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Polluters' Profits and Political Response: Direct Controls Versus Taxes

By JAMES M. BUCHANAN AND GORDON TULLOCK*

Economists of divergent political persuasions agree on the superior efficacy of penalty taxes as instruments for controlling significant external diseconomies which involve the interaction of many parties. However, political leaders and bureaucratic administrators, charged with doing something about these problems, appear to favor direct controls. Our purpose in this paper is to present a positive theory of externality control that explains the observed frequency of direct regulation as opposed to penalty taxes or charges. In the public-choice theory of policy,¹ the interests of those who are subjected to the control instruments must be taken into account as well as the interests of those affected by the external diseconomies. As we develop this theory of policy, we shall also emphasize an elementary efficiency basis for preferring taxes and charges which heretofore has been neglected by economists.

I

Consider a competitive industry in long-run equilibrium, one that is composed of a large number of n identical producing firms. There are no productive inputs specific to this industry, which itself is sufficiently small relative to the economy to insure that the long-run supply curve is

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¹ Charles Goetz imposes a public-choice framework on externality control, but his analysis is limited to the determination of quantity under the penalty-tax alternative.

horizontal. Expansions and contractions in demand for the product invoke changes in the number of firms, each one of which returns to the same least-cost position after adjustment. Assume that, from this initial position, knowledge is discovered which indicates that the industry's product creates an undesirable environmental side effect. This external diseconomy is directly related to output, and we assume there is no technology available that will allow alternative means of producing the private good without the accompanying public bad. We further assume that the external damage function is linear with respect to industry output; the same quantity of public bad per unit of private good is generated regardless of quantity.² We assume that this damage can be measured and monitored with accuracy.

This setting has been deliberately idealized for the application of a penalty tax or surcharge. By assessing a tax (which can be computed with accuracy) per unit of output on all firms in the industry, the government can insure that profit-maximizing decisions lead to a new and lower industry output that is Pareto optimal. In the short run, firms will undergo losses. In the long run, firms will leave the industry and a new equilibrium will be reached when remaining firms are again making normal returns on investment. The price of the product to consumers will have gone up by the full amount of the penalty tax.

² This assumption simplifies the means of imposing a corrective tax. For some of the complexities, see Otto Davis and Andrew Whinston and Stanislaw Wellisz.

No one could dispute the efficacy of the tax in attaining the efficient solution, but we should note that in this setting, the same result would seem to be equally well insured by direct regulation. Policy makers with knowledge of individual demand functions, the production functions for firms and for the industry, and external damage functions, could readily compute and specify the Pareto-efficient quantity of industry output.³ Since all firms are identical in the extreme model considered here, the policy makers could simply assign to each firm a determinate share in the targeted industry output. This would then require that each firm reduce its own rate of output by X percent, that indicated by the difference between its initial equilibrium output and that output which is allocated under the socially efficient industry regulation.⁴

Few of the standard arguments for the penalty tax apply in this setting. These arguments have been concentrated on the difficulties in defining an efficient industry output in addition to measuring external damages and on the difficulty in securing data about firm and industry production and cost functions. With accurately measured damage, an appropriate tax will insure an efficient solution without requiring that this solution itself be independently computed. Or, under a target or standards approach, a total quantity may be computed, and a tax may be chosen as the device to achieve this in the absence of knowledge about the production functions of firms.⁵

³ See Allen Kneese and Blair Bower, p. 135.

⁴ No problems are created by dropping the assumption that firms are identical so long as we retain the assumption that production functions are known to the regulator.

⁵ This is the approach taken by William Baumol, who proposes that a target level of output be selected and a tax used to insure the attainment of this target in an efficient manner.

