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WASTE POLICY IN THE PRESENCE OF ILLEGAL DISPOSAL AND ORGANIZED CRIME

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Waste Policy in the Presence of Illegal Disposal and Organized Crime[*]

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Abstract

The paper extends the exisiting literature on optimal waste policy in two ways: it endogenize enforcement effort and it allows for the presence of a criminal organization receiving a rent in exchange of illegal disposal. We assume that in the latter case the state and the criminal organization compete *a la* Cournot and that, coherently with real life observation, the state is spoiled of any enforcement power. The first conclusion we achieve is that incomplete enforcement implies a larger illegal as well as legal disposal, at least when, as it seems to be the case in real life, environmental damages from illegal disposal are higher than those from legal disposal. Second, we assess the consequences of the introduction of a criminal organization and conclude that the presence of organized crime influences legal disposal, illegal disposal and social welfare in a non straightforward way, as a result of the complex interaction of environmental damages from illegal disposal, net benefits from the waste generating economic activity and private costs of legal disposal. Finally, in our simulations the criminal organization always results in welfare losses, contradicting results obtained

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in seminal papers on the economics of organized crime.

JEL numbers: Q53, K42. **Keywords:** waste policy, organized crime, enforcement

1 Introduction

Organized crime plays a crucial role in distorting waste management in many parts of Italy as well as worldwide[1]. It is therefore surprising that no attention is devoted by the waste policy literature to this specific issue. The aim of this paper is to move a first step to fill this gap.

We develop a simple model where an economic agent chooses the level of economic activity (consumption or production) as well as the way of disposing of the consequent wastes. More specifically, it can choose among legal and illegal disposal. We derive first best conditions and compare them to those arising from a two stage incomplete enforcement game where an environmental authority first sets the waste tax rate and enforcement effort to maximize social welfare, while in the second stage the economic agent sets legal and illegal disposal and the resulting level of economic activity to maximize its expected net benefits. We conclude that, although first best levels would be feasible, they might not be desirable; more specifically, legal disposal will be higher than under first best if illegal disposal leads to higher damages than legal disposal, as it seems to be the case in real life. This result is driven by costly enforcement: to save on such costs, the environmental authority provides incentives towards legal disposal that are stronger than under first best. Further, illegal disposal and the level of economic activity under incomplete enforcement exceed the corresponding first best levels.

The second part of the paper introduces organized crime, which is assumed to compete *a la Cournot* with the environmental authority and aims at maximizing the net rent accruing from illegal waste management. Coherently with real life

[1] See Legambiente ([7] and [8]).

observation[2], we assume that in the presence of organized crime, enforcement by the environmental authority becomes useless, as the criminal organization is capable of disposing of wastes and hide, at the same time, its operations under the cover of a lawful documentation. Another crucial assumption is that the costs born by organized crime are mainly fixed costs, related to lobbying and becoming part of the political and economic establishment.

The second part of the paper leads us to conclude that the presence of organized crime influences legal disposal, illegal disposal and social welfare in a non straightforward way, as a result of the complex interaction of environmental damages from illegal disposal and private costs of legal disposal.

The starting point of our work is the paper by Sullivan [10], where different policy options to address waste disposal are compared in the presence of illegal waste disposal: a laissez-faire policy, a subsidy on legal disposal and a penalty coupled with monitoring effort. In a subsequent work Fullerton and Kinnaman [4] extend Sulllivan paper to account for the joint use of available policy instruments. The paper addresses, in a general equilibrium setting, the optimal waste policy under the assumption that illicit burning or dumping cannot be taxed directly. The authors conclude that the optimal fee structure is a deposit-refund system: a tax on all output plus a rebate on proper disposal through either recycling or garbage collection. Though our paper adopts a partial equilibrium modeling strategy, we add to the received literature by explicitly endogenizing enforcement and by allowing for the presence of a criminal organization in managing illegal disposal. Under this respect we also connect to the literature on the economics of organized crime, very well exemplified in the collection of papers edited by Fiorentini and Peltzman [3]. A relevant contribution is, in particular, the one by Grossmann [6], who develops the organized crime as a competitor of the state in the provision of public services. This modeling strategy implies an upper limit to the "price" that the state itself might charge to taxpayers. A similar trade off is likely to arise in waste disposal choices. Another crucial contribution under this respect is the one by Garoupa [5]. The author extends the

