consider the case of error. An interesting point would be to investigate the relationship between elections and conviction accuracy[24].

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[22] The role of the penal code is to shape individual preferences, in order that they adhere to preferences and behaviors that society promotes (Dau-Schmidt 1990).

[23] See Baker and Miceli (2005) for the case of benevolent enforcers.

[24] McCannon (2013) shows that, in addition of taking more case to trial (rather than plea bargain) during reelection campaign, prosecutors face a decreased probability of having the conviction being upheld by the appellate court.

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APPENDIX 1

Proof of Proposition 1. The derivatives of S with respect to f and p are given by:

$$\begin{aligned}\frac{\partial S}{\partial f} &= (h-pf)p \\ \frac{\partial S}{\partial p} &= (h-pf)f-m\end{aligned}$$

We have:

$$\left(\frac{\partial S}{\partial p}\right)_{|p=0} = hf-m$$

i) Thus, if $hw-m<0 \Leftrightarrow h<\frac{m}{w}$, then $\left(\frac{\partial S}{\partial p}\right)_{|p=0}<0$ and it must be that $p=0$, and the choice of f is of no matter.

ii) On the other hand, if $hw-m>0$, it is not optimal to choose $f=h/p<w$ since this would imply $\frac{\partial S}{\partial p}<0$ for any $p>0$. Hence, it must be that $f_u=w$. Note that for the optimal fine, we also have:

$$\left(\frac{\partial S}{\partial p}\right)_{|p=1/w} = (h-1)w-m$$

Thus, as long as $h<h_1+1$, there exists an interior solution where p_u satisfies $\frac{\partial S}{\partial p}=0$ or:

$$(h-p_u w)w=m \tag{6}$$

implying $h-p_u w>0$. Solving for p_u yields $p_u=(h-h_1)\frac{1}{w}>0$.

iii) Finally, when $h>h_1+1$, $\left(\frac{\partial S}{\partial p}\right)_{|p=1/w}>0$ such that the optimal policy is $(p_u=\frac{1}{w},w)$, and full deterrence is achieved (since $p_u w=1$).

APPENDIX 2

Benevolent enforcers. When $w < 1$, the analysis of the optimal policy is changed as follows (given that $f = w$ is still optimal); we have:

$$\begin{aligned} \left(\frac{\partial S}{\partial p}\right)_{|p=0} &= hw - m \\ \left(\frac{\partial S}{\partial p}\right)_{|p=1} &= (h-w)w - m \end{aligned}$$

Thus, $h < h_1$ implies $p_u = 0$. Moreover, as long as $h_1 < h < h_1 + w \equiv \hat{h}_2$, the solution corresponds to a p_u satisfying $\frac{\partial S}{\partial p} = 0$ or:

$$(h - p_u w)w = m$$

implying under deterrence: $h - p_u w > 0$. Solving for p_u yields $p_u = (h - h_1)\frac{1}{w} > 0$.

In contrast, when $h > \hat{h}_2$, the optimal policy is $(p_u = 1, w)$, and incomplet deterrence occurs $(p_u w < 1)$.

Law abiding citizens. When $w < 1$, the analysis of the best policy chosen by law abiding people changes as follows (given that $f = w$ is still optimal); we have:

Proof.

$$\left(\frac{\partial u_h}{\partial p}\right)_{|p=1} = (1 + h - 2w)w - m$$

■

Thus, as long as $(1 + h - 2w)w < m \Leftrightarrow h < \frac{m}{w} + 2w - 1 \equiv h_4$, p_h is the solution to $\frac{\partial u_h}{\partial p} = 0$, or:

$$1 + h - 2p_h w = \frac{m}{w}$$

Solving for p_h yields $p_h = (1 + h - h_1)\frac{1}{2w} > 0$, which implies $h - p_h w \gtreqless 0$. On the other hand, If $h > h_4$, then $\left(\frac{\partial u_h}{\partial p}\right)_{|p=1} > 0$ which implies $p_h = 1$.

