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POLITICAL CULTURE AND MONOPOLY PRICE DETERMINATION

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Abstract

In this paper we study the endogenous determination of monopoly price. Our proposed game of endogenous monopoly-price setting extends the literature on monopoly-price, monopoly rent-seeking contests and monopoly rent-seeking rent-avoidance contests by (i) determining the monopoly price such that it maximizes a composite utility function that depends on two components: expected social welfare and lobbying efforts. The welfare component has a positive or no effect on the utility while the lobbying efforts have a positive, negative or no effect on the utility (ii) introducing the political culture of the government and clarifying its role in the endogenous determination of monopoly price. In the proposed model the single parameter representing political culture is the weight assigned to the enhancement of social welfare. Our main concern is with the study of the relationship between this parameter and the proposed monopoly price and, in turn, the rent-seeking rent-avoidance efforts of the potential monopoly and the consumers and their aggregate expected benefit.

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1. Introduction

In representative democracies monopoly price is determined by a political process that reflects the interest of the government (a bureaucrat, a regulator, a politician) that proposes the pricing policy and the pressures exerted by the producer, the potential monopoly, and by the consumers on the ruling politicians who approve or reject the proposed price. The producer is interested in securing the rent associated with the approval of the proposed price while the consumers prefer that the proposed price be rejected, thus avoiding a reduction in their surplus.

Our proposed game of monopoly regulation extends the existing models in the literature on monopoly-price, Tirole (1988), monopoly rent-seeking contests, Kruger (1974), Peltzman (1976), Posner (1975), Tullock (1980), Tollison (1982) and monopoly rent-seeking rent-avoidance contests, Appelbaum and Katz (1986a), Baik (1999), Ellingsen (1991), Paul and Wilhite (1991), Schmidt (1992) and Wenders (1987) by:

(i) determining the monopoly price assuming that it maximizes a composite utility function that depends on two components: the expected social welfare and the lobbying efforts exerted by the interest groups. The welfare component has a positive or no effect on the utility while the total lobbying outlays have a positive, negative or no effect on the utility.

(ii) introducing the political culture of the government and clarifying its role in the endogenous determination of monopoly price. The weights assigned to each of the components can be interpreted as the political culture of the government.

Our model has an alternative interpretation that can clarify the roles played by bureaucrats, incumbent politicians, potential monopolies and consumers on the endogenous determination of monopoly price. More specifically, the proposed framework enables a distinction between the role of the bureaucrat who proposes the monopoly price and the role of the incumbent politician who approves or rejects the proposal. The politician faces an information problem , viz., he lacks information regarding the costs and benefits of the proposal. His decision is therefore uncertain depending on the efforts made by the interest groups to convince him to vote in favor or against the proposed policy. Consequently, the

bureaucrat and the interest groups consider the outcome of the lobbying contest they take part in to be uncertain.[1]

Our modeling of the endogenous determination of monopoly price is related to the approach proposed by Appelbaum and Katz (1986b), namely, that governments seek rents by setting rents and, more generally, to the recent literature on optimal contest design (Amegashie (1999), Baye, Kovenock and de Vries (1993), Clark and Riis (1998), Dasgupta and Nti (1998), Gradstein (1998), Morgan (1998), Nitzan (1994)), where the structure of the contest is determined by a politician. It is also related to the strategic trade literature (Grossman and Helpman (1994); Rodrik (1994); Rama and Tabellini (1995)) and to the earlier non-strategic trade literature (Hillman (1982), (1989); Mayer (1984); Rodrik (1986)) where trade policy is endogenously determined by elected politicians.

The second extension enables us to predict different patterns of monopoly regulation in different political-economic environments. Our notion of political culture is related to the welfare weight parameter in the composite utility function of the government, see van Winden (1998) for a survey of studies where such an assumption is made.

In order to focus our discussion, we adopt the first interpretation. That is, we assume that the regulator (politician or bureaucrat) determines the monopoly price via maximization of a composite utility function, disregarding the distinction within the government between bureaucrats and politicians and their different roles. Toward the end of the paper we will discuss the alternative interpretation and clarify why the model fits the more complex decision-making process in a two-tier government. The main objective of this paper is to examine how changes in the parameter representing political culture affect monopoly regulation and, in turn, the rent-seeking rent-avoidance efforts of the producer and the consumers and their aggregate expected benefit.

[1] As in Peltzman (1976) the government sets a price, however, in our extended framework the regulator is not taken as equivalent to an elected politician, but is considered as an interest group.

2. The Game of Monopoly Regulation

A. *The Contest on the Approval of the Proposed Regulation*

In our game of monopoly regulation there are three players. The first one is the regulator who sets and proposes the regulated monopoly price I. His proposal along with the status-quo price constitutes the agenda. The binary decision of the approval or rejection of the policy affects the two remaining players; the producer (the potential monopoly) and a representative of the consumers. The producer and the consumers are engaged in a rent-seeking rent-avoidance contest, the contest on the approval or rejection of the proposed monopoly price I.[2] The regulator is aware of the direct potential benefit of this contest, namely, of the possibility to collect part or all of the rent-seeking rent-avoidance outlays incurred by the two contestants. If the regulator is a politician, he may also be aware of the effect of his decision on his probability of being re-elected either via the expected campaign contributions of the contestants (the contestants' outlays) or via the expected support of the voters whose welfare depends on the regulation policy of the government.

The regulation game is based on the following main assumptions: There are only two interest groups that can affect the probability of rejection/approval of the proposed policy; the expenditures incurred by the interest groups can be transfers and/or wasteful resources; the contest is resolved by the standard symmetric Tullock's (1980) contest success function (CSF); the regulator is a leading player and, finally, the political culture is exogenous. The robustness of the results to these assumptions will be discussed while presenting the analysis and in the concluding remarks.

