Oligopoly Pricing and Profits Tax

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1. Introduction

The pricing behaviour of entrepreneurs has been a subject of long discussion among economists, and yet remains unresolved. Pricing policy based on the profit maximisation hypothesis has been criticised for a long time now for its apparent lack of realism. Although it was not unexpected, the survey result by Hall and Hitch in 1939 showed that businessmen do not equate marginal cost to marginal revenue in order to maximise profits, but that they practiced full cost pricing, by equating price to the full cost, in which some measure of normal profit is calculated.(1) Since then there have been many different assumptions on the behaviour of businessmen and, consequently, on how they price their products. Some advanded a theory that businessmen do not maximise short-run profits but long-run one.(2) Others advanced a theory that businessmen equate price to the situation where some measure of rate of profit is obtained.(3) In 1958 William Baumol advanced a theory of oligopolists pricing behaviour based on the assumption that businessmen maximise total sales rather than their profits. In doing so they are subject to some minimum level of profit constraint. This is, in a sense, relevant to the long-run profit maximisation theorem, because survival appears to be the most important aspect of business life.(4)

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(1) R.L. Hall and C.J. Hitch, "Price Theory and Business Behaviour", *Oxford Economic Papers* (May 1939), pp. 12-45.

(2) M.J. Farrell, "The Case Against the Imperfect Competition Theories", *Economic Journal* (June 1951), pp. 422-26.

(3) H.A. Simon. "Theories of Decision Making in Economics and Behavioural Science", *American Economic Review* (June 1959), pp. 253-283.

(4) W.J. Baumol, "On the Theory of Oligopoly", *Economica* (August 1958), pp. 187-98. and also, *Business Behaviour, Value and Growth* (Macmillan Co., New York, 1959).

This note aims not to castigate any particular hypothesis but attempts to show, in a theoretical perspective, how the controversy surrounding the incidence of profits tax (although there is some difference, I shall use profits tax and corporation income tax interchangeably) can be approached and, to a certain extent, tackled by using a simple economic model based on thesales maximisation hypothesis.

2. Sales maximisation Hypothesis

Baumol's hypotheses are that oligopolists' interdependence in day to day decisions is sufficiently small to be disregarded, that oligopolists maximise sales and not profits, and that they maximise sales subject to certain minimum profit constraint. He advances the reason why oligopolists are likely to maximise sales; the disadvantages of declining sales aremany because consumers shun the product, because bank and money market are less receptive to their requests, because they will lose distributors, because the executive may meet unpleasant firing problems, because success in business is measured by the volume of sales, because executive salaries appear to be far more closely correlated with the scale of operations of the firm than withits profitability, and because by and large in a modern corporation which is characterised by seperation of ownership from management, many executives find it better to avoid an absolute or relative decline in their operations. According to Baumol, the typical oligopolistic firm is large in the market for its product but small in the capital market. Therefore it must be prepared to meet competitive pricing conditions in obtaining capital by issuing shares. The level of profit constraint should be high enough to keep shareholders satisfied and to contribute adequately to financing of company growth.

Let us illustrate this relationship in a simple algebraic form. The revenue functions will be, $R=R(q)$ where R refers to total sales and q to output produced. Given the price of product, total sales will be determined by the level of output. The cost function will be, $C=C(q)$ where C refers to total cost. Given the price of input, the total cost will be determined by the level of output. Profit (π) will be the difference between total sales and total cost. Thus,

$$\pi^*=R(q)-C(q) \tag{1}$$

where* denotes a minimum level of profit constraint.

By formulating the function with Lagrange multiplier in order to maximise sales subject to profit constraint and disregarding the inequality sign in (1), we get,

$$V=R(q)+\lambda[R(q)-C(q)-\pi^*] \tag{2}$$

Differentiating V with respect to output and equating this to zero, we get,

$$\frac{dV}{dq}=\frac{dR}{dq}+\lambda\frac{dR}{dq}-\lambda\frac{dC}{dq}=0 \tag{3}$$

$$\frac{dR}{dq}(1+\lambda)=\lambda\frac{dC}{dq}$$

Therefore,

$$MR=a\cdot MC \text{ where } a=\frac{\lambda}{1+\lambda} \tag{4}$$

where $\frac{dR}{dq}$ is marginal revenue (MR), and $\frac{dC}{dq}$ marginal cost (MC).

