12 Economic Regulation and Political Influence[1]

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1 INTRODUCTION

The purpose of this chapter is to discuss the effect of political pressure on economic regulation. In particular, we compare indirect regulation by prices to direct, administrative control of quantities. This is Martin Weitzman's (1974) comparison. However, while Weitzman contrasts controls where information is incomplete, we analyze the consequences of political influence. As a concrete example, we consider an industry employing a factor with external effects – negative or positive. (Drawing water from a shared source may create negative externalities and using reclaimed sewage for irrigation may have positive effects.) The government is attempting to regulate utilization of the factor and the producers react, trying to modify the implemented policy. The ensuing political equilibrium varies with the nature of the externalities and means of control.

The regulation regime may be either an administrative regime with quantity controls (enforcement is costless), or a price regime. Under the latter, taxes are imposed when the externalities are negative and subsidies are used, to encourage utilization of the regulated factor, when the effects are positive. By assumption, the regulation regime is determined 'constitutionally' and is not subject to the political debate (a similar assumption is made explicitly by Rodrik, 1986, in an analysis which resembles ours in several ways). The major question posed is: given political influence, when is regulation by prices the preferred regime and when is direct, quantity control more adequate? In this chapter we describe the problem and survey the findings. A rigorous mathematical analysis is presented elsewhere (Finkelshtain and Kislev, 1995).

2 THE SETTING

An industry with N homogeneous producers is employing a single variable factor with external effects on the rest of the economy. The producers

maximize profits and disregard the externalities they create. A planner, taking into account both the value of production in the industry and its effect on others, can determine socially optimal utilization of the externalities-inducing factor.

The role of the social planner is undertaken by the government, with one modification: politicians are sensitive to political pressure, to rent-seeking efforts. We model the pressure as contributions or rewards paid by the producers to the politicians. In this framework, rent-seeking lowers social welfare but creates a political surplus which is shared by the politicians and the producers. The magnitude of the political contributions determines the division of the surplus: the higher the rewards, the larger the share of the politicians and the smaller the share of the producers. The rewards may take many forms: monetary campaign contributions, outright bribes, demonstrations, strikes, letter-writing, and personal services. The political rewards may enhance welfare, the welfare of the politicians or even public welfare as when a constructor builds a school in return for a lucrative permit. Concentrating on political influence, we disregard the particular nature of the rewards and their wider implications.

One assumed characteristic of the producers–government polity which has significant implications for the analysis is linearity: the political rewards are in money or money-like contributions, they are of constant cost and effect. We do not consider the possibility that the cost of collecting political contributions is rising or that their effect may show diminishing returns.

The policy regimes – taxes, subsidies or quotas – have different and opposing income and budgetary effects. Concentrating on allocation, we put the alternative regimes on the same footing by introducing a lump-sum compensation payment which, by assumption, is introduced with the imposition of a regime. For example, the implementation of a tax regime is accompanied by a compensation equal to the computed equilibrium value of the tax and distributed to the producers as a side-payment; when the control shifts to a subsidy regime, the producers are asked to pay the lump-sum. Being a lump-sum payment, the compensation does not affect allocation – either the magnitude of the political rewards or employment of the variable factor. Such payments, which are here introduced as an analytical device, are observed in practice. For example, the government of Israel is now considering a reform in the country's water economy. Prices will rise to replace administrative allocation, farmers will be compensated. The compensation will be a function of the water quota a farmer has held, independent of future water utilization.

By construction, taxes and subsidies are uniform while quotas may be individually tailored. Consequently, free-riding can be expected in a price regime. Accordingly, we assume that only K of the N producers participate in the industry's lobby if prices are the instrument of control. The number K is taken as exogenous; that is, the size of the lobby is accepted in the analysis as given. Under an administrative control, on the other hand, the government may assign each firm its social optimum employment of the regulated factor, producers can then be expected to lobby individually to modify personal quotas. Moreover, as firms are identical, if it pays one firm to invest in political activity, it is worthwhile for every other firm. Therefore, in a quota regime, full participation of all N producers is part of the definition of a political equilibrium (to be further characterized below); is not an assumption of the analysis. Still, to emphasize the possibility of individual political activity, we keep the firm index i in the presentation.