We first present the contest on the approval of the regulator's proposal, the rent-seeking rent-avoidance contest. In this contest, in fact, sub-game of the regulation game, the two players choose their strategies (the rent-seeking outlays) given (a) the proposed monopoly price I and (b) the contest success function, CSF, that represents the involvement of the regulator in the regulation game beyond his setting the agenda. This function transforms the rent-seeking rent-avoidance efforts of the contestants into probabilities of approval and rejection of the proposed monopoly price I. Notice that the existence of a CSF might be due to an information problem faced by the regulator who may not know, for example, the true production costs of the regulated enterprise. The rent seeking game is thus viewed as a "black box" or a reduced form of the outcome of the regulatory process, possibly also for some

[2] This contest is a special case of the two-player contest studied in Epstein and Nitzan (2001).

incomplete information game between the politician and the voters in which the politician can obtain some rent from appropriating some share of the rent- seeking efforts.

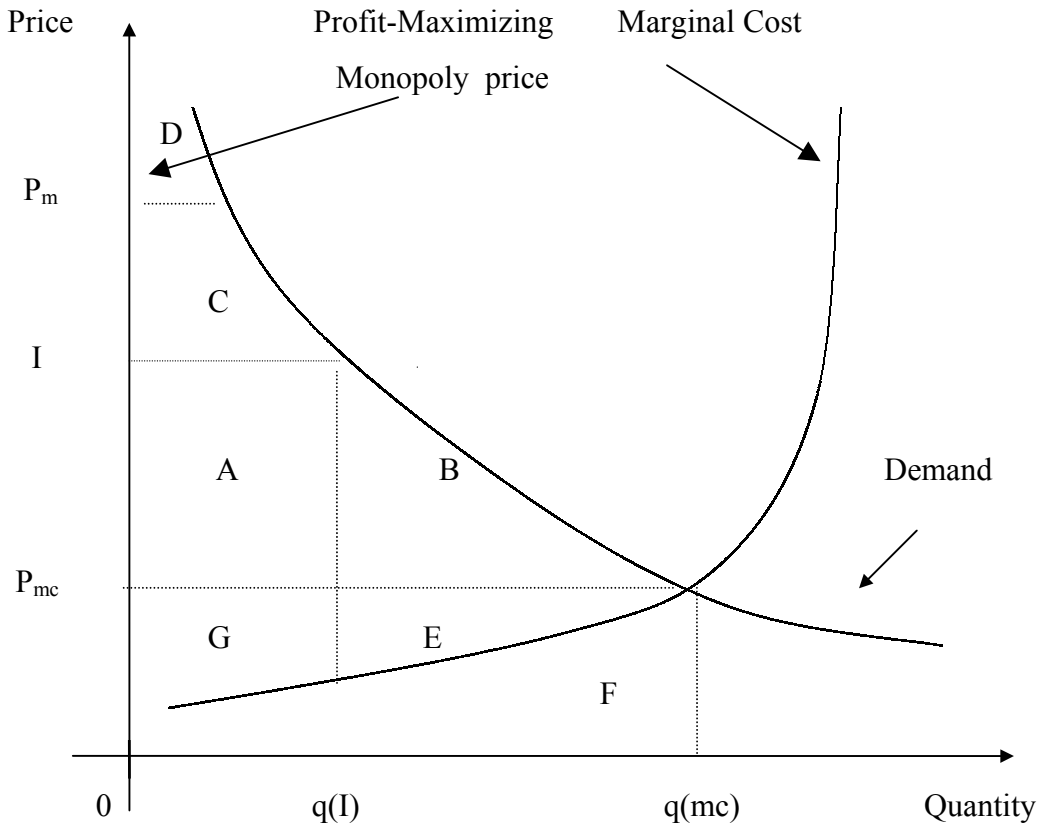
We examine the Nash equilibrium of the two-player contest on the approval of the regulator's proposal. We then complete the presentation of the game of monopoly regulation in which the regulator's preferred policy is set taking into account his political and professional commitments, his narrow self interest and the political constraint that he faces, namely, the equilibrium outcome in the rent-seeking rent-avoidance sub-game (contest).

Being a regulated monopoly, a producer may charge some price I that differs from the status-quo constrained surplus-maximizing price P_{mc}, the price at which the marginal cost curve intersects the demand curve.[3] [4] The price I, which is typically higher than P_{mc}, can be equal to or lower than the standard profit-maximizing monopoly price P_m[5]. The quantities corresponding to approval and rejection of the proposed price I are $q(I)$ and $q(mc)$. The producer's payoff in the event that he wins the contest is equal to the monopoly profit at price I, $A(I) + G(I)$. In such a case the consumers' surplus is given by $D(I) + C(I)$. The consumers' payoff if they win the contest is equal to their surplus under the competitive price, $D(I) + C(I) + A(I) + B(I)$. In such a case the producer's payoff is given by $G(I) + E(I)$. Note that, in general, the payoffs of the players under the two possible outcomes of the rent-seeking rent-avoidance contest, viz., the players' payoffs corresponding to approval and rejection of the price depend on I.

Figure 1

[3] We disregard the producer's fixed costs, assuming that his normal profit is sustained for any price which is equal to or higher than P_{mc}.

[4] An alternative candidate for the status-quo price is the unregulated standard profit-maximizing monopoly price $P_{m.}$ Our results are robust to the selection of the status-quo price.