In the full information model, none of these arguments is applicable. There is, however, an important economic basis for favoring the penalty tax over the direct control instrument, one that has been neglected by economists. The penalty tax remains the preferred instrument on strict efficiency grounds, but, perhaps more significantly, it will also facilitate the enforcement of results once they are computed.⁶ Under the appropriately chosen penalty tax, firms attain equilibrium only at the efficient quantity of industry output. Each firm that remains in the industry after the imposition of the tax attains long-run adjustment at the lowest point on its average cost curve only after a sufficient number of firms have left the industry. At this equilibrium, there is no incentive for any firm to modify its rate of output in the short run by varying the rate of use of plant or to vary output in the long run by changing firm size. There is no incentive for resources to enter or to exit from the industry. So long as the tax is collected, there is relatively little policing required.

This orthodox price theory paradigm enables the differences between the penalty-tax instrument and direct regulation to be seen clearly. Suppose that, instead of levying the ideal penalty tax, the fully informed policy makers choose to direct all firms in the initial competitive equilibrium to reduce output to the assigned levels required to attain the targeted efficiency goal for the industry. No tax is levied. Consider Figure 1, which depicts the situation for the individual firm. The initial competitive equilibrium is attained when each firm produces an output, q_i . Under regulation it is directed to produce only q_0 , but no tax is levied. At output q_0 , with an unchanged number of firms, price is above

⁶ See George Hay. His discussion of the comparison of import quotas and tariffs on oil raises several issues that are closely related to those treated in this paper.

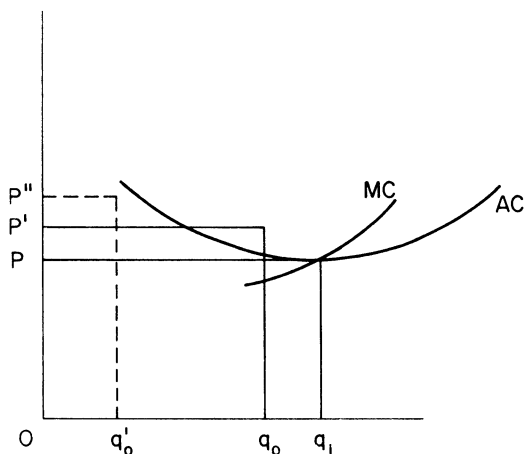


FIGURE 1

marginal cost (for example price is at P'). Therefore, the firm is not in short-run equilibrium, and would if it could expand output within the confines of its existing plant. More importantly, although each firm will be producing the output quota assigned to it at a somewhat higher cost than required for efficiency reasons, there may still be an incentive for resources to enter the industry. The administrator faces a policing task that is dimensionally different from that under the tax. He must insure that individual firms do not violate the quotas assigned, and he must somehow prevent new entrants. To the extent that the administrator fails in either of these tasks, the results aimed for will not be obtained. Output quotas will be exceeded, and the targeted level of industry production overreached.

If the administrator assigns enforceable quotas to existing firms and successfully prevents entrants, the targeted industry results may be attained, but there may remain efficiency loss since the industry output will be produced at higher average cost than necessary if firms face U-shaped long-run average cost curves. Ideally, regulation may have to be accompanied by the

assignment of full production quotas to a selected number of the initial firms in the industry. This policy will keep these favored firms in marginal adjustment with no incentives for in-firm adjustments that might defeat the purpose of the regulation. But even more than under general quota assignment there will be strong incentives for firms to enter the industry and to secure at least some share of the rents that the restriction of industry output generates. If the response to this pressure should be that of reassigning quota shares within the unchanging and targeted industry output so as to allow all potential entrants some share, while keeping all firms, actual and potential, on an equal quota basis, the final result may be equivalent to the familiar cartel equilibrium. No firm will be earning more than normal returns, but the industry will be characterized by too many firms, each of which produces its assigned output inefficiently.