[2] See [7].

optimal law enforcement literature to organized crime and models the criminal organization as a vertical structure where the principal extracts some rents from the agents through extortion, concluding that, at least as long as extortion is a costless transfer from individuals to the criminal organization, the existence of extortion might even be social welfare improving. We borrow the modeling strategy by Garoupa, and apply it to the specific problem of waste disposal.

The paper is organized as follows: the next section presents the model, section 3 derives first best, while section 4 compares the first best with the case when enforcement is costly. Section 5 derives results in the presence of organized crime and performs some comparisons. Finally, section 6 concludes.

2 The model

We assume tha an economic agent performs an economic activity, that could be broadly labeled as "consumption" or "production". Such an activity generates strictly concave benefits:

$$U = \alpha c - \frac{c^2}{2}$$

where α is a positive paramete and c is the level of economic acivity.

Economic activity also causes wastes, that must be disposed of. The economic agent has the opportunity of disposing of waste legally (g being the corresponding amount) or illegally (we label illegal disposal as b). We assume a very simple one to one relationship between economic activity and waste:

$$c = g + b$$

Private disposal costs for legal disposal are convex and given by:

$$C(g) = \varepsilon \frac{g^2}{2}$$

while, private costs for illegal disposal are assumed to be strictly lower and normalized to 0. Social welfare is also influenced by net social costs from waste disposal. The corresponding damage function is:

$$D(g,b) = \frac{(\delta g + \gamma b)^2}{2}$$

As it is reasonable, waste production generates convex damages, while the two ways of disposing of waste are weighted according to the corresponding net social costs. More specifically, we assume $\gamma > \delta$, implying that (for a given quantity of waste) illegal disposal implies higher damages. These include social costs related, for example, to the impossibility of recycling wastes that are illegally disposed of, as well as to the additional environmental harm caused by illegal disposal.

The incentive towards economic activity, legal or illegal disposal, are influenced by an environmental authority aimed at maximizing social welfare, given by net benefits minus social damages, i.e.

$$W = U - D - C$$

The authority sets a tax rate t on legal disposal, while it cannot observe the amount of illegal disposal, unless it expends resources in doing so. We sum up enforcement efforts in the level of a per unit expected fine on illegal disposal, that we label as F; the costs of enforcement are given by

$$E(F) = \frac{\rho}{2}F^2,$$

implicitly implying decreasing returns in enforcement efforts. The amount of expected fine paid by economic agents is therefore bF[3].

Finally, it is worthwhile to notice that fine and tax payments are net transfers under a social welfare point of view.

We will now present first best as a benchmark, then investigating what happens under incomplete enforcement but in the absence of organized crime. Finally, we will introduce organized crime in our model.

[3] As, for example, in Malik [9], we assume that the firm is audited in an unexpected way and cannot change b after realizing. Further, the expected unit fine is assumed not to vary with b. The removal of this assumption will be investigated in subsequent steps of the analysis.

3 First best

First best implies the maximization of social welfare. Legal and illegal disposal are chosen to solve the following problem:

$$\begin{aligned} \max_{g,b} W &= U - D - C(g) \\ s.t.\ c &= g + b \end{aligned}$$

that is,

$$\max_{g,b} W = \alpha\,(b+g) - \frac{(b+g)^2}{2} - \frac{\varepsilon g^2}{2} - \frac{(\delta g + \gamma b)^2}{2}$$