With probability Pr_c the ruling politician rejects the proposed price I. This implies that he approves the preferred price of the consumers, P_{mc}. With probability Pr_f the ruling politician approves the proposed price I. We denote by x_f and x_c the rent-seeking and rent-avoidance expenditures of the risk-neutral players: the producer and the consumers. These expenditures determine the probability of approval of the policy proposed by the regulator. The total rent-seeking rent-avoidance outlays ($x_f + x_c$) represent either transfers to the government (the ruling politician and/or the bureaucrat) or resources wasted in the rent-seeking rent-avoidance contest.

The expected net payoff (surplus) of the consumers and the producer are, respectively, given by

$$(1) \qquad E(w_c) = \Pr_c (A(I) + B(I) + C(I) + D(I)) + \Pr_f (C(I) + D(I)) - x_c$$

and

$$(2) \qquad E(w_f) = \Pr_f (A(I) + G(I)) + \Pr_c (E(I) + G(I)) - x_f$$

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[5] A price cap I higher than P_m is ineffective because even if such a price is approved the monopoly would

Let us assume that the demand and marginal cost functions are continuous and twice differentiable in *I*. This assumption implies that *A(I), B(I), C(I)* and *D(I)* are continuous and twice differentiable in *I*.

Let n_c = *(A(I)+B(I))* and n_f = *(A(I)-E(I)*.) denote, respectively, the contest stakes of the consumers and the producer. n_f and n_c are the real benefits of rent seeking and of rent avoidance of the players. The consumers win the contest when their preferred policy, viz. rejection of the proposed monopoly price, is the outcome of the contest. Their benefit in such a case is their avoided loss. The producer wins the contest when his preferred outcome, namely, approval of the proposed monopoly price, is the outcome of the contest.

Notice that $n_c > n_f$, i.e., *A(I) - E(I) < A(I) + B(I).* The total benefit, in fact, the deadweight loss associated with the approval of the proposed monopoly price is given by *B(I) + E(I).*

The probabilities Pr_c and Pr_f are obtained by the contest success function. This function transforms the two players' rent-seeking rent-avoidance expenditures into probabilities of securing their preferred policy outcome. The existence of the contest and, in particular, the existence of a specific contest success function reflects the crucial role played by the ruling politician, the phantom player in our game. In the present study we assume that the contest is determined by Tullock's (1980) commonly used non-discriminating rule. That is, player *i*'s probability of success in competing against player *j* is given by[6]

$$\Pr_i = \Pr_i(x_i, x_j) = \frac{x_i}{x_i + x_j}, \ \forall i \neq j \tag{3}$$

It is clear from the structure of the game that both players participate in the contest with positive values of x_i and that one of them wins the contest. We therefore focus on interior Nash equilibria of the contest. The conditions characterizing an interior equilibrium of our two-player contest (subgame) are [7]

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charge the advantageous lower price P_m.

[6] Our main results are valid, however, under more general assumptions regarding the form of the contest success function.

[7] The sufficient (second order) conditions of such equilibria are satisfied.

(4) $$\frac{\partial E(w_c)}{\partial x_c}=\frac{x_f}{(x_c+x_f)^2}\, n_c - 1 = 0 \quad \text{and} \quad \frac{\partial E(w_f)}{\partial x_f}=\frac{x_c}{(x_f+x_c)^2}\, n_f - 1 = 0$$

The equilibrium rent-seeking rent-avoidance expenditures of the two players are given by

(5) $$x_c^{*}=\frac{n_c^2 n_f}{(n_c+n_f)^2} \quad \text{and} \quad x_f^{*}=\frac{n_c n_f^2}{(n_c+n_f)^2}$$

The equilibrium probabilities of the consumers and the producer to win the contest are equal to

(6) $$\Pr_c^{*}=\frac{n_c}{n_c+n_f} \quad \text{and} \quad \Pr_f^{*}=\frac{n_f}{n_c+n_f}$$

(5) and (6) are well established in this literature.

B. The Proposed Monopoly Price and the Contestants' Stakes, Efforts and Winning Probabilities

By the expressions in (5) and (6) that specify the equilibrium rent-seeking outlays of the players and their probabilities of winning the contest, we directly obtain that under our stylized assumptions the player with the higher stake representing the consumers invests more resources in rent-seeking activities and has a greater probability of winning the contest than the producer. These results are known and are well established in the literature (for example see Baik, 1994a and Nti, 1999). The probability that the socially inefficient monopoly price will be set is therefore smaller than the probability of the more efficient outcome, namely that the price is the competitive one.[8] Note that despite this result the anti-monopoly activity of the consumers is not necessarily beneficial, that is, the social cost of

[8] This efficiency criterion has been used by Ellingsen (1991), Fabella (1995), Hurley (1998) and Morgan (1998).

monopoly is not necessarily reduced as established by Baik (1999), Ellingsen (1991) and Schmidt (1992).

The effect of a change in the proposed price *I* on the extent of the equilibrium rent-seeking rent-avoidance activities of the two players is

$$(7) \qquad \frac{\partial x_c^*}{\partial I} = \left(n'_f(I)\left(n_c(I)\right)^2\left(n_c(I) - n_f(I)\right) + 2n_c(I)n_f^2(I)n'_c(I)\right)\frac{1}{\left(n_c(I)+n_f(I)\right)^3}$$

and

$$(8) \qquad \frac{\partial x_f^*}{\partial I} = n_c n_f n'_f\left(n_f - n_c\right)\left[\frac{\eta_c}{\eta_f} + 2\frac{n_c}{n_f - n_c}\right]\frac{1}{\left(n_c(I)+n_f(I)\right)^3}$$

where $\eta_j = \frac{\partial n_j}{\partial I}\frac{I}{n_j} = n'_j\frac{I}{n_j}$ is the elasticity of player *j*'s stake (benefit) with respect to a change in the proposed price *I*.