Formally, let net product, or profits – before taxes or subsidies – in the production activity of the ith producer be written as

$$\pi^i(q^i) = \rho f^i(q^i) - pq^i \tag{1}$$

In (1), q marks the regulated factor; q^i is the ith producer's utilization level of this factor; ρ is the price of the industry's product; $f^i(q^i)$ is the production function with q the only variable input; and p is the private market price of the variable factor. By assumption, ρ and p are constant and so also prices of other, non-variable inputs are constant. It is also assumed that the function $\pi^i(q^i)$ is concave in q^i

Maximizing profits, the producers maximize y in

$$y^i = \pi^i(q^i) - c^i - tq^i + R^i \tag{2}$$

The variable t marks the tax; for a subsidy $t < 0$ and when the control is a quota, $t = 0$. The variable c indicates political contributions. The compensation payment is R, equal to the equilibrium magnitude of $-tq$. With N producers in the industry, total income, factor utilization and political rewards are given, respectively, by

$$Y = \sum_{i=1}^{N} y^i,\ Q = \sum_{i=1}^{N} q^i,\ \text{and}\ C = \sum_{i=1}^{N} c^i \tag{3}$$

If, under a price regime, $K < N$, c^i may be zero for some values of i.

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

$$W = V(\mathbf{q}) + \alpha C \tag{4}$$

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

Welfare is taken to be the sum of net product and external effects. Accordingly, the function V is written as

$$V(\mathbf{q}) = \sum_{i=1}^{N} p^i(q^i) + \sum_{j=1}^{M} m^j(Q) \tag{5}$$

where $\mu^j(Q)$ is the money-metric utility function of the jth consumer who is influenced 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, assuming a small economy with all goods traded, prices are constant and they 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.

Note that c and C enter linearly in (2) and (4). This reflects the linear nature of costs and effects in the political process and will simplify significantly the analysis below.

3 POLITICAL EQUILIBRIUM

As indicated, politicians in the government are willing to accept political contributions in return for economic favours. In our model the politicians are willing to lower taxes, raise subsidies or modify quotas. By the 'political process', we mean the particular interaction between the politicians and the interest groups attempting to influence them. The threat point of both sides to the political give and take is the social allocation with no rewards. This is the situation either side may retreat to if it is not satisfied

with the outcome of the political process. The government can, by assumption, force social optimum; the producers may also decide to accept the social allocation and in so doing deprive the politicians of the rewards they desire.

A political process leads to a political equilibrium. The equilibrium in our model is characterized by a set of rewards and controls. Thus, under a price regime, the equilibrium is defined by a pair of values C and t; under quota, the equilibrium is characterized by C and a vector $\mathbf{q}$. The political equilibrium is process-specific. Several models of political processes have been suggested in the literature (example are Zusman, 1976; Rodrik, 1986; Hillman, 1989; Grossman and Helpman, 1994; Scarpa, 1994). We consider below two game theoretic models, a cooperative bargaining and a political auction. The political equilibrium of the bargaining model, for example, will be the Nash (1950) solution to a cooperative game.

Though often differing in many ways, most processes considered in the literature – including the games employed in the chapter – share a rather natural common property: they are politically efficient. Their equilibria lie on the contract curve where the indifference curves of the sides to the political process are at points of tangency. It will be convenient to rely on efficiency in the presentation below.

In principle, equilibrium political contributions and controls are determined simultaneously; but when, as we assume, the contributions are linear in cost and effect – the equilibrium configuration can be calculated recursively: the controls are set regardless of the level of the contributions (provided that no side chooses the threat point). These are identical levels of controls for all processes maintaining linearity and political efficiency; the particular model specifying the political process can then be seen as affecting only the division of the political surplus between the parties, between the producers and the politicians.[2] We therefore separate the presentation and start with the employment of the regulated factor and postpone the specification of the games and the determination of the political payments to Section 6.