The first order conditions with respect to g are:

$$\alpha - (b+g) - \varepsilon g - (\delta g + \gamma b)\,\delta = 0$$

while those with respect to b are:

$$\alpha - (b+g) - (\delta g + \gamma b)\,\gamma = 0$$

Solving the system we get

$$g_f = \frac{\alpha\gamma^2 - \alpha\gamma\delta}{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \gamma^2\varepsilon} \tag{1}$$

$$b_f = \frac{\alpha\varepsilon + \alpha\delta^2 - \alpha\gamma\delta}{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \gamma^2\varepsilon} \tag{2}$$

$$c_f = \alpha\frac{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta}{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \gamma^2\varepsilon} \tag{3}$$

where a subscript f identifies values corresponding to the first best benchmark case. We focus on interior solutions, implying, in particular, that $\frac{\varepsilon}{\delta} > \gamma - \delta$, so that the amount of illegal disposal turns out to be stritcly positive. In other words, private legal disposal costs are sufficiently high to guarantee that, even under first best, some illegal disposal takes place[4].

[4] This makes our results coherent with the existing literature. See Fullerton and Kinnaman [4].

4 Incomplete enforcement

We now turn to the two stage game resulting from the presence of illegal disposal under incomplete enforcement. We solve such a game backwards: in the second stage the agent takes the level of the tax and the expected fine as given and chooses the amount of legal and illegal disposal as well as the overall resulting level of economic activity to maximize net benefits from economic activity. In the first stage the environmental authority chooses the level of waste tax and expected fine to maximize social welfare.

4.1 Second stage: agents

$$\begin{aligned} & \max_{g,b} U - C(g) - tg - Fb \\ s.t.\ c &= g + b \end{aligned}$$

First order (necessary and sufficient) conditions, for a maximum are as follows:

$$\alpha - (b+g) - \varepsilon g - t = 0 \tag{4}$$

$$\alpha - (b+g) - F = 0 \tag{5}$$

As it is clear, first best would be feasible in this setting, as it would be enough to set:

$$F = (\delta g^* + \gamma b^*)\,\gamma$$

$$t = (\delta g^* + \gamma b^*)\,\delta$$

Solving the system given by (4) and (5) we get

$$g = \frac{1}{\varepsilon}(F - t)$$

$$b = \frac{1}{\varepsilon}(t - F - F\varepsilon + \alpha\varepsilon)$$

As a consequence, the higher the tax rate on legal disposal (the level of the expected fine), the lower (higher) will be legal (illegal) disposal, and the higher (lower) will be legal disposal.

The resulting level of economic activity is

$$c = \alpha - F$$

4.2 First stage.

Maximization of social welfare implies choosing t and F to solve the following problem:

$$\begin{aligned} \max_{F,t} W &= U - C(g) - D(g,b) - E(F) \\ & s.t.\ (4) \text{ and } (5). \end{aligned}$$

Taking the first order (necessary and sufficient) conditions for a maximum and solving for F and t we get (where a subscript n identifies levels arising in the absence of organized crime):

$$F_n = \alpha\gamma^2 \frac{\varepsilon}{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \varepsilon\rho + \gamma^2\varepsilon + \gamma^2\rho + \delta^2\rho - 2\gamma\delta\rho} \tag{6}$$

$$t_n = \frac{\alpha\gamma\delta\varepsilon + \alpha\gamma\delta\varepsilon\rho - \alpha\gamma^2\varepsilon\rho}{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \varepsilon\rho + \gamma^2\varepsilon + \gamma^2\rho + \delta^2\rho - 2\gamma\delta\rho}. \tag{7}$$

The corresponding levels of legal and illegal disposal are;

$$g_n = \frac{\alpha\gamma^2 + \alpha\gamma^2\rho - \alpha\gamma\delta - \alpha\gamma\delta\rho}{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \varepsilon\rho + \gamma^2\varepsilon + \gamma^2\rho + \delta^2\rho - 2\gamma\delta\rho} \tag{8}$$

$$b_n = \frac{\alpha\varepsilon + \alpha\delta^2 + \alpha\delta^2\rho - \alpha\gamma\delta + \alpha\varepsilon\rho - \alpha\gamma\delta\rho}{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \varepsilon\rho + \gamma^2\varepsilon + \gamma^2\rho + \delta^2\rho - 2\gamma\delta\rho} \tag{9}$$

and the resulting level of economic activity is:

$$c_n = \alpha\,(\rho + 1)\,\frac{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta}{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \varepsilon\rho + \gamma^2\varepsilon + \gamma^2\rho + \delta^2\rho - 2\gamma\delta\rho} \tag{10}$$

A first relevant result can be obtained here: endogenizing enforcement might have consequences on the desirability of first best levels of legal and illegal disposal. Indeed, first best itself could be too costly in terms of the needed enforcement. This result is in contrast with what is obtained in [4][5].