Not abiding people. When $w < 1$, the analysis of the best policy chosen by people not abiding law changes as follows (given that $f = w$ is still optimal); we have:

$$\begin{aligned} \left(\frac{\partial u_c}{\partial p}\right)_{|p=0} &= hw - m \\ \left(\frac{\partial u_c}{\partial p}\right)_{|p=1} &= (h-2w)w - m \end{aligned}$$

Thus, $h < h_1$ implies $p_c = 0$. Moreover, as long as $h_1 < h < \hat{h}_3 \equiv \frac{m}{w} + 2w$, p_c is defined as the solution to $\frac{\partial u_c}{\partial p} = 0$, or:

$$h - 2p_c w = \frac{m}{w} \tag{7}$$

Solving for p_c yields $p_c = (h - h_1)\frac{1}{2w} > 0$, such that $h - p_c w > 0$. But If $h > \hat{h}_3$, then $\left(\frac{\partial u_c}{\partial p}\right)_{|p=1} > 0$ and $p_c = 1$.

It is straightforward to verify that assuming $1 > w > \frac{3}{4}(> m)$ implies: $h_1 < h_1 + \frac{1}{2} < h_4 < \hat{h}_2 < h_1 + 1 < \hat{h}_3$.

Proof of proposition 10. First note that for $h < h_1$, there exists a proportion $p_h w = \frac{1}{2}(1 + h - h_1) < \frac{1}{2}$ of voters for (p_h, w) and a proportion $1 - p_c w = 1$ of voters for $(p_c = 0, w)$. Hence, for $h < h_1$, the equilibrium is such that both candidates announce $(p_c = 0, w)$ (i.e. proposition 6 still holds).

i) Let us consider the domain of offenses $h_1 < h < h_1 + 1$.

- On the one hand, the proportion of law abiding citizens voting for $(p_h < 1, w)$ is $p_h w = \frac{1}{2}(1 + h - h_1) > \frac{1}{2}$ (when $h < h_4$); or the proportion of law abiding citizens voting for $(p_h = 1, w)$ is $p_h w = w > \frac{1}{2}$ (when $h > h_4$).

- On the other hand, the proportion of offenders voting for $(p_c < 1, w)$ is $1 - p_c w = 1 - \frac{1}{2}(h - h_1)$ and satisfies $1 - p_c w > \frac{1}{2}$ as long as $h < h_1 + 1$.

Thus it can be verified that:

a) when $h_1 < h < h_4 (< h_1 + 1)$: the condition $p_h w = \frac{1}{2}(1 + h - h_1) < 1 - p_c w = 1 - \frac{1}{2}(h - h_1)$ still writes equivalently as $h < \frac{m}{w} + \frac{1}{2}$, and vice versa ($p_h w > 1 - p_c w \Longleftrightarrow h > \frac{m}{w} + \frac{1}{2}$). This shows that the equilibrium is such that both candidates announce: i) $(p_c < 1, w)$ if $h_1 < h < h_1 + \frac{1}{2}$; or ii) $(p_h < 1, w)$ if $h < h_1 + \frac{1}{2} < h < h_4$.

b) when $h_4 < h < h_1 + 1$: the condition $p_h w = w > 1 - p_c w = 1 - \frac{1}{2}(h - h_1)$ is equivalent to $h > h_1 + 2(1 - w)$; this is always true, given that $h > h_4 > h_1 + 2(1 - w)$ where $h_4 > h_1 + 2(1 - w) \Leftrightarrow w > \frac{3}{4}$. This implies that when $h_4 < h < h_1 + 1$, the equilibrium is such that both canidates announce $(p_h = 1, w)$.

ii) When $h > h_1 + 1$, the proportion of citizens voting for $(p_h = 1, w)$ is $w > \frac{1}{2}$. On the other hand, when $h < \hat{h}_3$ the proportion voting for $\left(p_c = \frac{1}{2w}(h - h_1), w\right)$ is $1 - p_c w < \frac{1}{2}$; while for $h > \hat{h}_3$, the proportion voting for $(p_c = 1, w)$ is $1 - w < \frac{1}{2}$. Hence, when $h > h_1 + 1$, the equilibrium is such that both candidates announce $(p_h = 1, w)$.