4 FACTOR UTILIZATION

Relying on the linearity of the political process and its consequences, the derivation of the conditions specifying levels of controls and factor utilization is based in this section solely on efficiency of the political equilibrium; that is, on the equality of the marginal rate of substitution between the control and the political contribution for the producers with the

corresponding rate for the politicians.[3] The equilibrium is indicated by tangency of social and private indifference curves in the q, c plane, depicted in Figure 12.1 for negative externalities. The indifference curves in the figure are for a single producer and society, where for society it is assumed that all other producers are at equilibrium utilization of the factor q.

A private indifference curve is the graph of points of identical income; it is derived from (2) by changing c and q, keeping y constant. Accordingly, the curves are marked y_1 and y_2. As drawn, $y_1 < y_2$ as for each value of q, the political payment on y_1 is higher than on y_2. Similarly, the social indifference curves are constant W graphs (4), marked W_1 and W_2, with $W_1 < W_2$.

Three levels of utilization are marked on the diagram: q^w for social optimum, this is the utilization maximizing $V(\mathbf{q})$ in (5); q^p for political

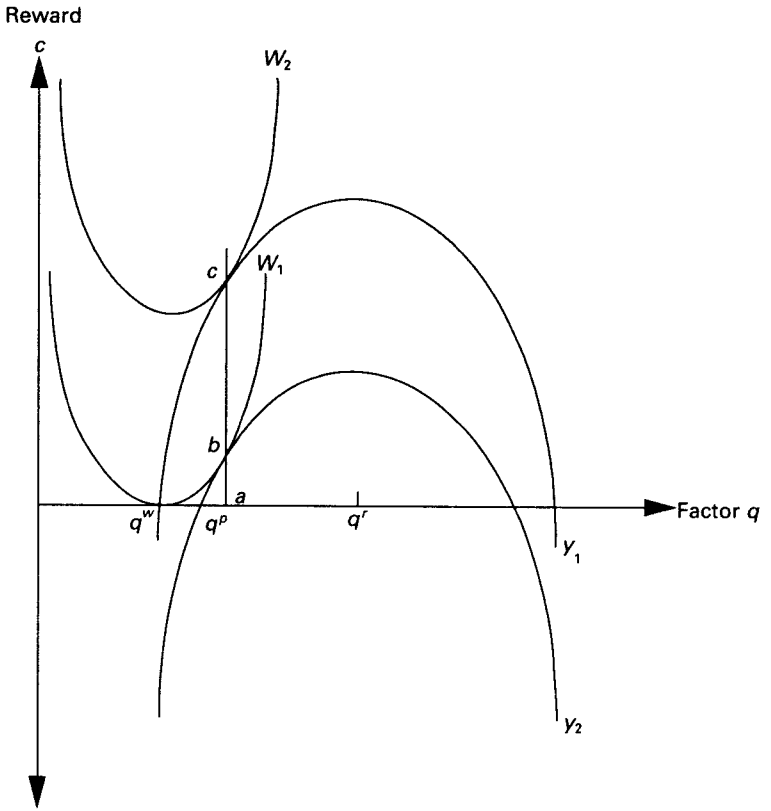

Figure 12.1 Political equilibrium with negative externalities (quota or tax)

equilibrium, and q^r for private, non-intervention, profit-maximizing level. The contract curve is the line extending from q^p; it being vertical reflects the property that the quantity of the regulated factor is the same for any level of the political reward. As Figure 12.1 indicates, when the externalities are negative, the political equilibrium employment of the regulated factor is a compromise between the social optimum and the no-intervention, private profit-maximizing employment of the factor. For negative externalities, the graphical configuration is the same for either a tax regime or a quota control and the political utilization is a compromise for both regimes (not necessarily the same quantity q^p). The situation will be different with positive externalities; but before considering positive effects, it is useful to view the equilibrium reached in terms of marginal magnitudes in panel a of Figure 12.2. In this diagram, π_q marks private marginal profits,[4] while V_q marks marginal social welfare (both termed marginal utility in the diagram). The political equilibrium for negative externalities is again seen to be a compromise in which private marginal profit is positive and social marginal welfare is negative.