We now turn to some comparisons with respect to first best.

$$g_n - g_f =$$

$$= \alpha\gamma^3\varepsilon\rho \frac{\gamma - \delta}{\left(\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \gamma^2\varepsilon\right)\left(\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \varepsilon\rho + \gamma^2\varepsilon + \gamma^2\rho + \delta^2\rho - 2\gamma\delta\rho\right)}$$

If we assume that parameter values are such to guarantee a strictly positive F_n, then $g_n - g_f > 0$ if $\gamma > \delta$, that is, if the damage parameter for illegal disposal is higher than the one for legal disposal. Legal disposal is higher than under first best if illegal disposal leads to higher damages, as it seems to be the case in real life. This result is driven by costly enforcement. If illegal disposal causes higher marginal damages, the assumption of incomplete and costly enforcement implies the need for the environmental authority to provide incentives towards legal disposal that are stronger than under first best.

Turning to illegal disposal, we get:

$$b_n - b_f =$$

$$= \alpha\gamma^2\varepsilon\rho \frac{\varepsilon + \delta^2 - \gamma\delta}{\left(\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \gamma^2\varepsilon\right)\left(\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \varepsilon\rho + \gamma^2\varepsilon + \gamma^2\rho + \delta^2\rho - 2\gamma\delta\rho\right)};$$

under the same assumptions as above, $b_n - b_f > 0$ if $\varepsilon > (\gamma - \delta)\,\delta$, which we assumed to be the case in order to guarantee interior solutions for the first best problem. Illegal disposal under incomplete enforcement exceeds the corresponding first best levels. Finally, turning to the activity level,

$$c_n - c_f =$$

$$= \alpha\gamma^2\varepsilon\rho \frac{\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta}{\left(\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \gamma^2\varepsilon\right)\left(\varepsilon + \gamma^2 + \delta^2 - 2\gamma\delta + \varepsilon\rho + \gamma^2\varepsilon + \gamma^2\rho + \delta^2\rho - 2\gamma\delta\rho\right)}$$

[5] Notice, however, that in [4], the enforcement choice is overruled, but the choice set of the authorities is larger. The comparison of our result with theirs is therefore not straightforward.

The overall level of activity is therefore higher than under first best. Of course, by definition, first best leads to a higher welfare.

5 Organized crime

We introduce, in this section, the chance for organized crime to "take the place" of government in illegal disposal enforcement. In other words, the criminal organization is so well rooted in the enforcement authorities, that illegal disposal cannot even be recognized by the environmental regulator. This is coherent with real life observation[6]. As in the case without organized crime, we solve the game backwards.

5.1 Second stage: agents

The agents' maximization problem is the same as without organized crime, except that $F = 0$ while on each unit of b an extortion rate, which is the choice variable of the criminal organization, has to be paid. Net benefits maximization implies therefore the solution to the following problem:

$$\max_{g,b} \alpha (b+g) - \frac{(b+g)^2}{2} - \frac{\varepsilon g^2}{2} - tg - xb$$

Legal and illegal disposal are therefore:

$$g = \frac{1}{\varepsilon}(x - t) \tag{11}$$

$$b = \frac{1}{\varepsilon}(t - x - x\varepsilon + \alpha\varepsilon) \tag{12}$$

and the corresponding economic activity level is:

$$c = \alpha - x$$

As a consequence, the level of economic activity is entrely determined by the extrorion rate chosen by the criminal organization.

[6] See, for example, [2].