APPENDIX 3

In this appendix, we extend our main results to more general environments. Let us assume that b is distributed according to a general, continuous law represented by a density $g > 0$ at any b and a cumulative function G defined on

$[0,1]$. Wlog, we will assume that $\frac{1-G}{g}$ is decreasing on $[0,1]$. Regarding the monitoring costs associated with the control of illegal activities, we will assume the following conditions hold: $\forall p \in [0,1]$, $m' > 0$, $m'' > 0$, and $m'(1) \to \infty$.

In this case, a benevolent enforcer (Garoupa 2001), would choose $p_u = 0$ for any $h < h_1 = \frac{m'(0)}{wg(0)}$; otherwise, the optimal policy is $(p_u, f_u = w)$ where $p_u < 1$ (given that $m'(1) \to \infty$) is the solution to:

$$h - p_u w = \frac{m'(p_u)}{wg(p_u w)} \tag{8}$$

with $h - p_u w > 0$.

The analysis of the electoral game is now developed with these new assumptions.

At stage 4, any policy (p, f) will induce a screening of citizens between those who abide the law, and those who become criminals. Using the analysis of paragraph 2.1, it is straightforward that the deterrence threshold at equilibrium is $\bar{b} = pf$.

At stage 2, a citizen who anticipates to behave honestly at stage 4 votes for a policy $(f_h, p_h) = \arg\max_{(f,p)} \{u_h \;\; under \; (1)\}$. Substituting (1) in u_h leads to:

$$u_h = w - m(p) + (1 - G(pf))\,(pf - h)$$

The derivatives of u_h with respect to f and p are given by:

$$\begin{aligned} \frac{\partial u_h}{\partial f} &= [(1 - G(pf)) - g(pf)(pf - h)]\,p \\ \frac{\partial u_h}{\partial p} &= [(1 - G(pf)) - g(pf)(pf - h)]\,f - m'(p) \end{aligned}$$

and we have:

$$\left(\frac{\partial u_h}{\partial p}\right)_{|p=0} = (1 + g(0)h)f - m'(0)$$

i) Thus, if $(1+g(0)h)w - m'(0) < 0 \Leftrightarrow h < \frac{m'(0)}{wg(0)} - \frac{1}{g(0)}$, then $\left(\frac{\partial u_h}{\partial p}\right)_{|p=0} < 0$ and the solution is $p_h = 0$ whatever f is. ii) On the other hand, if $h > \frac{m'(0)}{wg(0)} - \frac{1}{g(0)}$, then it is not rational to choose $f \neq w$ such that $\frac{\partial u_h}{\partial f} = 0$ since this would imply that $\frac{\partial u_h}{\partial p} = -m'(p)$. Thus, $f_h = w$ such that $\left(\frac{\partial u_h}{\partial f}\right)_{|p_h w} > 0$, and p_h is defined according to:

$$h - p_h w + \left(\frac{1-G}{g}\right)_{|p_h w} = \frac{m'(p_h)}{g(p_h w) w} \tag{9}$$

which implies $h - p_h w \gtrless 0$. To sum up, we have :

Lemma A. The policy preferred by honest citizens (p_h, f_h) may be one of the two following solutions: i) Assume $h < h_1 - \frac{1}{g(0)}$; then the policy is $p_h = 0$, and is associated with zero deterrence. ii) Assume $h > h_1 - \frac{1}{g(0)}$; then the policy is $p_h > 0, f_h = w$, and is associated with either over or under deterrence: $p_h w \gtrless h$.

