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Prices versus Quantities: The Political Perspective

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Regulation regimes subject to the influence of interest groups are compared. It is shown that the allocation of the regulated commodity varies with the implemented control and that the advantage of prices (vs. quotas) increases with the elasticity of the demand for or the supply of the commodity and decreases with the number of organized producers in the regulated industry. Control regimes can be ranked for negative, but not positive, externalities. Finally, a control regime leading to a more efficient commodity allocation also entails using fewer resources in rent-seeking activities.

I. Introduction and Summary

Given that government intervention is subject to lobbying and political pressure, when is regulation by prices the preferred regime and when is quantitative control adequate? The neoclassical answer to the control dilemma is that price and quota regimes are identical in their effect: both yield the same resource allocation and social welfare level. But, as Weitzman (1974) has already shown, the equivalence of the controls does not hold where information is imperfect and monitoring incomplete.[1] We focus on a different issue: the political aspect.

We analyze a single regulated industry, employing a factor with

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[1] For extensions and applications of Weitzman's analysis, see, e.g., Fisher (1981) and Cropper and Oates (1992).

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negative or positive external effects. The political equilibria, and hence the magnitude of the distortions, differ with the external effect and the implemented control. Under quota and when taxes are imposed to reduce negative effects, the employment of the controlled factor will lie between the private profit-maximizing utilization and the social optimum; with subsidies (when the effects are positive), there is a political struggle for higher payments, and equilibrium allocation will be greater than both private, nonintervention, utilization and the social optimum. In this case, resource allocation in the political equilibrium may be worse than free-market factor utilization.

It is further shown—for negative externalities—that the comparative advantage of either of the control regimes depends on a factor involving the share of organized producers in the industry, the value of the demand elasticity for the regulated good, and the tax rate. A price regime yields a more efficient political equilibrium when this factor is less than one. If this is not so, quota is the more efficient instrument. The preferred control cannot be unambiguously characterized when the external effects are positive. Finally, describing the political process as a menu auction with a single industrial lobby, we show that the relatively more efficient regime in terms of resource allocation induces a lower level of rent-seeking expenditures.

II. Society and Polity

Regulation is called for where external effects exist: in production or consumption, where scale economies lead to a natural monopoly, or in the provision of public goods. The analysis in this paper is confined to regulation of a factor of production with externalities affecting consumers or producers elsewhere in the economy; they do not affect producers in the regulated industry. An example of a negative externality would be an irrigation project lowering the water table of a nearby urban center. An example of a positive effect would be the utilization and disposition of reclaimed sewage. Restricting the discussion to an input does not affect the generality of the conclusions.

The producers using the regulated factor are assumed to behave rationally and disregard externalities associated with their activity. In a free market, the producers tend to overutilize factors of production with negative effects and underutilize factors with positive effects. A social planner, taking into account both the value of production in the controlled industry and its effect on others, can

determine socially optimal utilization of the factor. (Income distribution is disregarded in the analysis.)

The government in our analysis is a political entity whose own utility is affected both by social welfare and by political rewards or contributions. The producers and the government (the politicians), being engaged in political give and take, constitute a *polity*, and the ensuing allocation reflects the equilibrium reached in the political struggle. The government willingly accepts rewards and bends its policy but is not powerless. We assume that if a political agreement is not achieved, socially optimal resource allocation is enforced. The producers may also retreat to the social allocation and thus deprive the politicians of the rewards they desire. The social optimum is the threat point of the political game.

The producers either operate individually in the political arena or are organized into lobbies. We analyze the effect of collaboration in the influence groups but do not discuss the structure of the lobbies and modes of collaboration. Also, by our assumption, the individual political contribution is not determined in the political equilibrium; it is left to the lobby to charge its members. Political rewards may come in all shapes and forms: monetary political contributions (or even outright bribes), demonstrations, letter writing, and assistance in campaigns. They may be negative when the producers punish the government or demonstrate against it. Sometimes the political rewards may enhance welfare—the welfare of the receiving politicians or in a wider sense, for instance, when a builder offers a new school in return for a desired permit.