The indifference curves Y_1 and W_1 in Figure 12.1 pass through the threat point q^w; the segment *bc* on the contract curve is the core of the political game. The segment *ab* indicates the amount the politicians have to receive to be kept on their reservation utility. It is the minimum political payment for the politicians to participate, to move from the socially optimal allocation to the political equilibrium.

Panels b and c in Figure 12.2 depict political equilibrium for positive externalities. Under a quota regime, equilibrium allocation is a compromise – as it is for negative effects – between the social and the private allocations. Under a price regime, on the other hand, the producers need not be forced to increase production; with subsidies they do it willingly and they further augment the price effect by pressing for even higher subsidies. As a result, the political equilibrium is not a compromise. In Figure 12.2, panel c, q^p is to the right of both q^r and q^w. Consequently, when externalities are positive and the control instrument is a subsidy, the political equilibrium may be socially inferior to the profit-maximizing allocation of a free market without government intervention.

5 PRICES OR QUANTITIES

The central question of this chapter is: when are prices the adequate instrument and when is a quantity control better? A control is preferable if it is relatively more efficient, it will therefore be useful to clarify the different

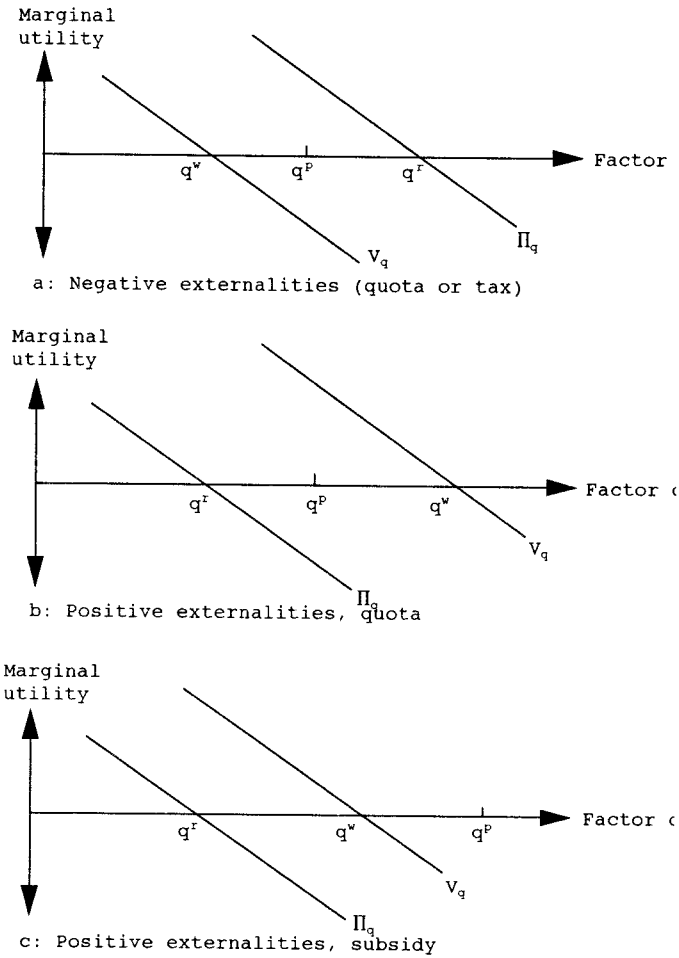

Figure 12.2 Marginal welfare and marginal profits

dimensions of efficiency in the analysis. Political efficiency was defined in Section 4 as Pareto-efficiency of the polity: the producers and the politicians are on their contract curve. Allocative efficiency as used below for a political equilibrium is measured by the distance of the employment of the factor q from social optimum utilization. The closer the employment, the more efficient the equilibrium. *S*-efficiency (for rent-*S*eeking) is defined by the size of the political reward: the smaller the reward, the more efficient the political equilibrium.