The relationship (4) shows that when sales is maximised with a minimum profit constraint, there will be a divergence between marginal cost and marginal revenue; marginal revenue will be smaller than marginal cost. We may note that when profit is maximised, marginal revenue is equal to marginal cost and that when sales is maximised, marginal revenue will be zero.

3. Incidence of Profits Tax

The incidence of profits tax has been of great interest and a puzzle to many public finance specialists for a long time. Although much speculation has been made as regards the incidence of profits tax, it was not until 1963 that the real controversy started. Until then there had been no empirical evidence that profits tax is not borne out of capital from profits earned and that the price of product was affected by this tax. The empirical research carried out by Krzyzaniak and Musgrave in 1963 showed that, in the short run, the coporation income tax in America was shifted by more than 100 per cent.(5) Their study has since been subjected to much criticism and debate.

Theoretically the profit maximisation hypothesis shows that profits tax is not shifted but borne out of profits. This can be easily demonstrated by using a simple calculas. The profit after tax will be,

$$\pi_t=R(q)-C(q)-t[R(q)-C(q)]=(1-t)[R(q)-C(q)] \tag{5}$$

where t refers to profits tax. In order to maximise profits in the presence of tax, we differentiate π_t with respect to output and then equating this to zero, we get,

$$\frac{d\pi_t}{dq}=\frac{dR}{dq}-\frac{dC}{dq}-t\left[\frac{dR}{dq}-\frac{dC}{dq}\right]=0 \tag{6}$$

$$(1-t)\left(\frac{dR}{dq}-\frac{dC}{dq}\right)=0 \text{ where } 0<t<1.$$

(5) M. Krzyzaniak and R.A. Musgrave, *The Shifting of the Corporation Income Tax* (Johns Hopkins Press, Baltimore, 1963).

Therefore,

$$MR = MC. \tag{7}$$

This is the same condition as when the profits are maximised in the absence of profits tax. This implies that tax on profits does not affect the level of output and that price is not affected.

If we make a more realistic assumption that the entrepreneurs do not know marginal cost or marginal revenue schedule and hence do not know what the profit maximising output is, and that all they know is total sales should be as big as possible subject to some sort of profits constraint, then the effect of profits tax becomes more revealing. By using the relationships (1), (2) and (5) and formulating the function with Lagrange multiplier in order to maximise sales subject to profit constraint in the presence of tax, we get,

$$W = R(q) + \lambda\{(1-t)[R(q) - C(q)]\} \tag{8}$$

Differentiating W with respect to output and equating this to zero, we get,

$$\frac{dW}{dq} = \frac{dR}{dq} + \lambda(1-t)\left[\frac{dR}{dq} - \frac{dC}{dq}\right] = 0 \tag{9}$$

$$\frac{dR}{dq}[1+\lambda(1-t)] = \lambda(1-t)\frac{dC}{dq}.$$

Therefore,

$$MR = b \cdot MC \text{ where } b = \frac{\lambda(1-t)}{1+\lambda(1-t)}. \tag{10}$$

It is interesting to note the relationship between the two coefficients, a and b. This shows that,

if $a=b$, the there will be no change in the price of product due to tax,

if $a<b$, then the price of product will be reduced,

if $a>b$, then the price of product will increase.

By comparing the two coefficients it is clear that the tax coefficient is smaller than the no tax coefficient and hence, there will be an increase in price due to tax.

The above relationship can be seen in the following diagrams.[6] In figure 1, revenue and cost curves are given together with profits curve before (π) and after ($\pi(1-t)$) tax. q_π denotes the level of output where profit is maximised, q_s where sales are maximised subject a profit constraint in the absence of profits tax, and q_t where sales are maximised subject to profit constraint in the presence of tax.

(6) More detailed discussion based on figure 1 can be seen in M.E. Levy, "Professor Baumol's Oligopolistic Model and the Corporation Income Tax" *Public Finance*, No. 3-4(1961), pp.366-372.