The discussion in the paper is limited to the effect of political contributions on government regulation; the nature of the rewards and their wider implications are not analyzed. As in Grossman and Helpman (1994), only "linear," money-like rewards are considered, and the political influence technology is restricted to exhibiting constant returns to scale. This assumption simplifies the analysis considerably by permitting recursive calculation of the variables making the political equilibrium. The use of the controlled factor is set in the first stage, and the political rewards—the distribution of the political surplus—are determined in the second stage. An important advantage of the linear model is that factor allocation is the same for a variety of political economies. The political contributions, on the other hand, are model-specific. We remark on possible generalizations in the concluding section of the paper (Sec. VIII).

The political process we consider is embedded in a "constitution" by which the control regime may be either a quota or a price regime. The constitution is accepted as predetermined, it is not debatable,

and we do not consider here the political process leading to its establishment.[2]

Our main concern is to compare a quota with a price regime. Under quota, the producers must comply with administrative regulations. With price control, they either pay a tax or receive a subsidy and freely choose the quantity of the factor they use. Focusing on the efficiency of the controls, we eliminate income differences by introducing revenue-neutral policy shifts; that is, lump-sum payments are seen as balancing taxes or subsidies. For example, when the change is made from a quota to a tax, the government pays upfront the value of the taxes that will be applied in the political equilibrium. A shift to a subsidy regime entails a compensating lump-sum tax. Similarly, a move from a tax to a quota control is associated with a lump-sum payment to the government. The compensation is not debatable, and the producers cannot expect to affect it, even if the magnitude of the tax or subsidy is modified in the political negotiations that follow once the control regime has been in place and the compensation scheme implemented.[3]

Compensations of this nature are observed in reality. The government of Israel, for example, is at the present time "purchasing" production quotas in agriculture in an attempt to gain political acceptance of steps toward the elimination of planning and administrative intervention in farming.

III. Recent Theories of Political Economy

Political processes affecting public intervention in the economy have been the subject of intensive literature. Examples include Zusman (1976) in agricultural planning; Rodrik (1986), Hillman (1989), and Grossman and Helpman (1994) in the context of international trade; and Scarpa (1994), who studies the consequences of political influence by a public utility. These studies analyze political equilibria for particular control regimes. In contrast, we attempt to compare the performance of alternative politically influenced regimes.

The political process may be viewed in many ways. Following the

[2] A similar approach is taken by both Rodrik (1986) and Grossman and Helpman (1994), who view the evolution of the political process as proceeding in two stages. In an analysis of the political choice of regimes, Buchanan and Tullock (1975) concluded that politicians will, generally, prefer quantitative controls. These authors, however, ignore the possibility that rent-seeking activities will modify the level of controls once they are implemented.

[3] Lump-sum compensating payments eliminate income effects of control regimes and facilitate an analysis of net allocation effects. Sometimes, however, a crucial consideration in the choice of a control is revenue raising and cost covering. These considerations are disregarded in the present analysis.

Peltzman (1976) tradition, Hillman (1989) sees the government as setting policies to maximize a political support function that trades welfare of voters with divergent interests. In Zusman (1976) and Scarpa (1994), the political process is a Nash (1950) bargaining game, with politicians and lobbies negotiating policy parameters and political contributions. Grossman and Helpman (1994) describe the political process as a menu auction.

Although these models differ, they share a common property: The equilibrium reached is politically efficient and is located on the polity's contract curve. Moreover, as we show shortly, in the case of linear political rewards, the allocation of the controlled factor is independent of the magnitude of the political contributions, and all the models above predict identical allocations (Hillman does not specify rewards explicitly). We make use of this property in the next four sections of the paper.

IV. The Model

Net income of a producer in the regulated industry is

$$y^i = \pi^i(q^i) - c^i - tq^i + R^i, \tag{1}$$

where q^i marks the ith producer's utilization level of the regulated factor and the magnitude t marks the tax imposed by the government (for a subsidy $t < 0$). The compensation payment is R, and it is equal to the equilibrium level of tq. The variable c^i indicates political contribution. The function $\pi^i(q^i)$ is the ith producer's profit in the production activity; it is concave and subsumes the prices of goods other than the regulated good. It also subsumes the private market price, p, of the regulated factor, but taxes or subsidies are not included in π. The industry supplying q is competitive and is characterized by constant returns to scale with a perfectly elastic supply. There are N producers in the regulated industry, and total factor utilization and political rewards are given, respectively, by

$$Q = \sum_{i=1}^{N} q^i, \quad C = \sum_{i=1}^{N} c^i. \tag{2}$$

If only K producers participate in the industry's lobby ($K \leq N$), c^i may be zero for some values of i.