Note that for $P_m > I > P_{mc}$, $\frac{\partial n_j}{\partial I} = n'_j > 0, \ \forall\ j = c, f$. We can therefore conclude that $\frac{\partial x_c^*}{\partial I} > 0$ and $\frac{\partial x_f^*}{\partial I} \lessgtr 0$ if $\frac{\eta_c}{\eta_f} \lessgtr -2\frac{n_c}{n_f - n_c}$.

The consumers' investment in the contest is directly related to changes in the proposed price *I*, while the effect of such changes on the extent of rent-seeking activities of the producer is ambiguous. Due to the potential monopoly's awareness to the increased rent-avoidance efforts of the consumers, he may reduce his rent-seeking efforts. This situation arises when his relatively low incentives (recall that his stake is the lower one) are enforced by second order inferiority, that is, η_f/η_c being sufficiently small. This additional asymmetry between the players means that the elasticity of the consumers' stake with respect to the proposed price, η_c, is sufficiently higher than the elasticity of the potential monopoly's stake with respect to the proposed monopoly price, η_f. Specifically, $\frac{\eta_c}{\eta_f} > 2\frac{n_c}{n_c - n_f}$.

The relative probabilities of winning the contest and the relative equilibrium outlays of the players are obtained from (3) and (5),

$$\frac{\Pr_c^*}{\Pr_f^*} = \frac{x_c^*}{x_f^*} = \frac{n_c(I)}{n_f(I)} = \frac{A(I)+B(I)}{A(I)-E(I)} \tag{9}$$

(9) is known and well established in this literature. In equilibrium then the players' relative probabilities of winning the contest are equal to their relative expenditures and to their relative stakes. Denote by X the total rent-seeking rent-avoidance outlays. In equilibrium $X^* = x_c^* + x_f^* = \frac{n_c(I)n_f(I)}{n_c(I)+n_f(I)}$.

The effect of a change in the proposed monopoly price I on the total contestants'outlays is ambiguous.

$$\frac{\partial X^*}{\partial I} = \frac{n_f(I)n_c(I)n'_f(I)}{\left(n_c(I)+n_f(I)\right)^2}\left(\frac{\eta_c}{\eta_f}+\frac{n_c(I)}{n_f(I)}\right) \tag{10}$$

By (10) we obtain that $\frac{\partial X^*}{\partial I} > 0$. That is, the total rent-seeking outlays of the contestants are directly related to the proposed monopoly price. In particular, an increase in the proposed price induces larger total efforts. This result implies that even when such an increase induces the producer to reduce his rent-seeking efforts, this reduction is more than counterbalanced by the increase in the rent-avoidance efforts of the consumers.

C. The Proposed Monopoly Price

The proposed monopoly price I is determined by the maximization of the regulator's objective function $G(\,)$ which is a function of the expected welfare of the players and their total lobbying transfers and is of the general form

$$G\left(E(w_c);E(w_f);(x_c+x_f)\right) \tag{11}$$

$E(w_c)$ and $E(w_f)$ are the expected net payoff of the consumers and the producer. The sum of these net payoffs is referred to as the expected social welfare of the public that in our case consists of the two interest groups competing on the rents associated with the proposed regulation. These rents correspond to the approval and rejection of the proposed monopoly price. The total rent-seeking rent-avoidance outlays ($x_f + x_c$) represent either transfers to the government or resources wasted in the rent-seeking rent-avoidance contest.

Let us denote by $\overline{E}\left(w_l^*\right)$ the equilibrium expected payoff of player l. That is, $\overline{E}\left(w_l^*\right)$ is player l's equilibrium expected payoff when the rent-seeking rent-avoidance costs are disregarded, $E\left(w_l^*\right)=\overline{E}\left(w_l^*\right)-x_l^*$. We assume that the regulator's objective function is of the following additive form that reflects his mixed commitments.

$$G(.)=\alpha g\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)+\left(1-2\alpha\right)f\left(x_c^*+x_f^*\right) \tag{12}$$

The weight $(1-2\alpha)$ determines whether the second expression in the regulator's objective function is a positive or a negative welfare component. A negative weight implies that the total rent-seeing rent-avoidance outlays are considered as wasteful resources. g and f are monotone increasing functions that specify the utility components corresponding to the aggregate expected payoff of the public and to the total rent-seeking rent-avoidance outlays. The parameters α and $(1-2\alpha)$ are the weights assigned to the utility components. The regulator's mixed commitments are thus represented by α. This parameter represents the political culture of the government. It reflects the allocation of the contestants' expenditures between wasteful and non-wasteful lobbying resources . It also reflects the commitments of the regulator to the public interest and to his narrow interest of collecting the contestants' expenditures. Increased politicization, namely, a higher 1- α, implies that the government assigns more emphasis to the transfers from the interest groups and is less concerned about welfare. A government with a short horizon may indeed put a larger emphasis on the transfers rather than on the well being of the interest groups. The degree of politicization depends on the norms and the culture that exist in the country. If the enhancement of self interest is a highly respected norm in the economy and bribes are tolerated to some extent, then even if the government has a long horizon, it may still assign a high weight to the transfers. In such a case receiving transfers from the interest groups is considered by the public as a normal action that does not necessarily reduce the politicians' probability of being

re-elected. This is not the case in countries where bribes and transfers are not part of the culture.

