OLIGOPOLISTIC INTERDEPENDENCE AND THE REVENUE MAXIMIZATION HYPOTHESIS—NOTE

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Following the dissatisfaction with the traditional economic theory of the firm which assumes profit maximization, many alternative theories have been advanced. Perhaps the most publicized and debated alternative theory is Baumol's Revenue Maximization Hypothesis. This theory is supposed to apply to large oligopolistic enterprises. One of the debates on this hypothesis is the Shepherd–Hawkins discussion on the relative price and output levels of a sales-maximizing firm and a profit-maximizing firm. The purpose of this paper is to push this discussion a step further by taking account of the effect of oligopolistic interdependency on the levels of advertising outlays.

I. THE SHEPHERD–HAWKINS DEBATE

Shepherd¹ argued against the usefulness of Baumol's hypothesis. He explained that under conditions of interdependent oligopoly both the total revenue curve and the total profit curve will each reach their peak at or near the level of output where the kink occurs in the demand curve.² In Figure 1 the profit maximizing level of output and price will be the same as the revenue maximizing level of output and price, i.e. both have an output level of $OA_e$ and price $R_eA_e/OA_e$. Therefore since the firm will stay at the output level of the kink no matter what motivation is followed, Shepherd concludes that the sales maximizing approach does not add to our understanding of interdependent oligopoly situations.³

Hawkins⁴ reconsidered the interdependence problem in 1970 and concluded that Shepherd's argument does not hold in the typical oligopoly situation where non-price competition such as advertising is also prevalent.⁵

Hawkins justified his position by observing that advertising and other forms of non-price competition shift the demand curve (whether or not it is kinked) facing the firm. This means that the firm's total revenue curve is shifted. In other words the firm has a different total revenue curve for each level of advertising. If revenue-maximizing firms and profit-maximizing

² Ibid., p. 422.
³ Ibid., p. 423.
⁵ Ibid., p. 132.
firms each have a different level of advertising outlay, then they will each be facing a different total revenue curve. Thus each may have a different level of output even if both are producing at the output level where their respective demand curves are kinked. Therefore the fact that total revenue is at a peak at the kink where maximum profits occur, does not prove that both types of firm will necessarily choose the same level of output.\(^6\)

Hawkins realized that Shepherd’s argument would be rehabilitated if it could be proved that both types of firm necessarily choose the same level of advertising, i.e. both operate on the same total revenue curve. For this reason he tried to dismiss that possibility by attempting to demonstrate that profit-maximizing and revenue-maximizing firms will almost always choose different levels of outlay on optimum mixtures of production and advertising costs, i.e. sales-maximizing firms will almost always choose a greater level of outlay than profit-maximizing firms.

However, our discussion below suggests, that in oligopolistic situations where the kinks in the demand curves are marked, the firm will often choose the same level of advertising no matter whether it seeks to maximize sales or to maximize profits.

II. OLIGOPOLISTIC INTERDEPENDENCE AND THE LEVELS OF ADVERTISING EXPENDITURES

Hawkins, like Baumol, sees increases in advertising expenditure as always being accompanied by an increase in total revenue, even though after a certain point any increase in this expenditure will exceed the resulting rise in revenue. This can be seen in the diagram Baumol used to illustrate the advertising part of his model, i.e. Figure 2. Here the total revenue curve does not reach a maximum along the advertising costs axis.

The empirical work of one of the writers raises the possibility that under some conditions of interdependent oligopoly, the total revenue curve does not behave in the manner postulated by Baumol and Hawkins. One of the executives interviewed told how the rival firms in his industry had come to an agreement amongst themselves with regard to the maximum amount of advertising each firm may carry out. For example there is a certain maximum area measured in square inches that each firm may buy for advertising in the daily papers, the ‘Pink Pages’, etc. These agreements were established because it was felt that increased advertising by any one firm would increase the total revenue of that firm, largely at the expense of the other firms.