The second sector, the government, is viewed as maximizing the sum

$$W = V(\mathbf{q}) + \alpha C, \tag{3}$$

where $V(\mathbf{q})$ is social welfare defined over the vector $\mathbf{q} = q^1, \ldots, q^N$,

and the constant $\alpha > 0$ represents the preference of the government for political bribes relative to public welfare. It can also be seen as standing for the political power of the influence group in the industry. Lobbies in different industries may have different α values.

The welfare function, V, is given by

$$V(\mathbf{q}) = \sum_{i=1}^{N} \pi^i(q^i) + \sum_{j=1}^{M} \mu^j(Q), \tag{4}$$

where $\mu^j(Q)$ is the money-metric utility function of the jth person who is affected by the external effects of the regulated factor. The function μ increases with Q for positive externalities and decreases for negative effects. Utility is also defined over the vector of prices of consumption goods, but under the assumption of a small economy with all goods traded, prices are constant and are not represented explicitly in the function.

It is assumed that μ^j is concave in Q and hence in each q^i. Similarly, since V is the sum of concave functions (in each q^i), it is a concave function itself. All functions are second-order differentiable, and interior solutions are assumed throughout.[4] It is also assumed that enforcement of the regulation instrument is costless.

Because of externalities, optimal levels of q^i from the points of view of the producer, q_i^{pr}, and the society, q_i^s, do not agree. That is,

$$q_i^{pr} = \underset{q_i}{\operatorname{argmax}}[\pi(q)] \neq q_i^s = \underset{q_i}{\operatorname{argmax}}[V(\mathbf{q})]. \tag{5}$$

This, of course, creates the conflict that induces rent seeking and political rewards.

As indicated, producers in an industry may operate in the political arena individually or in the industrial lobby. We assume that a lobby maximizes total income of the members in the group:

$$Y = \sum_{k=1}^{K} y^k. \tag{6}$$

The formulation is general: an industry may have just a single producer ($N = K = 1$); this may be a monopsonist in the use of the regulated factor, perhaps a public utility. Alternatively, some or all

[4] Among other things, interior solutions mean that all producers use positive quantities of q at any of the prices considered.

producers in an industry may form an influence group and lobby for their interests.[5]

One difference between the regimes affects behavior in a crucial way. Taxes are uniform, and in an industry with many producers, both those who lobby to modify the policy and those who do not face the same tax. We show that an industry with a comparatively large share of free riders is politically weaker, but, as indicated, we do not analyze the internal structure of the lobby groups and the forces that keep them together.

Under a quantity control, on the other hand, a producer who does not engage in political activity will be assigned the social quota (with negative externalities, nonparticipants may even get zero quotas to balance overutilization by the political activists). There is, therefore, no free riding in the political equilibrium of a quota regime: all producers participate and are members of the industrial lobby.[6]

V. Equilibrium Utilization of the Regulated Factor

In the first stage of the recursive calculation of the political equilibrium, we set the allocation of the regulated factor. This first stage is described here. The contributions by the K politically active producers are determined in the second stage, which is presented in Section VII.

Let γ mark a common label for the allocation parameters in the two alternative regimes considered in the paper: a quota system in which $\gamma = \mathbf{q} = q^1, \ldots, q^N$; and indirect control, a price regime with a per unit tax or subsidy, $\gamma = t$. Exogenous to the political equilibrium are the production technology, prices, private and social preferences, and the constitution specifying the instrument of regulation.

An efficient agreement between the government and the producers, located on the polity's contract curve, can be characterized by the necessary conditions for an internal solution to the following constrained maximization problem:

$$\begin{aligned} \gamma^{po}, \mathbf{c}^{po} &= \underset{\gamma, \mathbf{c}}{\operatorname{argmax}}\ W(\gamma, \mathbf{c}) \\ \text{subject to} \quad & Y(\gamma, \mathbf{c}) \geq \overline{Y}. \end{aligned} \tag{7}$$

[5] With linear political rewards, the analysis is not modified by the number of lobby groups in the industry. For simplicity and brevity, the discussion is conducted in terms of a single lobby.

[6] Similar considerations underlie Rodrik's (1986) analysis of trade with either a uniform tariff or firm-specific subsidies.

In equation (7), $\overline{Y}$, defined as in (6), is the reservation utility, the alternative income of the lobby members in the event that an agreement is not reached, and **c** is the vector of political rewards. We commence with a quota control.

