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Monopoly Slack and Competitive Rigor: A Simple Model

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Abstract

What is the welfare loss from monopoly? Triangle allocation losses are surprisingly small. This article shows by a simple numerical example that a substantial loss in operating efficiency can arise because a monopoly cannot use tournaments between top managers to control moral hazard.

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This article was written in February 1983 while the author was an assistant professor at MIT but is here published for the first time. It was never quite finished, but we have chosen to keep it in the state you read it here.

Introduction

Professional economists and others have long worried about monopolies, and the inefficiencies supposedly produced by them. One such inefficiency is the departure of price from marginal cost in the behavior of a profit-maximising monopolist: this generates (in many cases) a Pareto inefficiency. For many years professional economists were mainly content to describe that as "the" loss from monopoly, even though informal thinking has often laid more stress on some sort of undisciplined slackness which can find no expression in any simple model of profit-maximizing behavior. Harberger's provocative article [1954] in which he estimate the "welfare triangle" loss from monopoly in the US at 0.1% of GNP, had the effect of dividing economists concerned with industrial organization into three broad groups. First, there were/are those who noticed inadequacies in Harberger's analysis, and set to re-calculate the loss For example, ... (Stigler's concept of the welfare trapezoid is perhaps the most interesting of this class.) The second group consists of those who take the conclusion at face value, more or less, and stop worrying about monopoly. The third group is exploring the question: If the conventional loss is so small, are there other, more significant losses? This paper is devoted to a simple, rigorous, maximizing model of an idea which informal (and especially non-professional) thought has always stuck to: monopolies are simply slack. They leave opportunities unexploited, they refrain from cutting costs, they are rude to customers, they discriminate unreasonably in employment, ... –the list is long. Most economists react to such ideas with distress and puzzlement. Why should a monopoly, any more than another firm or economic agent, willingly give up profits?

The difficulty of this problem has led some people simply to sidestep it by defining concepts such as "X-inefficiency" or "satisficing." A closer examination suggests that problems of information must be essential. Leibenstein's "Beyond Economic Man" cites, as evidence of the existence of X-inefficiency, examples of firms whose performance improved greatly after getting some management advice. This seems more consistent with a view that they simply weren't trying. Likewise, a "satisficing" firm can hardly be supposed to be indifferent to profit beyond a certain point; rather, it is a matter of not looking for the information which might enable it to do better.

Once we put the problem in those terms, the idea that it has to do with a principal-agent problem becomes appealing. Suppose that a manager finds searching for better techniques costly. The firms itself cannot reliably tell when he is searching, and so cannot reimburse him for those costs. The firm also cannot reliably tell by results whether or not the manager has been diligent. The best they can do is provide a contract with some incentive to increase profits; but the manager's risk-aversion limits the effectiveness of this. The inefficiency which results is ameliorated if more information becomes available about the manager's activities; and, if there is a competing firm, the market interaction may convey such information.

In the model presented below, shareholders set up optimal incentive contracts for their managers to induce them to examine alternatives instead of acting at random. The alternatives are the same for each of two firms, and so comparing the performance of the two gives some information about the management of each. In fact, in the simple model I present, such a comparison completely solves the moral hazard problem and the first-best can be achieved. (That is a special result, but an analogous partial effect will occur in general.)

2. The Model

2.1 One Firm (Monopoly)

There are two alternative techniques, 1 and 2. The cost of production using technique i is $c_i = 1$ with probability p, 2 with probability $(1-p)$. There is a manager who can choose a technique at random; or at a utility cos of s (see below) he can learn the value of c_1 or c_2. His reimbursement can depend on the cost of production, but not on his search strategy (which is unobservable). Assume he is paid R_c if costs are c ($c = 1$ or 2), giving (von Neumann-Morgenstern) utility $log(R_c)$ if he didn't search, or $log(R_c) - s$ if he did. (It should be clear that he will never choose to inspect both techniques in this simple model). The firm's gross profits, given costs of c, are $\pi(c)$, with $\pi(1) > \pi(2)$. The manager must receive at least $log(v)$ from his contract in expected utility.