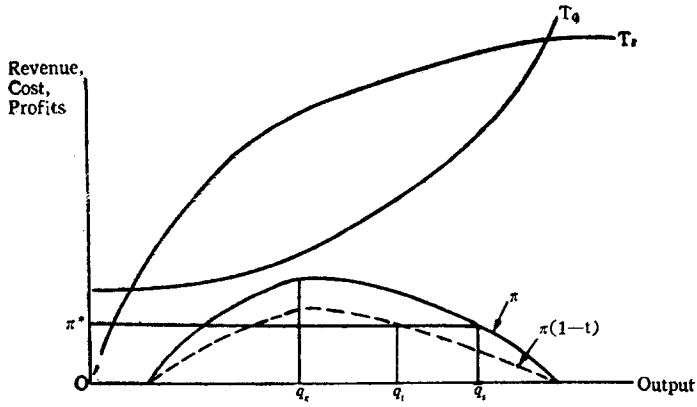

Figure 1 : *Revenue, Cost and Profit Schedule*

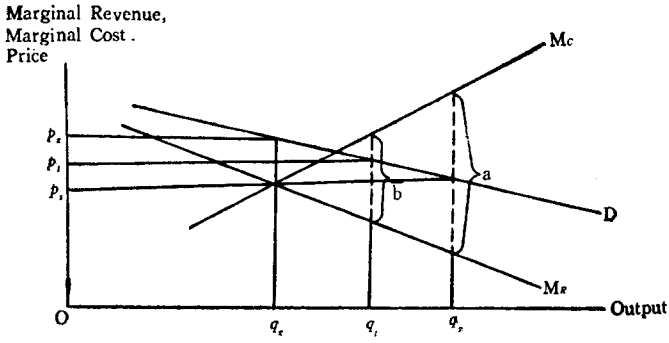

Figure 2 : *Maginal Cost and Marginal Revenue Schedule and Price*

In figure 2, marginal revenue and marginal cost curve derived from figure 1 are shown together with demand durve. P_π denotes price when profits are maximised, P_s the price when sales are maximised subject to minimum profit and P_t the price when sales are maximised subject to minimum profits in the presence of tax. The coefficients, a and b, are shown in figure 2.

4. Policy Implications

If the profits tax is borne by capital, thenit will interfere with its efficient use and consequently capital will move out of the taxed sector into non-taxed sector.(7) If we accepted the

(7) Exposition of elaborate view on this, see A.C. Harberger, "The Incidence of the Corporation Income Tax," *Journal of Political Economy* (June 1962), pp.215-40.

sales maximisation hypothesis, the profits tax will increase the price of product whilst not affecting the profitability of capital employed in the taxed sector in the short run at least, thus causing no distortion between taxed and untaxed sectors in the use of capital. On the consumers' side, however, the price of product where profits are maximised will not change regardless of tax. Although tax is shifted to the consumer in the sales maximisition case, they will be still better off under this regine than under profit maximising, because the upper limit of the price increase in the sales maximising regime will be the price already charged under the profit maximising regime.

In a country where the foreign sector is relatively important such as Britain and the European Common Market countries, two different hypotheses on businessmen's behaviour have very different implications as regards the balance of payments problem especially when profits tax is introduced or its existing rate is to be raised. If the government policy is to encourage export without contravening international agreement such as GATT, then depending on which hypothesis is used there will be a strong case for or against changing the tax structure of a country. Although the empirical evidence so far does not show clearly that any tax structure is more favourable to the balance of trade problems *per se*, it can still be argued that sales maximising extrepreneurs will be strongly affected by the introduction of profits tax, when competing in the international market. If the tax structure of one country is heavily direct tax orientated whilst the other is indirect tax orientated, one would expect that the latter will be in a more favourable position vis-a-vis the former in international competition, assuming that there are no cases of 'hidden' taxes.[8] As the international convention is that indirect tax can be refunded when taxed commodities are exported whereas directtax cannot be, the competitive edge of the former over the latter is self-evidence especially when direct tax is reflected on the price of exports. (January 1970)

(8) Efficiency aspect of 'hidden tax' see S.S. Han and G.K. Shaw, "Turnover Tax Harmonisation in the European Community", *Journal of World Trade Law* (January/February 1968), pp.97-107.