A. *A Quota Control*

The government sets quotas, **q**, the magnitudes of which are subject to political pressure. In this case, $y^i = \pi^i(q^i) - c^i$, and a politically efficient agreement concerning **q** satisfies (7) and is characterized by the following N first-order conditions (derivatives are marked as subscripts):

$$\pi^i_q(1 + \alpha) = -\sum_{j=1}^{M} \mu^j_Q(Q), \quad i \in \{1, \ldots, N\}. \tag{8}$$

Remarks.—(*a*) The political rewards, c^i, do not appear in the necessary conditions for the determination of the quotas. This verifies our earlier assertion on the recursive nature of the solution of the political equilibrium. (*b*) The utilization of the regulated factor likewise does not depend on the compensation, R. (*c*) Equations (8) will be the same whether the producers in the industry are unionized in a single lobby or in several groups or whether they operate individually. Political organization does not affect the equilibrium reached. These three features arise from the linear nature of the political reward system. The equilibrium would have been different with nonlinear rewards: if the political action was subject to economies or diseconomies of scale.

A useful result that emerges from condition (8) is that, as the right-hand side, $\sum_{j=1}^{M} \mu^j_Q(Q)$, is identical for all i, $\pi^i_q = \pi^j_q = \pi_q$ for all $i, j \in \{1, \ldots, N\}$ (similarly, $V_{q^i} = V_{q^j} = V_q$ for all $i, j \in \{1, \ldots, N\}$). In words, the value of the marginal profit (VMP) of the regulated factor is the same for all producers. The political game distorts the level of aggregate factor utilization, but allocation among producers is efficient. This is a reflection of producers with a higher VMP pressing harder for quotas.[7] When resources are administratively allocated, the political process replaces the market in securing between-firm efficiency.

Because of the signs of the derivatives μ^j_Q, equation (8) implies that for negative (positive) externalities $\pi^i_q > (<)\ 0$. In addition, equations (8) can now be rewritten as

[7] The argument that producers with a higher VMP press harder relies on a "truthful" property, namely, that producers struggle more—offer higher rewards—for more valuable political favors. We comment further on this property in Sec. VII.

TABLE 1

PROPERTIES OF THE POLITICAL EQUILIBRIUM

	Marginal Contribution of q		
	Social	Private	Quantity
	Negative Externalities		
Quota/tax	$V_q < 0$	$\pi_q > 0$	$Q^s < Q^{po} < Q^{pr}$
	Positive Externalities		
Quota	$V_q > 0$	$\pi_q < 0$	$Q^{pr} < Q^{po} < Q^s$
Subsidy	$V_q < 0$	$\pi_q < 0$	$Q^{pr} < Q^s < Q^{po}$

$$V_q = -\alpha\pi_q, \tag{8'}$$

which implies that for negative (positive) externalities $V_{q^i} < (>)\ 0$ for all $i \in \{1, \ldots, N\}$. Since all VMPs are equal, all the q^i values move together, and it follows unambiguously from the sign of V_q that for negative (positive) externalities, $q_i^{po} > (<)\ q_i^s$ for all $i \in \{1, \ldots, N\}$. Thus, under quota, the political equilibrium is a "compromise": With negative externalities, factor utilization exceeds the social optimum (where $V_q = 0$) but is lower than free-market use (characterized by $\pi_q = 0$). With positive externalities, utilization at the political equilibrium is smaller than socially optimal and larger than the private profit-maximizing quantity. These findings are summarized in the first two rows of table 1.

The political equilibrium is depicted graphically for a single producer and negative externalities in figure 1. The graphs W_1, W_2 and y_1, y_2 are the government's and the producer's indifference curves; their slopes are $-V_q/\alpha$ and π_q^i, respectively. (For the government, the curve is drawn with all other producers at the equilibrium configuration.) Because of differences in political payments, $W_2 > W_1$ and $y_2 > y_1$. Each indifference curve of the government has a minimum at $q = q^s$, the socially desired level, and the point $q = q^s$, $c = 0$ is the disagreement threat point. The equilibrium quota is q^{po}, and the segment $[a, b]$, between indifference curves passing through the origin, marks the core of the political game.