If the shareholders decide not to make the manager inspect a technique, they simply pay him v, and get net profits (in expected value):

$$p\pi(1) + (1-p)\pi(2) - v \tag{1}$$

If they decide to make him inspect a technique, and adopt it if its cost is 1, adopting the other if the revealed cost is 2, then they must make the rewards satisfy

$$plog(R_1) + (1-p)log(R_2) \leq p(2-p)log(R_1) + (1-p)^2 log(R_2) - s \tag{2}$$

or,

$$p(1-p)log\left(\frac{R_1}{R_2}\right) \geq s. \tag{3}$$

Subject to that, and to the expected-utility constraint, they wish (if risk-neutral) to minimize the expected cost of the contract. Hence we will have (3) satisfied with equality, and:

$$p(2-p)log(R_1) + (1-p)^2 log(R_2) - s = log(v). \tag{4}$$

The solution is:

$$\begin{aligned} R_1 =& \ ve^{s/p} \\ R_2 =& \ ve^{-s/(1-p)} \end{aligned} \tag{5}$$

and the expected cost is:

$$v\left[p(2-p)e^{s/p} + (1-p)^2 ve^{-s/(1-p)}\right] \tag{6}$$

For example, $p = 1/2$ $s = 1/2$ gives 2.12; $p = 0.1$ $s = 1$ gives 4,180.03.

2.2 Duopoly

Now suppose there are two firms, whose managers do not collude on search strategy. If manager 2 is searching, then if one of the techniques is low-cost ($c = 1$) he will get a low-cost technique; so will manager 1 if he searches. On the other hand, if 2 searches while 1 does not, there is positive probability that 1 will have $c = 2$, while 2 has $c = 1$. Accordingly, if manager 2 is searching (with positive probability as perceived by manager 1), the shareholders in firm 1 can make their manager search at no cost in equilibrium, by promising dire penalties if their firm ends up with high costs while their competitor has low costs. Notice that this depends on the simplicity of the example, but also more fundamentally that it depends on the fact that both managers are searching in the same set of techniques. There is not point comparing a manager's results to those of another manager in an unrelated industry: this is the "sufficient statistic theorem" of principal-agent analysis: see Holmstrom (1979).

Accordingly, the (expected) cost to the firm of paying the manager so that he searches is just ve^s, provided the other manager is expected to search. (If the penalty for bringing up the rear is sufficiently severe, the managers will plausibly go to the Nash equilibrium where both search, rather than that where neither does.) In the two examples calculated above, we compare:
$p = 1/2$, $s = 1/2$ gives 1.65– some saving;
$p = 0.1$, $s = 1$ gives 2.72– a dramatic saving;

In consequence, certain values of $\pi(1) - \pi(2)$ will lead shareholders in the monopoly case to refrain from trying to get their manager to search (since it is so expensive), while even though the profit difference may be smaller, shareholders of the duopoly firms will cause their managers to search. The result is that ex-post it will happen (with positive probability) that the monopoly is producing at cost 2, even though a cost-1 technique is available; moreover, it would have been worthwhile (ex-ante) for the monopoly to search; were it not for the unobservability of search. A duopoly structure, by contrast, may avoid this problem.

Notice moreover that in this model a duopolist faced with an "inefficient" (non-searching) competitor can still get its manager to search at no excess cost. I suspect that, in a more general model, the "efficiency" of a competitor will affect the possibilities for a given firm's incentive contracts. This raises the interesting prospect of multiple equilibria, so that, of two ex-ante identical industries with oligopolistic structure, one may be generally efficient and the other generally inefficient. The idea is that, if others are searching effectively (and especially if there are many others), at least one firm will discover "the best technique." Thus a manager can be induced to search thoroughly by threats of severe penalties if the firm falls behind "best practice." (I suspect this is related to the fact taht a principal who can observe the output of many agents solving the same problem can achieve the first-best solution.) It is less clear that, if the optimum is for the manager to search "somewhat but not exhaustively," this can be sustained. Indeed, in general that will not be true.

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