5.2 First stage.

The government and the criminal organization are assumed to compete *a la Cournot*. The government (or environmental authority) maximizes:

$$\max_{F,t} W = \alpha (b+g) - \frac{(b+g)^2}{2} - \frac{\varepsilon g^2}{2} - \frac{(\delta g + \gamma \beta b)^2}{2}$$
$$\text{subject to (11) and (12)}$$

where $\beta \geq 1$ represents the fact that illegal disposal by organized crime can be disruptive. In other words, we are assuming that the damages caused by organized crime for any given level of b are higher than the corresponding damages in the absence of a criminal organization.

The resulting tax rate on legal disposal is given by the following expression.

$$t = \frac{\varepsilon + (\beta\gamma - \delta)^2 + \beta\gamma\varepsilon(\beta\gamma - \delta)}{\varepsilon + (\beta\gamma - \delta)^2} x + \alpha\beta\gamma\varepsilon \frac{\delta - \beta\gamma}{\varepsilon + \delta^2 + \beta^2\gamma^2 - 2\beta\gamma\delta}$$

Clearly, under the assumption that illegal disposal is more damaging than legal disposal and that organized crime is disruptive, the tax is increasing in the illegal disposal fee. In the spirit of [6], if the criminal organization imposes a higher rate, then the tax rate can be set at a higher rate as well without causing too many wastes to be disposed of illegally.

The objective of the criminal organization is to maximize rent minus costs, solving therefore the following problem:

$$\max_x xb - K$$

where K represents the fixed costs for the criminal organization to infiltrate the bureaucratic and enforcement authorities in such a way to guarantee a formally legal disposal of waste to economic agents buying its "services". We assume such costs are never so low to force organized crime "out of business".

The first order (necessary and sufficient) conditions imply:

$$x = \frac{1}{2(\varepsilon + 1)} (t + \alpha\varepsilon)$$

so that the optimal illegal disposal rate is increasing in the tax rate, again as it is reasonable.

Solving for Nash equilibrium we get the following values for x and t (where the subscript o identifies the case where organized crime is active):

$$t_o = \frac{\alpha\varepsilon^2 + \alpha\delta^2\varepsilon - \alpha\beta^2\gamma^2\varepsilon^2 - \alpha\beta^2\gamma^2\varepsilon + \alpha\beta\gamma\delta\varepsilon^2}{\varepsilon + \delta^2 + 2\varepsilon^2 + \beta^2\gamma^2 + 2\delta^2\varepsilon + \beta^2\gamma^2\varepsilon - 2\beta\gamma\delta - 3\beta\gamma\delta\varepsilon} \tag{13}$$

$$x_o = \frac{\alpha\varepsilon^2 + \alpha\delta^2\varepsilon - \alpha\beta\gamma\delta\varepsilon}{\varepsilon + \delta^2 + 2\varepsilon^2 + \beta^2\gamma^2 + 2\delta^2\varepsilon + \beta^2\gamma^2\varepsilon - 2\beta\gamma\delta - 3\beta\gamma\delta\varepsilon} \tag{14}$$

The corresponding values for legal and illegal disposal and the level of economic activity are:

$$g_o = \frac{\alpha\beta\gamma\left(\varepsilon + 1\right)\left(\beta\gamma - \delta\right)}{\varepsilon + \delta^2 + 2\varepsilon^2 + \beta^2\gamma^2 + 2\delta^2\varepsilon + \beta^2\gamma^2\varepsilon - 2\beta\gamma\delta - 3\beta\gamma\delta\varepsilon} \tag{15}$$

$$b_o = \frac{\alpha\left(\varepsilon + 1\right)\left(\varepsilon + \delta^2 - \beta\gamma\delta\right)}{\varepsilon + \delta^2 + 2\varepsilon^2 + \beta^2\gamma^2 + 2\delta^2\varepsilon + \beta^2\gamma^2\varepsilon - 2\beta\gamma\delta - 3\beta\gamma\delta\varepsilon} \tag{16}$$

We assume strictly positive values for x_o, g_o and b_o, implying $\left(\varepsilon + \delta^2 - \beta\gamma\delta\right) > 0$ and $\varepsilon + \delta^2 + 2\varepsilon^2 + \beta^2\gamma^2 + 2\delta^2\varepsilon + \beta^2\gamma^2\varepsilon - 2\beta\gamma\delta - 3\beta\gamma\delta\varepsilon$.