Since the political equilibrium may be computed recursively in two stages and it is, by construction, politically efficient, the two other dimensions of efficiency – allocative and *S*-efficiency – can also be examined separately. We start with allocative efficiency. Our findings are summarized in Proposition 1, in which the following symbols are used:

$\sigma = \frac{Q(K)}{Q(N)}$ the share of production by firms in the lobby under a price regime
η = the elasticity of the demand for the factor q
$s = t/(p+t)$ the ratio of the tax to the producer price of q

Proposition 1

Consider political equilibria calculated for price regimes (either a tax or a subsidy) then,

(i) With negative externalities, a price control yields a more efficient allocation if and only if in equilibrium $|\frac{\sigma}{\eta s}| < 1$. A quantity control is more efficient when the inequality is reversed. The controls are equally efficient when $|\frac{\sigma}{\eta s}| = 1$.
(ii) Under both types of control, the efficiency of prices relative to quotas increases with the elasticity of the demand for the factor and decreases with the share of the producers organised in the industrial lobby.
(iii) Efficiency of both controls decreases with the political power of the producers, α.
(iv) With positive externalities, a price control yields higher utilization of the factor q than a quota regime. Efficiency comparison is inconclusive.

As indicated, a formal proof is given in Finkelshtain and Kislev (1995). We limit the present discussion to a few clarifying remarks and some interpretations and elaborations.

5.1 Remarks

The comparative advantage of a regime can be clearly identified only for negative externalities. When the external effects are positive, the equilibrium utilisations for the alternative regimes – quota and subsidy – are always 'far apart', one being a compromise and the other located to the right of the no-intervention profit-maximizing quantity (Figure 12.2). It is

therefore impossible to find analytically conditions under which the regimes are equally efficient and conditions which characterize comparative efficiency of either of the controls. Given the necessary data for any particular situation, one can, of course, calculate the political equilibrium utilization for both regimes and compare their welfare implications.

Item (iii) in Proposition 1 could be expected intuitively: the more powerful the producers, the more they succeed in moving the political equilibrium closer to profit-maximizing allocation and further away from the social optimum.

Item (iv) is again a reflection of the differences in Panels b and c in Figure 12.2.

5.2 Demand Elasticity

The intuition behind the role played by the elasticity of the demand for the regulated factor in comparing allocative efficiency of the regimes in part (i) of Proposition 1 can be explained conveniently for the special case where $\sigma = 1$, $p = 0$, $s = 1$; that is, the industry consists of a single producer or of an all-embracing lobby, the factor can be acquired freely up to the designated amount under a quota regime, and the tax is the entire unit price under a price regime. For this situation, let q_0 in Figure 12.3 be an initial quantity, either determined by a quota or reached by the producers 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 an increase in the quota itself or by reducing the tax to t_1. The corresponding gain to the producers is

Price regime	$A + B$
Quota regime	$B + C$
Difference	$A - C$

With unitary elasticity, $A = C$ and the difference vanishes, the regimes are equivalent at the margin. The returns to marginal political efforts of an equal quantitative effect 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, and with elastic demand, the political struggle will be relatively less intensive, and the equilibrium will be closer to the social optimum. Similarly, for Part (ii): the more elastic the demand function passing through (q_0, t_0) the smaller the area $A + B$, and the less intensive the political struggle. In Figure 12.1, more elastic demand means smaller slopes of the producer's