B. *Indirect Control*

A pure price control is either a tax or a subsidy. In this case, $y^i = \pi^i(q^i) - tq^i - c^i$ (R is omitted), and the producer is free to utilize any quantity of the factor. The private first-order condition charac-

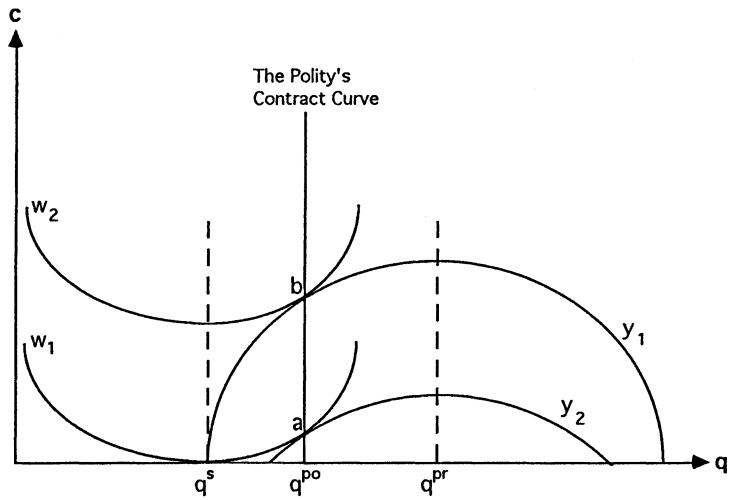

FIG. 1.—Construction of political equilibrium: negative externalities

terizing the producer's choice of q^i is then

$$\pi^i_q = t, \tag{9}$$

which implies

$$\frac{\partial q^i}{\partial t} = \frac{1}{\pi^i_{qq}}. \tag{9'}$$

By (9), for $t \neq 0$, $q^{po} < (>)\ q^{pr}$ for negative (positive) effects.

Solving (7) with respect to t and $\mathbf{c}$, using equation (9), yields the condition that characterizes the political equilibrium under a price regime:

$$\sum_{i=1}^{N} V_{q^i} \frac{\partial q^i}{\partial t} = \alpha Q^K, \tag{10}$$

where Q^K is the aggregate factor utilization by the members of the industrial lobby. The marginal effect of a tax on the whole industry is balanced against its effect on the active group whose utility is reserved on the political contract curve. The remarks following equation (8) on the independence of allocation apply here too. Also, producers in an industry controlled by prices may operate in several groups; their contributions will be aggregated by the receiving politicians in the government, and their effect will be a function of the sum. In this situation, K stands for the total number of participants in all groups.

It follows from $\pi_q^i = t$, for all $i \in \{1, \ldots, N\}$, that

$$V_{q^i} = \pi_q^i + \sum_{j=1}^{m} \mu_Q^j = V_q \quad \forall\, i \in \{1, \ldots, N\}$$

and that (10) can be written as

$$V_q = \alpha Q^K \frac{\partial t}{\partial Q}. \tag{11}$$

By concavity of π^i, $\pi_{qq}^i < 0$; then by (9′), $\partial t/\partial Q < 0$, implying that $V_q < 0$ regardless of the sign of π_q. Thus, under a price control, the producers overutilize (socially) the regulated factor both when the external effects are negative and when they are positive. With negative externalities, the political pressure is to reduce the tax. With positive effects, it is to increase the subsidy up to and above the social optimum (table 1). Consequently, while under a quota regime the political equilibrium is always a compromise (between the free-market allocation and the social optimum), in the presence of political power and with positive external effects, a price regime may yield an allocation that is *socially worse than the free-market utilization of the regulated factor.* In the presence of political pressure, the intervention of an otherwise benevolent government may detrimentally impair resource allocation.

That taxes and subsidies differ in their effects on resource allocation modifies—for a political economy—the Coase (1960) and Weitzman (1974) conclusion that property rights do not affect the nature of the solution to an externality problem. If the producer owns the right to pollute the air, to take an example from these references, **q** will stand for the resources going into pollution prevention, and their use will have positive externalities and will be subsidized. If the public, represented by the government, owns these rights, the polluters will be taxed. With political pressure, resource allocations will differ. In the first case the equilibrium will be characterized by overinvestment in pollution prevention; in the second it will be suboptimal.