The economic activity level under organized crime is:

$$c_o = \frac{\alpha\left(\varepsilon + 1\right)\left(\varepsilon + \delta^2 + \beta^2\gamma^2 - 2\beta\gamma\delta\right)}{\varepsilon + \delta^2 + 2\varepsilon^2 + \beta^2\gamma^2 + 2\delta^2\varepsilon + \beta^2\gamma^2\varepsilon - 2\beta\gamma\delta - 3\beta\gamma\delta\varepsilon} \tag{17}$$

5.3 Comparisons

In order to make readable comparisons, we run two simulations. In the first one we set the value for ε (the parameter characterizing legal disposal cost, set equal to 2), whereas we let ρ (the expected fine parameter) and β (the degree of disruptiveness) vary. In the second simulation, ρ is assumed to be fixed (and equal to 1) while ε and β vary[7].

[7] In both cases, we assume $\gamma = 0.5$, $\delta = 0.45$, $1 < \beta < 2.1$ and $\alpha = 1$, so that the damage from illegal disposal is entirely due to organized crime. Such assumptions ensure positive values of the tax rates and the amount of legal and illegal waste.

Since outcomes are the same, only comparisons from the first simulation are reported.

As Figure 1 shows, the tax rate can be higher under incomplete enforcement than in the presence of Mafia, depending on the the value of β. Specifically, $t_n > t_o$ when illegal disposal is not very disruptive (i.e. β is small), whereas $t_n < t_o$ for relatively high values of β. In other words, when the illegal disposal management by the Mafia is not excessively disruptive, the environmental authority can set higher tax rates on legal disposal, since the incentive towards illegal disposal does not create significantly higher damages than in the absence of Mafia. On the contrary, tax rates tend to be lower in the presence of Mafia if environmental damages caused by organized crime are relatively high. In the latter case, the State can apply only low tax rates in order not to induce individuals to illegally dispose of their waste.

Figure 1

The expected fine the government can apply under incomplete enforcement is always lower than the Mafia extortion rate ($F_n < x_o$, see figure 2). This is a consequence of the difference in enforcement costs between the government (featuring convex costs) and the Mafia (featuring only fixed costs). Further, our results seem to confirm the idea that organized crime might supplement the environmental authorities limiting illegal behaviour (see, among others, [5]).

Figure 2

As a consequence of that, the amount of legal waste is always higher in the presence of Ecomafia ($g_n < g_o$), whereas illegal wastes are lower ($b_n > b_o$) (Figures 3 and 4).

Figures 3 and 4

The overall effect is that the level of economic activity is higher when organized crime is absent and enforcement is partially realized by the State ($c_n > c_o$) (Figure 5).

Figure 5

Finally, according to our simulations, social welfare is lower when Ecomafia manages illegal disposal ($W_n > W_o$), irrespective of its disruptiveness rate. This result, which contradicts the existing literature ([5] and [6]), can be explained by considering that in our setting the expected fine is a net transfer (so that it does not affect social welfare) under any institutional assumption, while the presence of organized crime implies a lower level of economic activity: this is very likely to lead the economy further away from first best than in the case when organized crime is not present.

6 Concluding remarks

The idea that organized crime is not necessarily bad for social welfare is not new in the literature. Examples under this respect can be found in [1] as well as in [5] and [6]. We have shown that, under plausible assumptions concerning the interaction among the State and a criminal organization when dealing with waste policy, welfare might be always higher in the absence of the Mafia, while taxation might be larger in the presence of the latter, at least if the Mafia does not dispose of waste in way that is "too disruptive". Also, a surprising result has been obtained in terms of enforcement effort by the State and by the Mafia. Of course, our welfare comparison will have to be developed further. Future steps in our research will be a more general investigation of how organized crime affects environmental quality and welfare, specifically by moving to an implicit functional forms setting and by testing the robustness of our resuts to larger sets of parameter values.

