

RENT SEEKING COSTS
AND POLLUTION TAXES

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Abstract

The objective of this paper is to consider the effect of rent seeking costs on the design of an efficient pollution tax. Earlier work has concluded that a pollution tax imposed on an otherwise unregulated monopolist should always be less than the Pigouvian rate. This study demonstrates that if rent seeking costs are present, the appropriate monopoly pollution tax may equal to or greater than that levied on competitive firms.

RENT SEEKING COSTS AND POLLUTION TAXES

It has long been recognized that monopoly markets present special problems for the regulation of pollution, particularly if the regulatory instrument is a tax. James Buchanan and Asch and Seneca, have demonstrated that full internalization of an externality through a Pigouvian tax may, under certain circumstances, generate welfare losses rather than gains. In my earlier paper and in a contemporaneous study by A. H. Barnett it is argued that an emissions (or effluent) tax imposed on an otherwise unregulated monopolist should always be less than equal to the marginal damage inflicted by the pollutant and should be positively related to the elasticity of demand for the firm's product. This literature weighs heavily against the efficiency claims made for the Pigouvian tax by William Baumol and has the practical effect of substantially complicating the application of pollution taxes and eroding the case for taxation vis-a-vis direct regulation as the primary mechanism for controlling pollution in a mixed market economy.

The regulatory implication that a tax assessed on a monopolist should always be less than that imposed on a competitive firm generating the same pollutant in the same location is dependent on the assumption that profits earned in monopoly industries are merely transfers, irrelevant to social welfare the economic efficiency issues. Gordon Tullock, Richard Posner, and Cowling and Mueller have argued, however, that attempts to obtain and protect monopoly profits waste resources which would otherwise be used in production and that the opportunity costs of these resources, commonly termed rent seeking costs, must be considered in questions of economic efficiency. The

objective of this paper is to demonstrate that if these costs are present, the appropriate pollution tax to impose on an otherwise unregulated monopolist is not necessarily less than the competitive rate but may equal or even exceed the Pigouvian tax. The potential for producing welfare losses in some industries through adoption of Pigouvian taxes is thus much smaller than earlier thought.

THE MODEL

The model which I will use to illustrate these points is essentially the same as that used by Buchanan except for changes made to accommodate the introduction of rent seeking costs. The firm depicted in Figure 1 produces a single product Q and faces the (inverse) demand function

$$P = a - bQ. \quad (1)$$

Production occurs under constant costs and pollution damage per unit output is fixed.¹ Marginal cost (MC) is defined as the sum of marginal cost to the firm of productive inputs (MCF) and marginal damage to society of the pollution which occurs with production (MD). Discharges are taxed at rate τ per unit pollution which translates through the fixed technology assumption to a rate T per unit output. The profit maximizing firm faces no direct regulation other than the pollution tax and produces where marginal revenue equals the sum of marginal cost and the tax per unit output. Thus, from (1) marginal revenue is

$$MR = a - 2bQ \quad (2)$$

and the output level chosen by the firm is

$$Q = \frac{a - MCF - T}{2b} \quad (3)$$

Social losses from monopoly are defined as the sum of dead weight loss and rent seeking costs. The first of these is illustrated in Figure 1 as the triangle formed when output is above or below the point at which price equals marginal cost. Thus,

$$DWL = \frac{1}{2} (P - P^*) (Q^* - Q) \quad (4)$$

where P^* is the price and Q^* is the quantity at which the demand and MC curves intersect.²

Rent seeking costs which arise out of competition to become a monopolist take the form of expenditures made by the firm to protect its monopoly position and expenditures made by others to secure monopoly rent. These costs may include advertising and product differentiation expenses, investment in excess capacity, bribery or lobbying to influence government policy, or other expenditures associated with erecting (or dismantling) entry barriers. Posner argues that if 1) obtaining a monopoly is a (perfectly) competitive activity, 2) the long run supply of inputs used in obtaining a monopoly is perfectly elastic, and 3) costs incurred in doing so provide no socially valuable by-products then rent seeking costs are exactly equal to the expected profits of monopoly. Others, however, have challenged the validity of Posner's assumptions and questioned the methods which he uses to estimate the social costs of monopoly.

Cowling and Mueller recognize that measured profits may underestimate rent seeking costs if expenses incurred by the monopoly firm in protection of its position are reported as current costs. Littlechild argues that post-tax profits over estimate socially

wasteful expenditures if advertising provides at least some valuable information to consumers or if any portion of monopoly profit accrues to the owners of natural resources. Recognizing this controversy, I will define rent seeking cost as some portion λ of monopoly profit, π , where λ is assumed greater than zero but not necessarily equal to one.

The social loss from monopoly is, therefore,

$$L = DWL + \lambda\pi \quad (5)$$

$$L = \frac{1}{2} (P-P^*)(Q^*-Q) + \lambda (P-MCF-T)Q. \quad (6)$$

Using the demand function and equation (3), L can be written

$$L = \frac{1}{2} b (Q^*-Q)^2 + \lambda b Q^2. \quad (7)$$

The objective of the regulatory authority is to minimize L through selection of the optimal tax rate. A change in T induces the firm to change its output level which, in turn, affects D and π so that

$$dL/dT = dL/dQ \cdot dQ/dT, \quad (8)$$

$$dL/dT = -b(Q^*-Q)(-1/2b) + 2\lambda b Q (-1/2b), \quad (9)$$

$$dL/dT = \frac{1}{2} (Q^*-Q) - \lambda Q. \quad (10)$$

Expression (10) is set equal to zero to identify the output level which minimizes the social welfare cost of monopoly:³

$$Q = \frac{Q^*}{1 + 2\lambda} \quad (11)$$

The tax required to achieve this state can be found through substitution for Q. From (3)