II

When we examine the behavioral adjustments to the policy instruments in the manner sketched out above, a theory of policy emerges. Regulation is less desirable on efficiency grounds even in the presence of full information, but this instrument will be preferred by those whose behavior is to be subjected to either one or the other of the two policy instruments. Consider the position of the single firm in the fully competitive industry, depicted in Figure 1. Under the imposition of the tax, short-run losses are necessarily incurred, and the firm reattains normal returns only after a sufficient number of its competitors have shifted resources to other industries. The tax reduces the present value of the firm's potential earnings stream, whether the particular firm remains in the industry after adjustment or withdraws its investment and shifts to alternative employ-

ment. In terms of their own private interests, owners of firms in the industry along with employees will oppose the tax. By contrast, under regulation firms may well secure pecuniary gains from the imposition of direct controls that reduce total industry output. To the extent that the restriction is achieved by the assignment of production quotas to existing firms, net profits may be present even for the short term and are more likely to arise after adjustments in plant. In effect, regulation in this sense is the directional equivalent of cartel formation provided that the individual firm's assigned quota falls within the limited range over which average cost falls below price. Such a range must, of course, exist, but regulatory constraints may possibly be severe enough to shift firms into positions where short-term, and even possibly long-term, losses are present, despite increased output price. Such a result is depicted by a restriction to q_0' in Figure 1, with price at P'' .

Despite the motivation which each firm has to violate assigned quotas under regulation, it remains in the interest of firms to seek regulatory policy that will enforce the quotas. If existing firms foresee the difficulty of restricting entry, and if they predict that governmental policy makers will be required to accommodate all entrants, the incentive to support restriction by regulation remains even if its force is somewhat lower. In final cartel equilibrium, all the firms will be making no more than normal returns. But during the adjustment to this equilibrium, above-normal returns may well be available to all firms that hold production quotas. Even if severe restriction forces short-term losses on firms, these losses will be less than those under the tax. Rents over this period may well be positive, and even if negative, they will be less negative than those suffered under the tax alternative. Therefore, producing firms will always oppose any im-

position of a penalty tax. However, they may well favor direct regulation restricting industry output, even if no consideration at all is given to the imposition of a tax. And, when faced with an either/or choice, they will always prefer regulation to the tax.

III

There is a difference between the two idealized solutions that has not yet been discussed, and when this is recognized, the basis of a positive hypothesis about policy choice may appear to vanish. Allocationally, direct regulation can produce results equivalent to the penalty tax, providing that we neglect enforcement cost differentials. *Distributionally*, however, the results differ. The imposition of tax means that government collects revenues (save in the case where tax rates are prohibitive) and these must be spent. Those who anticipate benefits from the utilization of tax revenues, whether from the provision of publicly supplied goods or from the reduction in other tax levies, should prefer the tax alternative and they should make this preference known in the political process. To the extent that the beneficiaries include all or substantially all members of the community, the penalty tax should carry the day. Politicians, in responding to citizenry pressures, should heed the larger number of beneficiaries and not the disgruntled members of one particular industry. This political choice setting is, however, the familiar one in which a small, concentrated, identifiable, and intensely interested pressure group may exert more influence on political choice making than the much larger majority of persons, each of whom might expect to secure benefits in the second order of smalls.

There is an additional reason for predicting this result with respect to an innovative policy of externality control. The penalty tax amounts to a legislated change in property rights, and as such it will be

viewed as confiscatory by owners and employees in the affected industry. Legislative bodies, even if they operate formally on majoritarian principles, may be reluctant to impose what seems to be punitive taxation. When, therefore, the regulation alternative to the penalty tax is known to exist, and when representatives of the affected industry are observed strongly to prefer this alternative, the temptation placed on the legislator to choose the direct control policy may be overwhelming, even if he is an economic theorist and a good one. Widely accepted ethical norms may support this stance; imposed destruction of property values may suggest the justice of compensation.⁷

If policy alternatives should be conceived in a genuine Wicksellian framework, the political economist might still expect that the superior penalty tax should command support. If the economist ties his recommendation for the penalty tax to an accompanying return of tax revenues to those in the industry who suffer potential capital losses, he might be more successful than he has been in proposing unilateral or one-sided application of policy norms. If revenues are used to subsidize those in the industry subjected to capital losses from the tax, and if these subsidies are unrelated to rates of output, a two-sided tax subsidy arrangement can remove the industry source of opposition while still insuring efficient results. In this respect, however, economists themselves have failed to pass muster. Relatively few modern economists who have engaged in policy advocacy have been willing to accept the Wicksellian methodological framework which does, of course, require that some putative legitimacy be assigned to rights existent in the status quo.⁸

⁷ For a comprehensive discussion of just compensation, see Frank Michelman.