Note that since $\overline{E}(w_l^*) = E(w_l^*) + x_l^*$, if $f(y) = g(y) = y$, then (12) can be written as $G(.) = \alpha\left(E(w_c^*) + E(w_f^*)\right) + (1-\alpha)(x_c^* + x_f^*)$. In this form α and $1-\alpha$ are the weights assigned respectively to the aggregate expected payoff and to the total contestants' outlays.

To illustrate the general applicability of the assumed objective function, we consider several special cases where α ranges between 0 and 1.

When $\alpha = 1$, $G(.) = g\left(\overline{E}(w_c^*) + \overline{E}(w_f^*)\right) - f\left(x_c^* + x_f^*\right)$, the regulator is committed to the public interest, and the completely wasteful rent-seeking outlays are conceived as total loss to society. When $\alpha = 0.5$, $G(.) = 1/2\ g\left(\overline{E}(w_c^*) + \overline{E}(w_f^*)\right)$ and the regulator is again totally committed to the public interest. He disregards, however, the total rent-seeking outlays because they constitute a transfer to the government which is redistributed back to the public. When $\alpha = 1/3$, $G(.) = 1/3\ \left(g\left(\overline{E}(w_c^*) + \overline{E}(w_f^*)\right) + f\left(x_c^* + x_f^*\right)\right)$, the non-wasteful rent-seeking outlays are transferred to the government and the regulator assigns equal weights to his utility components, depending on the rent-seeking outlays and on the aggregate expected payoff of the players. When $\alpha = 0$, $G(.) = f\left(x_c^* + x_f^*\right)$ and the objective of the regulator is to maximize the rent-seeking outlays disregarding the welfare of the public. This objective function represents an extreme political culture where the regulator is totally committed to his and/or to the ruling politician's narrow interest of controlling the resources expended by the rent seekers.

We conclude therefore that an interior solution of the regulator's problem is obtained provided that $\alpha < 1/2$. The reason for this is that for $\alpha \geq 1/2$, the lobbying outlays have a negative effect on the regulator's utility. Since $\frac{\partial X^*}{\partial I} > 0$ and $\frac{\partial\left(\overline{E}(w_c^*) + \overline{E}(w_f^*)\right)}{\partial I} < 0$, it is clear that for any $\alpha \geq 1/2$ the equilibrium price is P_{mc}.

3 Results

A. Political Culture and Monopoly Price

When making the decision regarding the monopoly price, the regulator who is a leading player maximizes *G(.)* being aware of the equilibrium rent-seeking rent-avoidance outlays

corresponding to the possible prices . Substituting (5) and (6) into (12), we obtain for $\alpha < 1/2$

$$G(I)=\alpha g(\frac{n_c(I)}{n_f(I)+n_c(I)}(\big(D(I)+C(I)+A(I)+B(I)\big)+\big(G(I)+E(I)\big))+$$

(13)

$$\big(\big(A(I)+G(I)\big)+\big(C(I)+D(I)\big)\big))\ +(1-2\alpha)f\left(\frac{n_c(I)n_f(I)}{n_c+n_f}\right)$$

The regulator maximizes this objective function by determining the optimal level of *I*. The first order condition that characterizes an interior solution of his problem (we assume that the second order condition holds[9]) is

(14) $$\frac{\partial G(.)}{\partial I}=\alpha\frac{\partial g\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)}{\partial I}+(1-2\alpha)\frac{\partial f\left(x_c^*+x_f^*\right)}{\partial I}=0$$

or,

(15) $$\frac{\partial\, g\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)}{\partial\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)}\frac{\partial\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)}{\partial I}=-\frac{(1-2\alpha)}{\alpha}\frac{\partial f\left(x_c^*+x_f^*\right)}{\partial\left(x_c^*+x_f^*\right)}\frac{\partial\left(x_c^*+x_f^*\right)}{\partial I}$$

Given that in our two-stage political-economic game the regulator is a leading player, we can refer to the equilibrium outcome $\left(x_c^*, x_f^*, I^*\right)$ as the Stackelberg-Nash equilibrium of the monopoly regulation game. Such an interior equilibrium is characterized by (4), (5) and (15).

Let us turn to the study of the effect of a change in α, the parameter representing the political culture on the equilibrium price I^*. It can be verified that $\frac{\partial I^*}{\partial\alpha}=\frac{-\partial^2 G(.)/\partial I\partial\alpha}{\partial^2 G(.)/\partial I^2}$.

[9] By the second order condition, $\frac{\partial^2 G(.)}{\partial I^2}=\alpha\frac{\partial^2 g\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)}{\partial I^2}+(1-2\alpha)\frac{\partial^2 f\left(X^*\right)}{\partial I^2}<0$.

By the second order condition, $\frac{\partial^2 G(.)}{\partial I^2}<0$. Using the first order conditions, we therefore conclude that the derivative $\frac{\partial I^*}{\partial \alpha}$ and the derivative $\frac{\partial X^*}{\partial I}$ have opposite signs. That is,

Proposition 1: $$\left(\frac{\partial I^*}{\partial \alpha}\right)=-\left(\frac{\partial X^*}{\partial I}\right)< 0$$

Hence, the proposed monopoly price is inversely related to α. In particular, an increase in $(I-\alpha)$, the degree of politicization of the government, tends to increase the proposed monopoly price. This proposition can rationalize empirical evidence on different regulation patterns in different political- economic environments. For example, it rationalizes the findings reported in Paul and Schoening (1991) that deal with electricity price regulation. In this study it has been found that electricity prices are higher in states where the regulators are appointed rather than elected. By Proposition 1, this finding is expected as long as one makes the plausible assumption that appointed regulators are characterized by higher commitment to the ruling politicians and, therefore, by a lower α, relative to elected regulators.