Another useful way to write equation (11) is

$$V_q = \alpha \frac{\sigma}{s\eta} \pi_q, \tag{12}$$

where $s = t/(p + t)$; η is the factor demand elasticity, defined at the price the producer actually pays, $p + t$; and $\sigma = Q^K/Q$ is the share of the regulated factor utilized by the producers in the lobby

group.[8] The formulation of (12) is utilized in the analysis to follow. Expressing V_q in its extended form, we can rewrite equation (12) as

$$\sum_{j=1}^{M} \mu_Q^j = \pi_q \left(\frac{\alpha\sigma}{s\eta} - 1 \right), \tag{13}$$

which implies that, for positive externalities and a price regime, internal tangency solutions are confined to the region in which $\alpha\sigma/s\eta < 1$.

VI. Comparative Efficiency of Factor Utilization

We are ready now to turn to the question of *prices or quantities*. To examine this, we make the following definition: a control yields a *more efficient utilization* of the regulated factor than the alternative regime if and only if it yields a higher level of social welfare, $V(\mathbf{q})$.

A. *A Formal Proposition*

With negative externalities, both under quota and in a tax regime, the quantity of the regulated factor lies between the privately desired level and the social optimum. This "closeness" of the equilibria enables an analysis of the comparative performance of the alternative regimes. Such an analysis is impossible for a positive externality because of the distance between equilibria in which, under a quota, q^i, $i \in \{1, \ldots, N\}$, are lower than the social optimum and with a subsidy are above the optimum. These considerations are reflected in the following proposition, which summarizes the principal findings of the paper.

PROPOSITION 1. Suppose that the government is regulating the utilization of a factor by either a price or quota control. The factor is used by many producers. With quotas, all producers are represented in the political process; with prices, not all producers are necessarily members of the industrial lobby. Then (i) with a negative externality, a price (quota) regime yields a more efficient factor utilization if and only if $|\sigma/\eta s| < (>)\ 1$ (the inequality is evaluated at the price regime equilibrium); (ii) with a positive externality, a price regime yields a larger factor utilization than under quota; efficiency comparison is, however, inconclusive; (iii) under both types of externalities, the efficiency of a price relative to a quota control increases

[8] With a subsidy ($t < 0$), s can be either negative or positive. When $|t| < p$, $s < 0$; when $|t| > p$, $s > 0$. In the latter case, calculated $\eta > 0$; in both cases, $s\eta > 0$. For completion, we set $s\eta = 1$ for $|t| = p$.

with the elasticity of the demand for the regulated factor and decreases with the share of organized producers in total production; and (iv) the efficiency of both controls increases with the ethical norms of the politicians, $1/\alpha$.

Proof. To prove part i, denote $\epsilon = |\sigma/\eta s|$. For $\epsilon = 1$, resource allocation under quota is identical to allocation in a tax regime. To compare the controls, consider a shift in a given industry from a quota to a tax. Since the move occurs between equilibria, the compensation (R) is implemented and the only difference in the first-order condition occurs in the value of ϵ. Examining (8′) and (12), one realizes that, for $\epsilon < 1$, V_q in (12) is smaller in absolute value than in (8′); a tax regime is then comparatively more efficient. The inequality is reversed for $\epsilon > 1$, as required for the proof. Part ii is proved by noting that because of the differences in V_q values in table 1, comparative advantage cannot be determined. Parts iii and iv are proved by examination of (12). Q.E.D.

We now discuss interpretations and elaborations.

B. *Demand Elasticity*

The intuition behind the role played by demand elasticity in comparing efficiency of the regimes in part i of proposition 1 can be explained conveniently for $\sigma = 1$, $p = 0$, and $s = 1$; that is, the industry consists of a single producer or of an all-embracing lobby, there is no charge for the factor q under a quota regime, and the tax is the entire unit price under a price regime. For this situation, q_0 in figure 2 is an initial quantity, either determined by a quota or reached by the producer when the tax was set to t_0.

Consider the rent-seeking effort that increases the quantity to q_1. Depending on the control, the change may be achieved by either increasing the quota itself or reducing the tax to t_1. The corresponding gain to the producer is

$$\text{price regime:} \quad A + B,$$

$$\text{quota regime:} \quad B + C,$$

$$\text{difference:} \quad A - C.$$

With unitary elasticity, $A = C$ and the difference vanishes, the regimes are equivalent at the margin. The returns to marginal political efforts of equal quantitative effects are identical. Alternatively, if the factor demand is elastic, $A < C$, the returns under a price regime are smaller than under quota. Consequently, under a price regime the political struggle is less intensive and the equilibrium is closer to the social optimum. Similarly, for part iii, the more elastic the