If any firm broke this agreement, the other firms would immediately retaliate and increase their level of advertising to retain their share of the

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7 Ibid., p. 132.
8 He felt that probably the only case where their respective outlays would be identical was where the profit constraint was equal with maximum achievable profits.
9 Optimum here refers to combining advertising costs and production costs in such a way as to achieve maximum total revenue for any given level of total costs.
10 On the other hand, price cutting will not always increase total revenue.
11 One of the authors conducted 32 interviews of businessmen in the Sydney–Melbourne area. Details of this empirical work can be found in an unpublished honours thesis entitled ‘An Evaluation of Baumol’s Revenue Maximization Hypothesis’ by T. A. Murphy. A copy of this thesis can be obtained from the University of New England.
market. Unlike price-cutting this increased advertising would almost certainly increase the total revenue of the industry as a whole. Therefore a Baumol-Hawkins type total revenue curve does accurately represent the position of the whole industry. However, there is no direct relationship between advertising costs and advertising success so that even though all firms increase their advertising expenditure, some with particularly successful advertising campaigns will increase their total revenue at the expense of the rest of the firms in the industry. That is to say, increased advertising by the industry as a whole is likely to produce changes in the market shares within the industry, although the direction of such changes probably cannot be predicted, i.e. increased advertising by the industry as a whole results in the industry being in a state of flux.

Therefore, under conditions of interdependent oligopoly the effects of increased advertising by one firm on its total revenue can be summarized by the following diagram.

![Figure 2](image_url)
Increased Advertising by Firm A

Increased Advertising by the Whole Industry

Increased Total Revenue for the whole industry. The view that this increase is likely to be small is supported by Borden who concluded after an extensive study, that advertising increases the demand for the products of many individual companies, but has little effect on the demand for types of product as a whole.\(^{12}\)

Uncertainty with regard to the direction and magnitude of any change in Firm A's total revenue.

Probable change in market share of Firm A.

Industry in state of flux

Probable increase in total revenue for Firm A. This increase is likely to be small, particularly if the market is mature, as is usually the case with interdependent oligopoly.

Uncertainty with regard to the direction and magnitude of any change in Firm A's total revenue.

It can be concluded that the Baumol–Hawkins assumption that increased advertising always or nearly always increases total revenue is unacceptable in the case of interdependent oligopoly.\(^{13}\)

Of course it can be argued that, though increased advertising does not necessarily increase the total revenue of a firm, it does increase it in probabilistic terms. In other words with the increase in total revenue for the whole industry, the probability of an increase for a single firm is still higher than 50% even with a change in market share. If it is further assumed that executives are neutral towards risk, then it can still be established that a sales maximizer will advertise more than a profit maximizer. However, it seems more realistic to assume that most executives are, to a varying degree risk-aversers. With this assumption it is no longer true that a sales maximizer will necessarily advertise more than a profit maximizer. This is shown below.

Consider Figure 3 where the horizontal axis measures the gain (or loss if negative) in the total revenue and the vertical axis measures the probabilities of the respective levels of gain or loss of a certain advertising campaign. The distribution may be expected to be normal with the mean at a small positive figure. If the decision-maker is neutral towards risk, he is merely interested in the mathematical expectation in dollar terms. Hence he will undertake the advertising campaign as long as ‘a’ is positive. However, if he is a risk averter, he weighs the possible loss more heavily than the possible gain.


\(^{13}\) The possibility, that the total revenue curve could be kinked, or at least flatten out, along the advertising axis, was first mentioned by Hawkins, *op. cit.*, pp. 134–5. However, it was his opinion that such an occurrence was a freak case.
Hence he needs something extra to compensate for the risk involved. The mean expectation must not only be positive but must be larger than a certain figure ‘$b$’ which may depend on the dispersion.

Now ‘$a$’ is likely to be a very small figure for two reasons. First, advertisement is not likely to increase sales of the whole industry significantly. Secondly, if the decision-maker does increase his advertising he is to some extent withdrawing from the (tacit) collusive arrangement\textsuperscript{14} of the firms in that industry. This withdrawal could well lead to a breakdown of the agreements with regard to pricing and in effect start a price war. Alternatively the other firms in the industry may resent the first firm increasing its advertising and thus forcing them to follow suit. Their reaction may be to collude against the first firm in an attempt to make sure that it does not gain from its efforts at ‘rocking the boat’. If this attempt is likely to be successful then ‘$a$’ may well be even a negative figure.

Since ‘$a$’ is a small (or even negative) figure ‘$b$’ could be larger than ‘$a$’. The decision-maker may thus decide against taking the advertising campaign. Of course if ‘$a$’ were negative then the decision-maker would not start the advertising campaign even if he were neutral towards risk.

\textsuperscript{14} This arrangement may be very informal.
From the above it may be concluded that even if a firm's objective is sales maximization in conditions of certainty, the combined effect of kinked demand curves, oligopolistic interdependency, and risk aversion, may well mean that it will advertise and produce at the same levels as his profit maximizer counterpart. In some cases (i.e. when 'a' is negative) risk aversion is not necessary for this conclusion to hold.