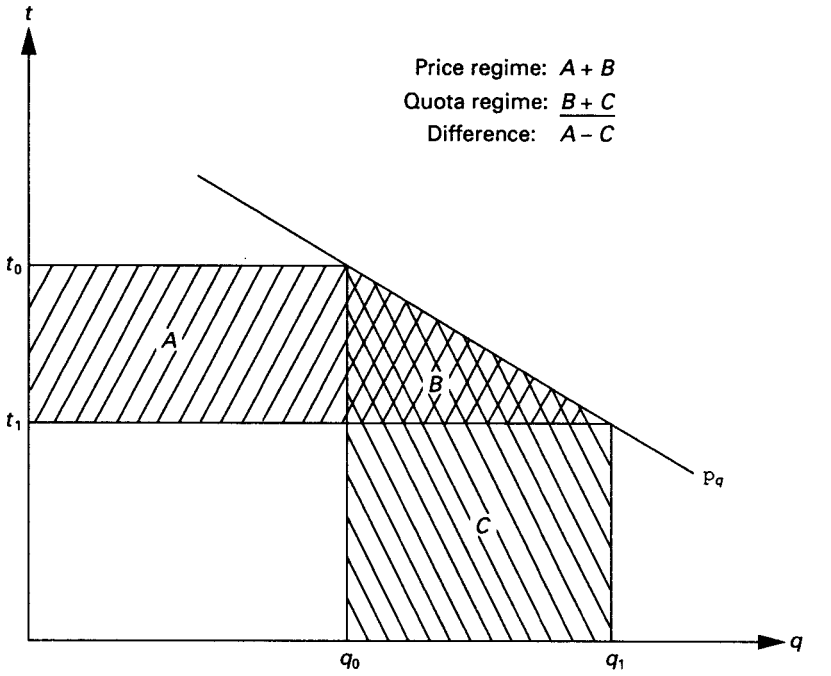

Figure 12.3 Gain from political influence – prices v. quantities

indifference curves and a move of the political equilibrium employment 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 the effect of the tax on resource allocation, while here the sole purpose of taxes is to modify use of resources so as to reduce the harming effects of the negative externalities.

5.3 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 $s\eta$. It has been explained already that under quota all producers are politically active and the extent of their organization does not enter the analysis of the political

equilibrium. 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 organization does not affect equilibrium. But a price regime is conducive to free-riding.

The explanation for 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 is trying to increase his or her utilization of the controlled factor and so does a lobby arguing for its members. The political activists present convincing arguments aplenty. For the government it is relatively easy to yield to the pressure of a particular individual or lobby; the quantitative effect is relatively small. In a price regime with a uniform tax rate, on the other hand, the government is standing 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. Similar considerations underlie Rodrik's (1986) analysis of trade regimes, though he views subsidies as firm-specific.

By conventional wisdom, heterogeneity of the production units argues in favour of price control as prices, being uniform, economize on information while, 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, heterogeneity in production further affects equilibrium allocation as a more heterogeneous industry may tend to be more loosely organized and have a larger number of free-riders.

5.4 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; 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 for a price regime (with negative externalities) $|\frac{\sigma}{\eta s}| < 1$, 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 $|\frac{\sigma}{\eta s}| > 1$, 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 $|\frac{1}{\eta s}| > 1$ and a quota control clearly dominates.

6 POLITICAL CONTRIBUTIONS

The derivation of the conditions specifying the allocation parameters – quotas, taxes, or subsidies – was based in the first stage of the calculation of equilibrium solely on the common property of political efficiency. The political contributions, and with them the division of the surplus between the producers and the politicians, depend on the particular characteristics of the political process. We have examined two alternative game formulations: the Harsanyi–Zusman model of cooperative bargaining (Zusman, 1976; Zusman and Amiad, 1977), the equilibrium of which is the Nash (1950) solution to the bargaining game, and Grossman and Helpman's (1994) model which employs the procedure of First Price Menu Auction. As before, the analysis is conducted under the assumption that all producers are members of a single industrial lobby and that in a price regime, some producers may not participate in the political activity. The analysis, for either model, determines the total industrial political contribution; the individual contributions by the producers in the industry are left to the lobby to set.

The two political games differ in the nature of their solution – in the equilibrium level of contributions. By the First Price Menu Auction, with a single lobby, as is the case analyzed here, the industry receives all the political surplus and the politicians are left on their reservation utility. In Figure 12.1, the politicians are given the segment *ab*. A Nash solution divides the surplus and the equilibrium corresponding to that solution will be located on the segment *bc* in Figure 12.1.

As with political allocation, equilibrium political rewards cannot be characterized unambiguously for positive externalities, the conclusions are limited to negative effects. The main findings of the analysis are summarized in Proposition 2 in which the control regimes are compared in terms of *S*-efficiency and a regime is relatively more efficient if it leads to smaller political contributions than the alternative control.

Proposition 2

With negative externalities,

(i) Both for a Nash solution of a cooperative bargaining game and for a First Price Menu Auction: if, in equilibrium under a tax control, $|\frac{\sigma}{\eta s}| < 1$, a quota regime induces a larger political contribution and a price regime is the more efficient control.