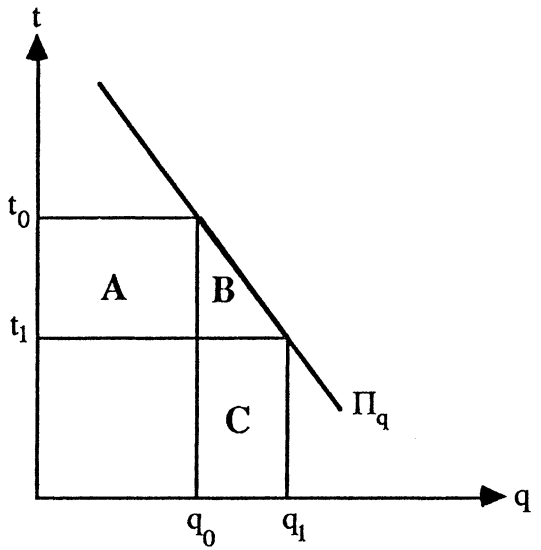

FIG. 2.—Gains from political influence: prices vs. quantities

demand function passing through (q_0, t_0), the smaller the area $A + B$ and the less intensive the political struggle. In figure 1, more elastic demand is expressed in smaller slopes of the producer's indifference curves and a move of the political equilibrium quantity to the left.

These findings may seem to contradict the established Ramsey-Boiteux tradition (Atkinson and Stiglitz 1980) of optimal taxation by which the more elastic the demand (or supply), the more socially harmful an intervention in prices. The apparent contradiction is resolved by recognizing that when taxes are levied to raise revenue, optimal rates minimize their effect on resource allocation; here the sole purpose of taxes is to modify the use of resources.

C. *Organization of Producers*

With a single producer, $\sigma = 1$ and the difference between the control regimes is reflected only in the size of the product $s\eta$. As we saw earlier, under quota, all producers are politically active and the degree of their organization does not affect the equilibrium reached. Similarly, if in a tax regime all producers are organized in a lobby and operate in unison, $\sigma = 1$ and the number of producers or their organizations does not affect equilibrium. But a price regime is conducive to free-riding.

The explanation of the importance of cooperation in determining

the political equilibrium of an industry is simple, and the situation is familiar to observers of administrative controls. With a quota, every producer tries to increase his or her own utilization of the controlled factor as does a lobby arguing for its members. The political activists present convincing arguments aplenty. For the government, it is comparatively easy to yield to the pressure of a particular individual or lobby; the quantitative effect is relatively small. Alternatively, in a price regime with a uniform tax rate, the government stands firmer: a concession to one producer or group is a concession to the whole industry. Consequently, the greater the amount of free-riding in a price regime, the stronger the comparative social advantage of this control.

According to conventional thinking, heterogeneity of the production units argues in favor of price control, since prices, being uniform, economize on information; with heterogeneous producers, efficiency calls for unequal, individually tailored quotas. This argument was qualified by Weitzman (1974), who noted that for iterative planning there is no significant information difference between a price and a quota regime. In a political environment, between-firm allocation is efficient, and heterogeneity in production affects equilibrium allocation only to the extent that it may lead to a looser organization and to a larger number of free riders.

D. A Caveat

The intuitive interpretations, and indeed proposition 1 and particularly its part i, should be accepted with care. The proposition is defined for the conditions of a political equilibrium. The equilibrium ratio s is endogenously determined, and the elasticity of the factor demand is also, in general, an endogenous magnitude. These variables are components of a political equilibrium. The proposition, as indicated, *characterizes* the equilibrium. If in equilibrium (with negative externalities) $|\sigma/\eta s| < 1$, price control dominates. It may, however, happen that even for an elastic demand and a comparatively small lobby, the equilibrium value of s will be so small that $|\sigma/\eta s| > 1$, and then a quota regime will be more efficient. The situation is simpler for an inelastic demand and $\sigma = 1$; it is then assured that $|1/\eta s| > 1$, and a quota control clearly dominates.