⁸ For a specific discussion of the Wicksellian approach, see Buchanan (1959).

IV

To this point we have developed a theory of policy for product-generated external diseconomies, the setting which potentially counterposes the interest of members of a single producing industry against substantially all persons in the community. External diseconomies may, however, arise in consumption rather than in production, and these may be general. For purposes of analysis, we may assume that all persons find themselves in a situation of reciprocal external diseconomies. Traffic congestion may be a familiar case in point.

The question is one of determining whether or not persons in this sort of interaction, acting through the political processes of the community, will impose on *themselves* either a penalty tax or direct regulation. We retain the full information assumption introduced in the production externality model. For simplicity here, consider a two-person model in which each person consumes the same quantity of good or carries out the same quantity of activity in the precontrol equilibrium, but in which demand elasticities differ. Figure 2 depicts the initial equilibrium at *E* with each person consuming quantity *Q*. The

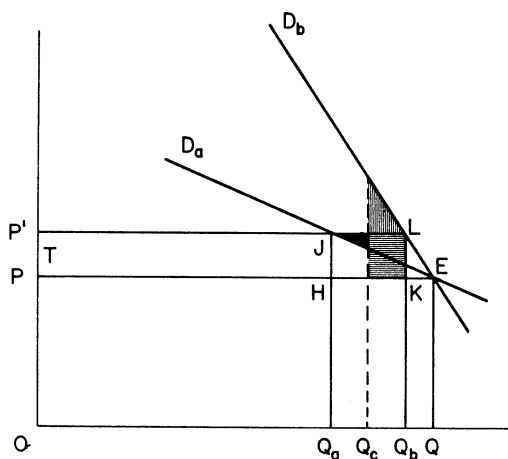


FIGURE 2

existence of the reciprocal external dis-economy is discovered. The community may impose an accurately measured penalty tax in the amount T , in which case A will reduce consumption to Q_a and B will reduce consumption to Q_b . Total consumption is reduced from $2Q$ to $(Q_a + Q_b)$, but both A and B remain in equilibrium. At the new price P' , which includes tax, neither person desires to consume more or less than the indicated quantities. The government collects tax revenues in the amount $[2(PP'JH) + HJLK]$. Alternatively, the community may simply assign a restricted quantity quota to each person. If the government possesses full information about demand functions it can reduce A 's quota to Q_a , and B 's quota to Q_b , securing results that are allocatively identical to those secured by the tax. However, under the quota, both A and B will find themselves out of equilibrium; both will, if allowed quantity adjustment, prefer to expand their rate of consumption.

It will be useful to examine the ideal tax against the quota scheme outlined above, which we may call the idealized quota scheme. If individuals expect no returns at all from tax revenues in the form of cash subsidies, public goods benefits, or reductions in other taxes, both A and B will clearly prefer the direct regulation. The loss in consumers' surplus under this alternative is small relative to that which would be lost under the penalty tax. Each person willingly trades off marginal quantity adjustment for the more favorable inframarginal terms offered under direct regulation, given our assumptions that both instruments achieve the same overall externality control objective.