B. Political Culture and Relative Rent Dissipation

The extent of *relative rent dissipation (RRD)* is the ratio between total rent-seeking rent-avoidance expenditures and the aggregate expected payoff of the contestants. The total equilibrium outlays of the contestants are given by $X^*=x_c^*+x_f^*$ while the aggregate expected benefit in equilibrium is given by $\overline{E}(w_c^*)+\overline{E}(w_f^*)$. The *relative rent dissipation (RRD)* rate is therefore given by $RRD=\frac{X^*}{\overline{E}(w_c^*)+\overline{E}(w_f^*)}$. The extent of relative rent dissipation depends on the proposed price *I**. We have seen that, even-though a change in this price has opposite effects on the benefits of the producer and the consumers, the effect of such a change on the equilibrium rent-seeking rent-avoidance outlays is positive. The effect of such a change on *RRD* is

(16) $$\frac{\partial RRD}{\partial I^*} = \frac{\frac{\partial X^*}{\partial I^*}\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right) - \frac{\partial\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right)}{\partial I^*} X^*}{\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right)^2}$$

The sign of this expression is equal to the sign of the numerator of (17), which is equal to

(17)
$$\frac{\partial X^*}{\partial I^*}\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right) - \frac{\bar{\partial}\left(E\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right)}{\partial I^*} X^*$$
$$= \frac{\partial X^*}{\partial I^*}\left(\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right) + \frac{(1-2\alpha)}{\alpha}\frac{\partial f\left(X^*\right)}{\partial X^*}\right)\left(\frac{\partial g\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right)}{\partial\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right)}\right)^{-1} = \frac{\partial X^*}{\partial I^*} A$$

As stated above, in an interior solution $\alpha < 1/2$. By assumption, $\frac{\partial f\left(X^*\right)}{\partial X^*} > 0$ *and* $\frac{\partial X^*}{\partial I^*}\frac{\partial g\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right)}{\partial\left(\overline{E}\left(w_c^*\right) + \overline{E}\left(w_f^*\right)\right)} > 0$. Hence $A > 0$. Since $\frac{\partial X^*}{\partial I^*} > 0$, we obtain

Proposition 2: $$\frac{\partial RRD}{\partial I^*} = \frac{\partial X^*}{\partial I} > 0$$

That is, the extent of relative rent dissipation, like the contestants' outlays, is positively related to the proposed price. The reason for this is that if the regulator sets a higher price, this increases the prize for winning the contest for both contestants. Hence, contest efforts go up, $\frac{\partial X^*}{\partial I^*} > 0$. Second, such an increase in price reduces the sum of the producer and consumer rents in the event that the high-price outcome is realized (and leaves the consumer and producer rents in the status-quo price unchanged). Hence, for unchanged winning probabilities the result is immediate. However, one also has to take into consideration that the equilibrium probabilities of the proposal being approved or rejected and, in turn, the expected welfare change. This change is given by:

$\frac{\partial\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)}{\partial I^*}=\frac{\partial \Pr_c^*}{\partial I^*}n_c^*+\frac{\partial n_c^*}{\partial I^*}\Pr_c^*+\frac{\partial(C+D)}{\partial I^*}+\frac{\partial \Pr_f^*}{\partial I^*}n_f^*+\frac{\partial n_f^*}{\partial I^*}\Pr_f^*+\frac{\partial G}{\partial I^*}$ and, by the above corollary we are assured that it is either negative or lower than the change in X*..

Finally, we study the effect of a change in the political culture which is represented by α on the extent of relative rent dissipation *(RRD)*. Since, $\left(\frac{\partial(RRD)}{\partial\alpha}\right)=\left(\frac{\partial I^*}{\partial\alpha}\frac{\partial(RD)}{\partial I^*}\right)=\left(\frac{\partial I^*}{\partial\alpha}\right)\left(\frac{\partial X^*}{\partial I^*}\right)$, by propositions 1 and 2 we get

Corollary 1: $\frac{\partial RRD}{\partial\alpha}<0$

That is, the extent of rent dissipation is inversely related to α A more politicized government (a lower α) results in increased rent dissipation (reduced expected payoff per unit of investment of the contestants).

C. Welfare Analysis

In the existing literature on the monopoly rent-seeking rent-avoidance game, the price that the monopoly can charge is assumed to be equal to the profit-maximizing monopoly price, P_m. The alternative price is assumed to be the competitive price P_{mc} and the analysis is chiefly concerned with the effect of introducing consumers' surplus-defending activities on the social cost of the monopoly. In the standard monopoly case with no consumer opposition and with no producers' contest on the monopoly's rent corresponding to the price *I*, the social cost of the monopoly is represented by $DWL_c = B + E = n_c - n_f$ (see Figure 1). In our reference case, where a single producer competes against a single representative of the consumers on the approval or rejection of the proposed monopoly price *I*, the expected social cost of the monopoly is equal to the sum of the expected deadweight loss and the contestants' aggregate equilibrium outlays. The social cost of monopoly is given by (see (6) and (13))

(18) $$DWL_u=\frac{n_f}{n_f+n_c}\left(n_c-n_f\right)+\frac{n_f n_c}{n_f+n_c}$$

Consumers' opposition reduces the social costs of monopoly if

(19) $$DWL_u < DWL_c \Leftrightarrow n_f < n_c - n_f$$

That is, if the benefit of the monopoly, n_f, is smaller than the deadweight loss $B + E = n_c - n_f$. This is a special case of the condition that has been established by Baik (1999), Ellingsen (1991) and Schmidt (1992) who studied the case of monopoly rent-seeking and rent-avoidance in a model with many consumers and many producers.