VII. Political Contributions

While the characterization of the allocation parameters in the first stage of the calculation of equilibrium was based solely on the common property of political efficiency, the contributions depend on

the specific political process. The analysis in the paper is confined to Grossman and Helpman's (1994) model, which employs the procedure of a menu auction. As before, the analysis is conducted under the assumption that all organized producers are members of a single industrial lobby and that under a price regime some producers may not participate in the political game. As indicated earlier, with our structural assumption of constant political cost and effect, only the aggregate reward, C, is determined in the political equilibrium; the individual c^i values are set by the lobby. The model conceptualizes the political process as a two-stage noncooperative auction game. In the first stage, lobbies, which may have opposing interests, offer political contributions for changes in policy parameters. In the second stage, the government chooses parameters that maximize its utility, which is, as in equation (3), a weighted sum of social welfare and political rewards. The perfect Nash equilibrium of this game is not unique, but "truthful" strategies lead to unique Nash equilibria that are coalition proof and focal.[9] With a single lobby, which is the situation we analyze, the government obtains only its reservation utility, and all surplus in the polity is received by the producers.

The government reservation utility is given by $V(q_1^s, \ldots, q_N^s)$. Accordingly,

$$C = V(q_1^s, \ldots, q_N^s) - V(q_1^{po}, \ldots, q_N^{po}). \tag{14}$$

In figure 1, the payment to the government is represented by the distance, on the contract curve, from the q axis to the point a. The political contributions grow with the deviation of equilibrium allocation of the regulated factor from the social optimum.

Using equations (14), we make the following conclusion.

PROPOSITION 2. Consider the setup of proposition 1 with negative externalities, and suppose that the political process follows the procedure of a menu auction. Then a quota (price) regime induces a larger level of political contributions if and only if $|\sigma/\eta s| < (>) 1$.

If the political process follows the procedure of a menu auction, then proposition 2 and part i of proposition 1 complete the main answers to the question of *prices or quantities:* (*a*) the comparative advantage of either of the regimes can be determined unambiguously for negative externalities; (*b*) with negative externalities, the condition for price regimes to be more efficient both in yielding resource allocation closer to the social optimum and in saving on

[9] Marginally and when contribution schedules are differentiable, all politically efficient equilibria are truthful: at points of tangency in fig. 1, producers under quota offer $\partial c/\partial q = \pi_q$; in a tax regime, they offer $\partial c/\partial t = q$. In both cases the marginal contribution is equal to the true value of an additional unit of the negotiated control.

political pressure and rewards is that $|\sigma/\eta s| < 1$; and (*c*) with positive externalities, the comparative efficiency of either of the regimes cannot be determined in general terms.

VIII. Concluding Remarks

Government intervention invites political pressure, and a political environment affects the efficiency of the instruments of public regulation. Our principal findings were that conditions for preference of a tax or a quota regime can be identified for negative externalities, but not for positive effects, and that a regime with more efficient factor allocation will also have lower levels of political activity. Moreover, the comparative advantages of the control regime—always in terms of factor allocation and in many cases also in terms of political contributions—are the same for markedly different modes of political activity.[10]

Simplifying and clarifying, we chose to restrict the discussion to linear political influence structure. But the cost of political activity can increase, for example, when it becomes more and more difficult to mobilize demonstrators and other activists, and it can decrease when a large lobby is more effective than the sum of its members. Likewise, the marginal political influence may decrease with the amount of the political contributions or with the intensity of the demonstrations. Incorporating decreasing or increasing cost and influence, we have found elsewhere (not as yet reported) that allocation and contributions are determined simultaneously; more interesting for the purpose of the present analysis, the major findings of the paper are left intact and are not affected by the adoption of the simplifying assumptions. The robustness of the conclusions in the face of changes in structural assumptions and in the political mechanism augments our confidence in the generality of our findings.

The analysis can be expanded in several directions. An immediate extension would be to apply it to the external effects caused by a product and not a factor. Another would be to examine the finding that the conclusions are the same whether the industry has one lobby group or several. In a nonlinear structure, lobbies may compete, and one may be stronger than the others. A further possibility envisages that consumers and socially conscientious individuals—not only producers—may organize in influence groups and counterbalance, at least partly, the political pressure of the industrial lobbies. One may

[10] In a working paper version of this article (Finkelshtain and Kislev 1995), we considered also the Harsanyi-Zusman model of cooperative bargaining (Zusman 1976) and reached similar conclusions.

also consider the imposition of mixed control combining a binding quantity control with some level of taxes. In a preliminary analysis in this direction, we found that an optimal policy combination can be identified and that it is not always true that an increased reliance on prices, in a mixed regime, improves allocation efficiency. We hope to examine these and other possibilities in the future.

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