Under extreme fiscal illusion, individuals may ignore benefits from tax revenues, but consistent methodological precept requires that we allow persons to recognize the benefit side of the fiscal account, at least to some degree. Let us allow all revenues

under the penalty tax to be returned in equal shares to all taxpayers. Under this arrangement, each person expects to get back one-half of the amount measured as indicated above for Figure 2. Simplifying, each expects to get back the amount $PP'JH$, which he personally pays in, plus one-half of the amount measured by the rectangle $JHKL$, all of which is paid in by B . From an examination of Figure 2, it is clear that individual A will favor the penalty tax under these assumptions. The situation for individual B is different; he will prefer direct regulation. He will secure a differential gain measured by the horizontally shaded area in Figure 2, which is equal to the differential loss that individual A will suffer under this alternative. The policy result, insofar as it is influenced by the two parties, is a standoff under this idealized tax and idealized quota system comparison.

For constitutional and other reasons, control institutions operating within a democratic order could scarcely embody disproportionate quota assignments. A more plausible regulation alternative would assign quotas proportionate to initial rates of consumption, designed to reduce overall consumption to the level indicated by target criteria. The comparison of this alternative with the ideal tax arrangement is facilitated by the construction of Figure 2 where the initial rates of consumption are equal. In this new scheme, each person is assigned a quota Q_c , which he is allowed to purchase at the initial price P . We want to compare this arrangement with the ideal tax, again under the assumption that revenues are fully returned in equal per head subsidies. As in the first scheme, both persons are in disequilibrium at quantity Q_c and price P . The difference between this model and the idealized quota scheme lies in the fact that at Q_c , the marginal evaluations differ as between the two persons. There are unexploited gains from

trade, even under the determined overall quantity restriction.

It will be mutually advantageous for the two persons to exchange quotas and money, but, at this point, we assume that such exchanges do not take place, either because they are prohibited or because transactions costs are too high. Individual *A* will continue to favor the tax alternative but his differential gains will be smaller than under the idealized quota scheme. In the model now considered, *A*'s differential gains under the ideal tax are measured by the blacked-in triangle in Figure 2. Individual *B* may or may not favor the quota, as in the earlier model. His choice as between the two alternatives, the ideal tax on the one hand and the restriction to Q_c at price P on the other, will depend on the comparative sizes of the two areas shown as horizontally and vertically shaded in Figure 2. As drawn, he will tend to favor the quota scheme, but it is clearly possible that the triangular area could exceed the rectangular one if *B*'s demand curve is sufficiently steep in slope. In any case, the choice alternatives for both persons are less different in the net than those represented by the ideal tax and the idealized quota.

While holding all of the remaining assumptions of the model, we now drop the assumption that no exchange of quotas takes place between *A* and *B*. To facilitate the geometrical illustration, Figure 3 essentially blows up the relevant part of Figure 2. With each party initially assigned a consumption quota of Q_c , individual *A* will be willing to sell units to individual *B* for any price above his marginal evaluation. Hence, the lowest possible supply price schedule that individual *B* confronts is that shown by the line RL in Figure 3. The maximum price that individual *B* is willing to pay for additional units of quota is his marginal evaluation, shown by SL . The gains-from-trade are measured by the triangular area RLS . The distribution of