$$\frac{a - MCF - T}{2b} = \frac{Q^*}{1 + 2\lambda} \quad (12)$$

From the definition of P^* and the demand curve

$$P^* = MCF + MD, \quad (13)$$

$$Q^* = \frac{a - MCF - MD}{b}. \quad (14)$$

Using (14) to eliminate the term $a - MCF$ from (12), we find the optimal tax,⁴

$$T = MD - bQ^* \frac{1 - 2\lambda}{1 + 2\lambda}. \quad (15)$$

IMPLICATIONS

From equations (11) and (15) it can be seen that under the assumptions of the model, the output level which minimizes the social loss from monopoly and appropriate pollution tax are dependent on the extent to which monopoly profits are transformed into rent seeking costs. If λ is zero rent seeking costs are nonexistent and the optimal output level is at Q^* , where the dead weight loss from monopoly is zero. If, however, any portion of monopoly profit is transformed into rent seeking cost, minimization of social loss is attained at an output level below Q^* . The emissions or effluent tax required to achieve this output level may be less than, equal to, or greater than the marginal damage of pollution depending on whether λ is less than, equal to, or greater than one half.

Whether or not rent seeking costs are economically significant remains a controversial issue. Both the Posner and the Cowling-Mueller studies have demonstrated that if monopoly profits are fully transformed into rent seeking costs, the social costs of monopoly are much larger than previous work had indicated. Cowling and Mueller estimate the annual welfare loss for General Motors alone at \$1.78 billion for the 1963-1966 period, which is over one quarter of one percent of GNP,

exceeding many earlier monopoly welfare loss estimates for the entire economy. For their entire sample of 734 firms, Cowling and Mueller estimate an annual welfare loss of nearly \$15 billion, approximately 13 percent of gross corporate product originating in these firms. This figure is of a comparable order of magnitude to A. Myrick Freeman's estimates of realized annual benefits of air quality improvement from 1970 to 1978. Freeman's best point estimate of annual mortality, morbidity, soiling and cleaning, and materials benefits associated with the reduction of emissions from stationary sources between 1970 and 1978 is \$19.5 billion. These estimates imply that if air quality benefits are of legitimate concern to policy makers, rent seeking costs may be of nearly equal importance.

Virtually all prior work on pollution control in monopoly markets has ignored rent seeking costs. From this literature has emerged the theorem that a pollution tax imposed on a monopolist should be less than the Pigouvian or competitive rate. This study has demonstrated to the contrary that if rent seeking cost are significant, the appropriate pollution tax to levy on the monopolist may equal or even exceed Pigouvian tax. In many, if not most, cases, therefore, application of the Pigouvian tax in monopoly markets would be expected to yield greater net social benefits than associated with any tax less than the competitive rate.

FOOTNOTES

¹ The fixed technology assumption is not critical to the analysis, as shown in my earlier article, but it greatly simplifies the arguments.

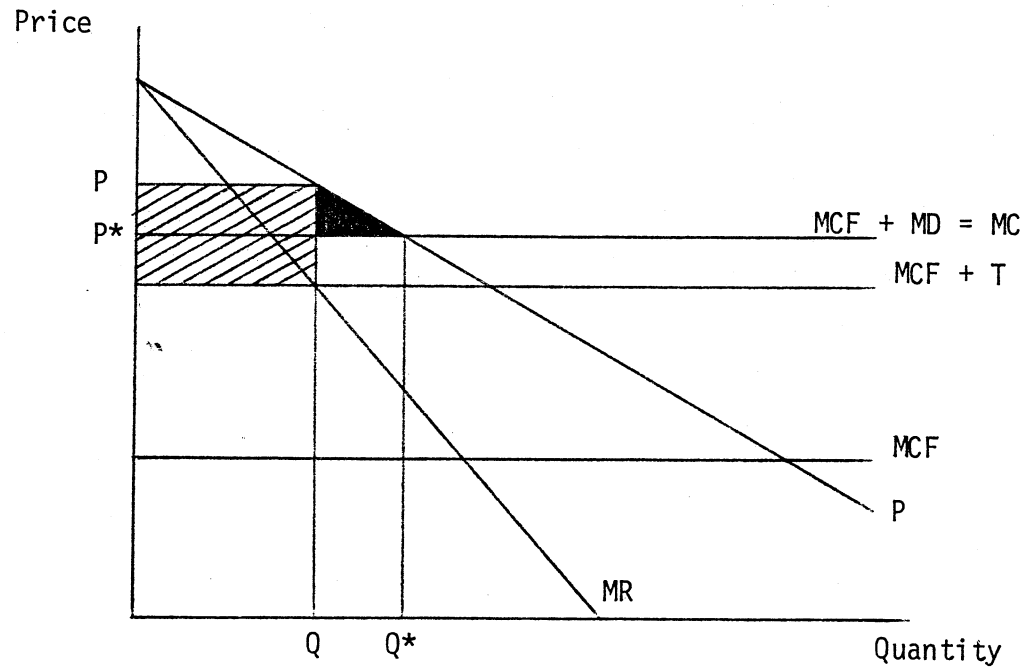
² Note that by definition DWL is positive when Q is either greater or less than Q^* .

³ The second order condition for minimization is satisfied with:

$$\frac{d^2L}{dT^2} = \frac{\lambda + 1/2}{2b} > 0.$$

⁴ If λ is equal to zero (i.e., rent seeking costs are assumed nonexistent), this tax can be reduced to $T = MD - bQ^*$. If we define the elasticity of demand as $\epsilon = -(\Delta Q/\Delta P)(P/Q)$, T can be expressed as $T = MD - (P/\epsilon)$, which is equivalent to the optimal tax formula developed in my earlier paper.

FIGURE 1
Social Loss from Monopoly



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