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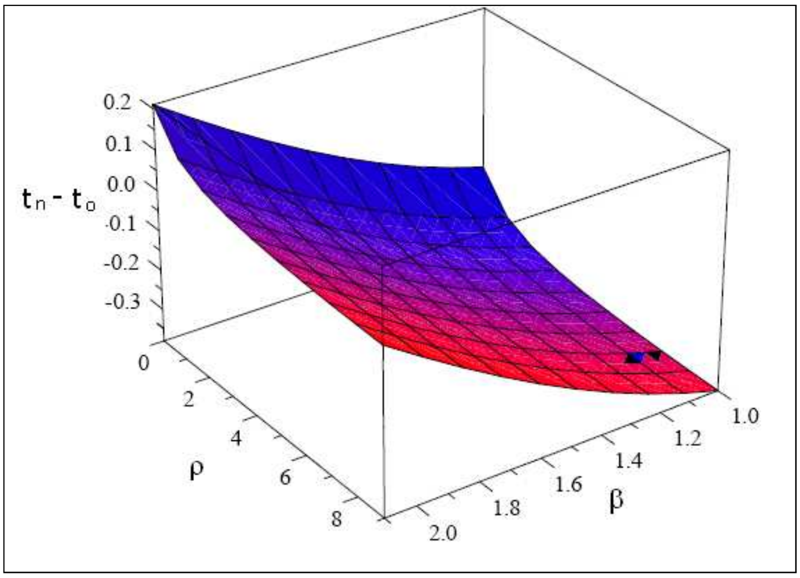