(ii) For a Nash solution, if $|\frac{\sigma}{\eta s}| > 1$, and $\sigma < 1$, a quota regime may yield a larger or smaller political contribution. The relative size of the

political contribution in a First Price Menu Auction is not affected by the magnitude of α.

The inequality condition in Proposition 2, part (i), is the same condition as for allocative superiority of a price regime in Proposition 1. The explanation being that with comparatively high allocative efficiency, q^p is relatively close to q^w and the compensation needed to keep the politicians on their reservation utility (the segment *ab* in Figure 12.1) is low. Hence the more efficient the allocation in the political equilibrium, the smaller the political contribution if the political process follows the procedure of the First Price Menu Auction. Also, the political surplus to be divided between the politicians and the producers is small when allocative efficiency is high, and so also the absolute contribution to the politicians is relatively small – whatever their share by the Nash solution to the bargaining game.

Part (ii) in Proposition 2 is a consequence of the fact that a small lobby, relative to the size of the industry, will often raise small amounts of political contributions. Hence, even if the sign condition indicates superiority of the quota regime (in terms of *S*-efficiency), it may still happen, in a particular case, that a price regime induces smaller contributions.

7 SUMMARY AND EXTENSIONS

The principal findings of the analysis are:

(a) The comparative advantage of one of the regimes can be characterized only for negative externalities. Then, if $|\frac{\sigma}{\eta s}| < 1$, a price regime induces socially preferred allocation and relatively less intensive rent-seeking efforts.

(b) The political equilibria for negative or positive effects are not symmetric. With negative externalities, the producers struggle to increase quotas under administrative control and they attempt to reduce the tax when regulation relies on prices. The political influence – under both control regimes – results in increased employment of the regulated factor, compared to the social optimum utilization. With positive externalities, on the other hand, depending on the control regime, the producers attempt to reduce quotas or to increase the subsidy. The results are different, higher subsidies increase production.

(c) Consequently, when the effects are positive, subsidization with political influence may reduce welfare compared to a free market no-intervention situation.

(d) Political modification of a uniform price instrument – a tax or a subsidy – is a public good. Therefore, it can be expected that free-riding will erode the political power of the interest group in a price regime.

The conclusions of the analysis are not confined to the simplified framework of the chapter, of external effects associated with the use of a factor of production. They can be extended in several directions. For example, the conclusions apply, with obvious modifications, to external effects caused by a product or a service. Likewise, the analysis is not necessarily limited to externalities, it applies to any case of administrative intervention: of a national government, a municipality, or even the management of a corporation. Political activity is present in any organization in which groups can gather around common interests.

The political rewards are seen here as income transfers from the producers to the politicians. The analysis can be elaborated. Preliminary work we did indicated that the conclusions of the analysis do not change if the formulation of the model covers explicit utilization of real resources in rent seeking. Further, the analysis was made simple by assuming constant costs and effects in the political process. Experiments with increasing costs or decreasing effects yielded similar conclusions. These findings strengthened our confidence in the main lessons of the analysis presented in the chapter.

It is natural to expect political activity to be found only in industries with a specific fixed factor or where entry is limited, as free entry and open access to all factors may erode the achievements of the costly political struggle. We have therefore confined the analysis to an industry with a given number of producers. Still, one sometime observes intense political activity where entry is not successfully limited; several farm industries can be taken as examples. We hope to report in the future on an extension in this direction.

Notes

1. We received useful comments and productive suggestions from Arye Hillman, Yair Mundlak, Martin Paldam, Norbert Wunner and Pinhas Zusman.
2. The rewards, C and c^i, do not appear in the first-order conditions of the Nash solution determining either t or $\mathbf{q}$, while the controls do appear in the equation determining the rewards.
3. The conditions characterizing efficient equilibrium are derived by maximizing W in (4), with respect to the rewards and the controls (either t or $\mathbf{q}$), subject to an arbitrary pre-assigned value of Y, total income in the industry.
4. Remember that $\pi(q^i)$ stands for profits before taxes or subsidies.

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