On the other hand, a citizen who anticipates to become a criminal at stage 4 votes for a policy $(f_c, p_c) = \arg\max_{(f,p)} \{u_c \ under \ (1)\}$. Substituting (1) in u_c yields:

$$u_c = w + b - m(p) - pf + (1 - G(pf))(pf - h)$$

We have now:

$$\begin{aligned}\frac{\partial u_c}{\partial f} &= [-G(pf) - g(pf)(pf - h)]\, p \\ \frac{\partial u_c}{\partial p} &= [-G(pf) - g(pf)(pf - h)]\, f - m'(p)\end{aligned}$$

and thus we obtain:

$$\left(\frac{\partial u_c}{\partial p}\right)_{|0} = g(0)(h)f - m'(0)$$

i) Thus, if $g(0)hw - m'(0) < 0 \Leftrightarrow h < \frac{m'(0)}{wg(0)}$, then $\left(\frac{\partial u_c}{\partial p}\right)_{|0} < 0$ and it must be that $p = 0$. ii) On the other hand, if $h > h_1$, then it is not rational to choose $f \neq w$ such that $\frac{\partial u_c}{\partial f} = 0$, since this would also imply that $\frac{\partial u_c}{\partial p} = -m'(p) < 0$; thus it must be that $f_c = w$ satisfying $\left(\frac{\partial u_c}{\partial f}\right)_{|p_c w} > 0$, and p_c is defined by:

$$h - p_c w - \left(\frac{G}{g}\right)_{|p_c w} = \frac{m'(p_c)}{g(p_c w)w} \tag{10}$$

such that $h - p_c w > 0$. To summarize:

Lemma B. The policy preferred by criminals (p_c, f_c) may be one of the two following solutions: i) Assume $h < h_1$; then the policy is $p_c = 0$ and is associated with zero deterrence. ii) Assume $h > h_1$; then the policy is $p_c > 0, f_c = w$, and is associated with under deterrence: $p_c w < h$.

Proof of proposition 11. Now, we turn to the initial stage of the game. We first consider the equilibrium associated with a small external cost, i.e. $h < h_1$.

Once more, it is easy to show that the unique equilibrium is such that both candidates announce the laissez-faire policy: $p_c = 0$. To see this, note first that when $h < h_1 - \frac{1}{g(0)}$, both honest citizens and criminals prefer the laissez-faire. Hence, an equilibrium cannot exist except when both candidates announce

$p = 0$. Assume now that $h_1 - \frac{1}{g(0)} < h < h_1$; we have to compare the proportion of citizens voting for (p_h, w): $G(p_h w)$, to the proportion voting for $(p_c = 0, f)$: $1 - G(p_c f) = 1$. The result is straightforward.

Consider now that the external cost is large, i.e. $h > h_1$. Let us compare the proportion of citizens voting for (p_h, w): $G(p_h w)$, to the proportion voting for (p_c, w): $1 - G(p_c w)$. Either: $G(p_h w) > 1 - G(p_c w)$ and thus both candidates maximize their chances to win the election soon as they propose (w, p_h); or: $G(p_h w) < 1 - G(p_c w)$ and thus both candidates maximize their chances to win the election when they propose (w, p_c). Note that using (8) and (9), we can write equivalently:

$$1 - G(p_h w) = \frac{m'(p_h)}{w} - (h - p_h w)\, g(p_h w) \quad (11)$$

$$G(p_c w) = -\frac{m'(p_c)}{w} + (h - p_c w)\, g(p_c w) \quad (12)$$

Define $\hat{h}$ as the value of the external harm for which $1 - G(p_h w) = G(p_c w)$ is verified. Then for any $h < \hat{h}$, $1 - G(p_h w) > G(p_c w) \Leftrightarrow 1 - G(p_c w) > G(p_h w)$ since the RHS in (10) decreases in h, and the RHS in (11) increases in h; as a result, the unique equilibrium is such that both candidates announce the policy (p_c, w). ii) In contrast if $h > \hat{h}$, then the unique equilibrium is such that both candidates announce the policy (p_h, w).

Finally, using (8), (9) and (10) which define as an interior solution respectively p_u, p_h, p_c, it can be verify that $p_c < p_u < p_h$. By second order condition, each LHS term is decreasing in p, while each RHS is increasing in p. The result is straightforward given that $h - pw - \left(\frac{G}{g}\right)_{|pw} < h - pw < h - pw + \left(\frac{1-G}{g}\right)_{|pw}$.