Figure 1 - Tax rates comparison

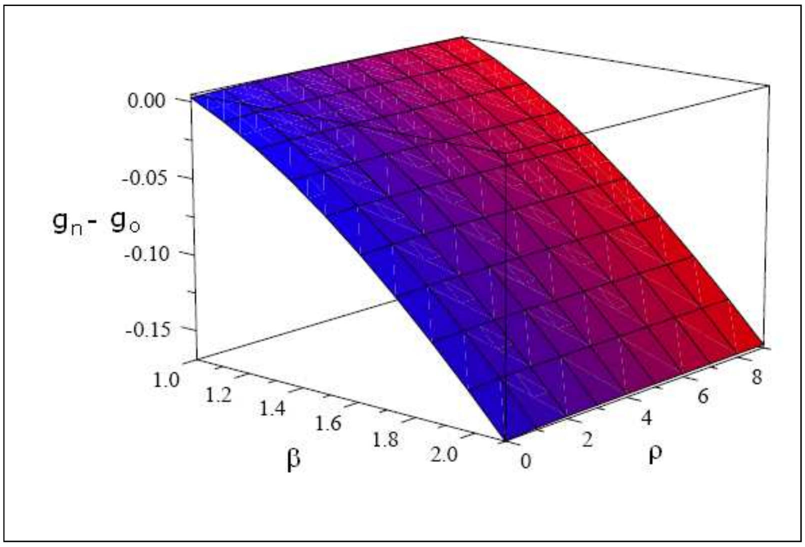

Figure 2 - Legal wastes comparison

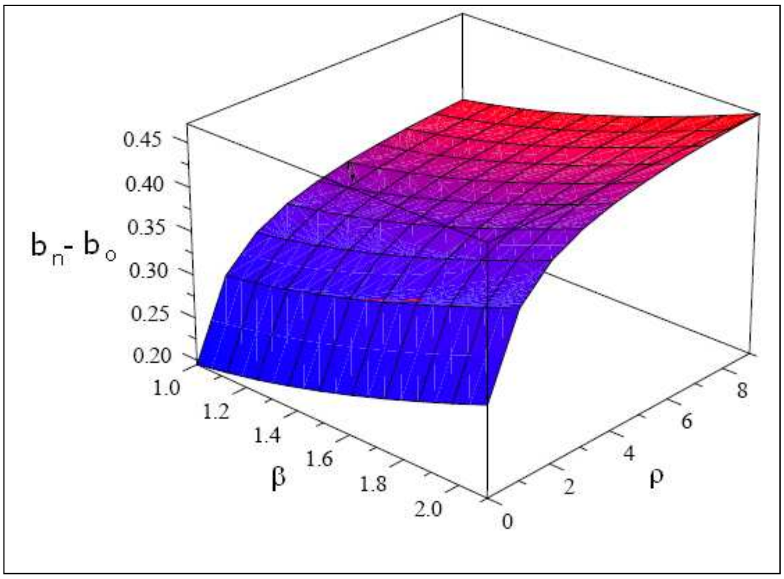

Figure 3 - Illegal wastes comparison

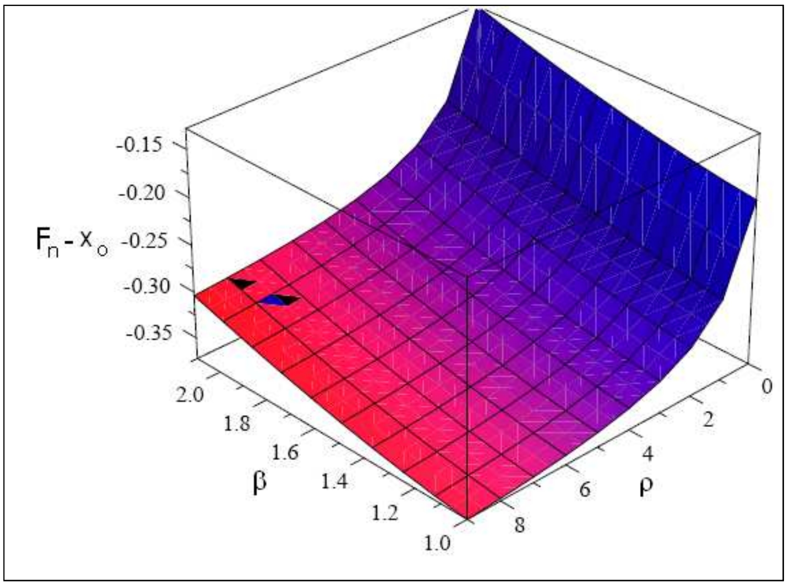

Figure 4 - Expected fine and extortion rate comparison

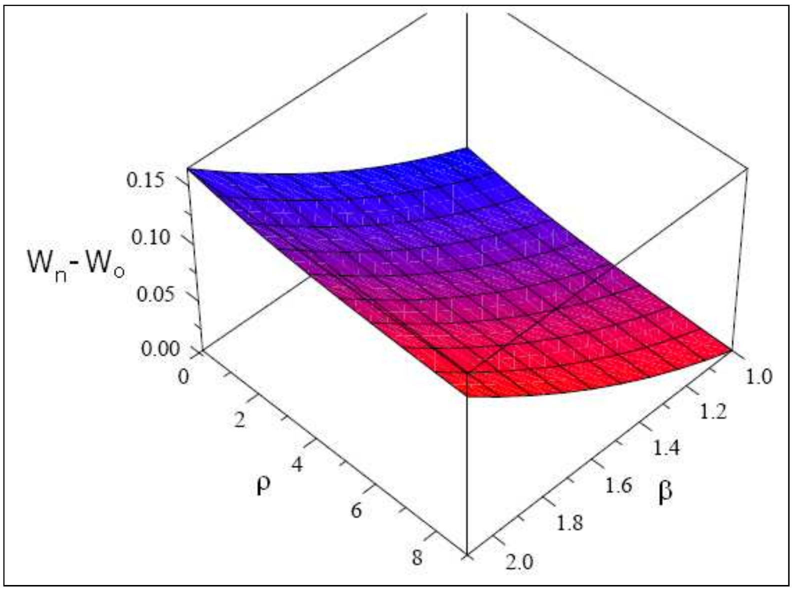

Figure 5 - Welfare comparison