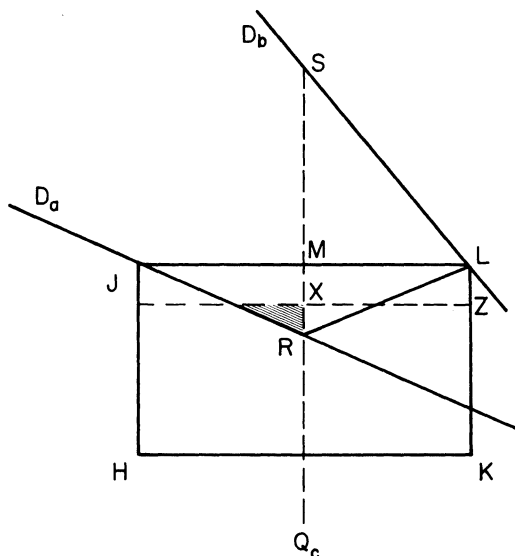


FIGURE 3

these gains will, of course, be settled in the strict two-man setting by relative bargaining skills, but let us assume that individual *B*, the buyer, wants to purchase consumption quota units from *A*, but also to do so in such a way that individual *A* will come to prefer this system over the tax. To accomplish this, he must insure that *A* gets a share of the net gains at least equal to the area RML on Figure 3. Individual *B*, the buyer, retains gains of MSL under this division of the spoils. But in this arrangement, both persons are indifferent as between the policy alternatives. The system is on the Pareto frontier, and the quota scheme plus the exchange process produces allocative and distributive results identical to those generated under the ideal tax. This becomes the analogue of the Coase theorem in the context that we are examining.⁹

V

These somewhat inconclusive results may seem to provide anything but a posi-

⁹ See Ronald Coase. For a related extension of the Coase theorem, see Buchanan (1973).

tive theory of policy akin to that presented with respect to production externalities. The comparisons are, however, a necessary stage in developing such a theory. Recall that we have made these comparisons under the most favorable possible assumption concerning anticipated return of revenues under the penalty tax. In the real world, individuals will not anticipate that these will be returned dollar-for-dollar, and they will tend to place at least some discount on the value of benefits that they expect.

Let us say that each person expects an aggregate benefit value of only 80 cents on the dollar from tax revenues collected under the penalty tax. Consider what this single change does to the results of the last comparison made, that which involves proportionate quota assignments along with a free market in quotas. In this case, individual *B*, the buyer, can offer individual *A*, the seller, more than the amount required to make him prefer the quota alternative, while himself continuing to secure differential benefit under this alternative. Individual *A*'s differential gains from the ideal penalty tax are reduced to the shaded area in Figure 3. By paying individual *A* the amount measured by *RML*, he has improved *A*'s position relative to the penalty tax. And, in the process, he has retained for himself a differential gain measured by the area *MXZL*. Both persons in full knowledge of the alternatives will prefer the quota system, and political leaders will presumably respond by opting for regulation.

The same reasoning can readily be extended to apply to any quota system. In the idealized quota assignment first considered, we demonstrated that one person would favor the penalty tax and the other the quota. Individual *A*, who favors the penalty tax, loses no consumer's surplus, and he does expect to secure an income

transfer through the return of tax revenues. When we modify the assumptions concerning expectations of the value of returned revenues or benefits, however, this conclusion need not hold. Individual *A* will, of course, expect to get back in benefits some part of the tax revenues paid in by *B* that is in excess of that contributed by *A* himself. If, however, individual *A* applies the same discount factor to all revenues collected, the deadweight loss may more than offset the income transfer effect. Examination of Figure 2 indicates that under the 80 percent assumption, one-fifth of the area measured by *PP'JH* will represent deadweight loss to *A* from the revenues that he pays in. This deadweight loss may well be larger than the measure of the income transfer that he expects, which amounts to 80 percent of the horizontally shaded area in Figure 2. Once we introduce any plausible discount factor into the expectation of individuals concerning the return of tax revenues, it is relatively easy to demonstrate situations under which both persons may be led by private self-interest to favor the direct regulation alternative.

VI

We have developed a positive theory of externality control policy for both the production and consumption interactions under highly abstract and simplified models which allow us to isolate influences on policy formation which have been neglected. Decisions on the alternative policy instruments in democratic governments are surely influenced by the preferences of those who are subjected to them. The public-choice approach, which concentrates attention on the individual's choice as between policy instruments, allows us to construct hypotheses that explain the prevalence of direct regula-

tion.¹⁰ For economists who continue to support the penalty tax alternative, the analysis suggests that they had best become good Wicksellians and begin to search out and invent institutional arrangements that will make the penalty tax acceptable to those who are primarily affected.

¹⁰ Much of the analysis developed in this paper can be applied more or less directly to policy alternatives proposed in the energy crisis of late 1973 and early 1974. For such application, see Buchanan and Nicolaus Tideman.

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