In this subsection we are not concerned with the effect of consumers' opposition on the aggregate expected welfare, but rather with the effect of a change in the endogenously determined monopoly price and with the effect of a change in the political culture on the expected aggregate welfare. Assuming that β $(0 \le \beta \le 1)$ of the rent-seeking rent-avoidance outlays are wasted resources, the expected social payoff in equilibrium is given by[10]

(20)
$$\begin{aligned} E(U^*) &= \overline{E}(w_c^*) + \overline{E}(w_f^*) - \beta X^* \\ &= \left(A(I) + B(I) + C(I) + D(I) + E(I) + G(I)\right) - \Pr_f\left(B(I) + E(I)\right) - \beta X^* \end{aligned}$$

The sum $A(I)+B(I)+C(I)+D(I)+G(I)+E(I)$ is independent of the price I. Therefore, maximization of the expected social welfare is equivalent to the minimization of the sum of the expected deadweight loss associated with the monopoly and the total rent-seeking rent-avoidance outlays, $\Pr_f\left(B(I) + E(I)\right) + \beta X^*$.

(21) $$\frac{\partial E(U^*)}{\partial I} = \frac{\partial\left(\overline{E}(w_c^*) + \overline{E}(w_f^*)\right)}{\partial I} - \beta \frac{\partial X^*}{\partial I}$$

By (15) we get that

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[10] Alternatively, the regulator's payoff could also be part of the welfare: $E(U) = \overline{E}(w_c^*) + \overline{E}(w_f^*) + G(.) - \beta X^*$ The results will not change as a result of using such an alternative definition to the welfare as we are assuming that the price sent by the regulator maximizes *G(.)* thus $\frac{\partial G}{\partial I^*} = 0$.

(22) $$\frac{\partial E(U^*)}{\partial I} = -\frac{(1-2\alpha)}{\alpha}\frac{\partial f/\partial X^*}{\partial g/\partial X^*}\frac{\partial X^*}{\partial I} - \beta\frac{\partial X^*}{\partial I} = -\frac{\partial X^*}{\partial I}\left[\frac{1-2\alpha}{\alpha}\frac{\partial f/\partial X^*}{\partial g/\partial X^*} + \beta\right]$$

Recall that (15) characterizes an interior solution of the regulator's problem. Such a solution is obtained when $\alpha < 1/2$. For $\alpha \geq 1/2$, the equilibrium price is P_{mc}. An increase in the proposed price relative to P_{mc} reduces the expected gross aggregate payoff and increases the zero rent-seeking outlays. Hence, by (21), $\left.\frac{\partial E(U^*)}{\partial I}\right|_{I=P_{mc}} < 0$. This implies that for $\alpha \geq 1/2$ and, by (22) also for $o \leq \alpha < 1/2$, the effect of a change in the proposed price I on the aggregate expected welfare is equal to the inverse of its effect on the total outlays of the contestants. Hence,

Proposition 3: $$\frac{\partial E(U^*)}{\partial I^*} < 0$$

That is, the expected social welfare is inversely related to the proposed monopoly price.

Proposition 3 clarifies the significance of the effect of a change in the proposed price I on the equilibrium rent-seeking rent-avoidance outlays in determining the effect of a change in the proposed price on the expected social welfare. An increase (a decrease) in the contestants' outlays implies a decrease (an increase) in the expected social welfare.

The effect of a change in the parameter α that represents the political culture on the expected social welfare is $\frac{\partial E(U^*)}{\partial \alpha} = \frac{\partial E(U^*)}{\partial I^*}\frac{\partial I^*}{\partial \alpha}$.

Hence, by Propositions 1 and 3,

***Corollary 2*:** $$\frac{\partial E(U^*)}{\partial \alpha} > 0$$

That is, the expected social welfare is positively related to the parameter α. In particular, a higher degree of politicization (an increase in $(1-\alpha)$) decreases the expected social welfare.

4. An Alternative Interpretation

As stated in the introduction, our model has an alternative interpretation that can clarify the roles played by regulators, incumbent politicians, potential monopolies and consumers on the endogenous determination of monopoly price. The regulator/bureaucrat can be conceived as a professional *civil servant* who works out policy proposals. The ruling politicians have to decide whether to accept or reject the proposed policy. Since the politicians lack information regarding the costs and benefits of the proposal, they can be "persuaded" by the interest groups to vote in favor or against a specific policy. Their decision is uncertain, depending on the lobbying efforts made by the interest groups. In such a case the regulator and the interest groups consider the outcome of the lobbying contest to be uncertain.

Now there are four players instead of the three presented above. The fourth player is the politician who approves or rejects the regulator's proposed price. We refer to this player as the ruling politician. The ruling politician is aware of the direct potential benefit of the contest between the interest groups, namely, of the possibility to collect part or all of the rent-seeking rent-avoidance outlays incurred by the two contestants. He may also be aware of the effect of his decision on his probability of being re-elected either via the expected campaign contributions of the contestants (the contestants' outlays) or via the expected support of the voters whose welfare depends on the regulation policy of the government. The bureaucrat considers the rent-seeking rent-avoidance contest as a political constraint. His action is motivated by commitment to the ruling politician, to the public or to his narrow self-interest.

The ruling politician can be considered as a phantom player who affects the outcome of the contest by creating it and, in particular, by being responsible to the existence of the specific CSF that characterizes the contest. As already noted, the uncertainty might be due to lack of information regarding the data relevant to the implementation of the proposed policy. Note that although the politician' s behavior is not modeled and he is just posited to respond to the pressure of the interest groups, the politician's preferences that may clearly depend on the proposed price usually affect the policy selected by the bureaucrat. This is due to the fact that the bureaucrat's objective function partly reflects the politician's preferences.

The ruling politician may initiate the regulation and issue guidelines that affect the form of the feasible policy domain $\left(\underline{I},\bar{I}\right)$. Indirectly, his preferences also take part in the determination of the proposed policy because, at least to some extent, they are reflected in the

objective function of the bureaucrat who is the actual third layer in the game. When preparing his proposal he takes into account the rent-seeking contest between the producer and the consumers which, from his point of view, is a political constraint. His action is affected by his commitments to the ruling politician and to the public interest. These commitments are represented by his specific objective function that may allow complete independence of the ruling politician (complete dedication to the enhancement of social welfare), complete dependence on the ruling politician and intermediate cases of mixed commitments to the ruling politician and to the public interest. The ruling politician may benefit from the rent-seeking rent-avoidance outlays that correspond to the proposed monopoly price that determines the payoffs of the consumers and the producer, because part or all of the outlays constitute a transfer of resources to him. A more complex description of the objective function of the bureaucrat v would be as follows: the politicians assigns a weight of *a* to the expected welfare and *(1-a)* to the contestants' outlays: $v = a\left(E\left(w_c^*\right)+E\left(w_f^*\right)\right)+(1-a)\left(x_c{}^*+x_f{}^*\right)$. The bureaucrat assigns a weight of *b* to the politician's preferences and *(1-b)* to the expected social welfare: $G = b\,v + (1-b)\left(E\left(w_c^*\right)+E\left(w_f^*\right)\right)$. We therefore obtain that $G=\alpha\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)+(1-2\alpha)\left(x_c{}^*+x_f{}^*\right)$ *where* $\alpha = (1-b+b\,a)$ or, in the more general form, $G(.)=\alpha\, g\left(\overline{E}\left(w_c^*\right)+\overline{E}\left(w_f^*\right)\right)+(1-2\alpha)\, f\left(x_c{}^*+x_f{}^*\right)$. Changes in the weight assigned by the bureaucrat and the politicians are reflected in changes in *a* and *b*. Changes in these weights affect α. Changes in α have been analyzed in the previous section.

5. Concluding Remarks

In our uncertain environment in which consumers defend their surplus, a potential monopoly may end up charging the status-quo competitive price or some higher price. Furthermore, a potential monopoly, even if granted a monopoly status, may charge different prices, dependent on the political culture of the environment. Our results highlight the significance of the political culture of the government (the bureaucrats and the ruling politicians) in the endogenous determination of monopoly regulation via price control. We examine, in particular, the relationship between the parameter that represents political culture (the degree of politicization of the government) and the rent-seeking rent-avoidance efforts of the interest groups affected by the proposed monopoly price, their probability of winning the

contest on the approval of the proposed policy and their aggregate expected benefit. Our results can rationalize some of the empirical findings regarding price regulation in alternative political-economic environments, e.g., electricity price regulation in different states where bureaucrats are appointed or elected, Paul and Schoening (1991).

In our extended strategic setting where the bureaucrat is a leading player who sets the monopoly price subject to the political constraint (the rent-seeking rent-avoidance contest on the approval of his proposed monopoly price), the equilibrium monopoly price usually differs from the standard profit-maximizing monopoly price. In fact any observed regulatory decision corresponds to some particular political culture.

In developing our analytical framework, we made some simplifying assumptions that enabled us, first, to focus on the new elements of our extended political-economic game of monopoly regulation and, second, to derive results making a relatively modest analytical effort. We conclude with a brief discussion on some possible extensions of our proposed model. In our model there is a single producer who is the potential monopoly. In a more complete theory competition among n producers on the potential monopoly status could be introduced. Such a generalization would tend to reduce the rent-seeking activities of the producers who face not only the opposing consumers, but also the competition of other producers. The assumption of a single representative consumer could also be replaced. Monopoly rent-avoidance, that is, protection of consumers' surplus is a public good. Assuming m consumers introduces free-riding incentives that may considerably lower the rent-avoidance activities of the consumers. Both of these generalizations could be introduced by adding another stage to our game as in Baik (1999), Ellingsen (1991), Katz and Tokatlidu (1996), Nitzan (1991) and Schmidt (1992).

In the contest on the approval of the proposed monopoly price, the players are asymmetric since their stakes are different. Additional asymmetry could be introduced by assuming that the producer and the representative of the consumers differ in their degrees of risk aversion or in their lobbying capabilities as in Baik (1994b), Gradstein (1994), Hillman and Riley (1989), Konrad and Schlesinger (1997).

The contest success function (CSF) in the competition on the approval of the proposed monopoly price is the most commonly studied special case of Tullock's (1980) family of contest success functions. Alternative assumptions could be made regarding the form of the CSF. In particular, our analysis can be extended by assuming that the CSF is of Tullock's general form, as in Baye, Kovenock and de Vries (1993), Che and Gale (1997), (1998), of the

more general logit form, as in Baik and Shogren (1992), Dixit (1987), Gradstein (1994), Rosen (1986), Snyder (1985) or of the difference form, as in Baik (1998), Hirshleifer (1989) and Skaperdas (1996).

Some other possible interesting generalizations that are beyond the scope of the present study are

(a) assuming a more general, non-linear, objective function for the regulator,

(b) allowing a more complex regulation policy that consists of monopoly price as well as monopoly tax or some form of compensation transferred from the monopoly to the consumers,

(c) endogenizing the parameter that represents the political culture of the government.

Our approach and analysis contribute to a better understanding of endogenous monopoly regulation. We believe that they constitute an interesting and useful step towards a more general theory of endogenous public policy.

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