Optimal Advertising and Market Structure:  
A Conceptual Framework

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Abstract

This study aims at exploring one of the most important issues of advertising strategic planning in advertising. It deals with determining the optimal advertising expenditures (budget) to be spent under four different market structures: perfect competition, monopolistic competition, oligopolistic market and pure monopoly market. After exploring the advertising role under all these market structures, the researchers attempt to offer mathematical evidence regarding the optimal advertising expenditure under those structures. Although this paper does not provide empirical data on the issue, it opens new horizons for further research in the future. This proposal will be of great importance and will have significant effects on marketing issues especially planning marketing strategy, and determining the optimal advertising budget to be allocated. This will help in reaching more rational decisions regarding the economics of advertising in the firm.
1- INTRODUCTION:

This study deals with one of the most important issues of promotional strategy, i.e., and the optimal advertising expenditures. Despite its importance, it is probably the least understood of key strategic decisions in the firm. Some marketing managers consider the decision of determining the amount to be spent on advertising as a routine one. This consideration prevalent in some firms is decidedly inaccurate. Determining the optimal advertising expenditure is a significant and vital activity for the marketing managers. In the present study the researchers attempt to explore the role of advertising under the different market structures, and they present a conceptual framework for the advertising budgeting. In addition, the study presents mathematical evidence to support the major orientation implied in managing this issue.

In fact, the importance of the present study stems from the values and benefits that can be derived from optimizing the advertising expenditures. Those can be summarized as follows: (Govoni and others, 1995):

1- Determining the optimal advertising expenditures serves as an input to the firm’s financial planning process, which is essential to a healthy firm.

2- Optimizing advertising expenditures helps marketing managers in deciding the extent to which they can benefit from the budget devoted to advertising activities that can stimulate sales and in turn profits.

3- Determining optimal advertising expenditures helps in minimizing the unnecessary costs, and in turn achieving maximum profit in both short and long run.

2- THE ROLE OF ADVERTISING UNDER DIFFERENT MARKET STRUCTURES:

The effectiveness of a firm’s advertising effort depends, to a considerable extent, upon the market structure prevailing, and the competitive conditions within the industry in which the firm is operating (Martin, 1988). In fact, these market structures vary from perfect competition to pure monopoly. In the following section of the present study, four
market structures and the role of advertising under each are to be discussed

2-1 PERFECT COMPETITION:

Perfect competition exists when a large number of firms produce and sell similar products (goods & services); generally speaking, four conditions are necessary for the perfect competition (Mansfield, 1979) These are:

a- The product of any producer or seller is the same as another (identical).

According to this undifferentiated situation, consumers have no choices, and they do not care whether they buy the product from one seller or another because each product is an appropriate substitute for others given that the price is a constant factor (Truett and Truett, 1988).

b- Perfect competition requires each firm in the market to be so small, in relation to the whole market; i.e., it cannot affect the price (Besanko, et al., 1996).

c- Perfect competition requires that all the firms be completely mobile; i.e., each firm must be able to get into or get out of the market, and resources can be switched from one use to another. (Of course, this does not mean that such movements of resources do not take time). In the short run, many resources cannot be transferred from one use to another.

d- Perfect competition requires that consumers and firms (producers and sellers) have perfect knowledge of the relevant economic and technological information. Under this condition, it is assumed that any of the firms hasn’t any differential advantage to make its product differentiated from others. In addition, consumers must be aware of all prices, and producers and sellers must be aware of how much their resources will bring in all possible uses. This full information is required by all the economic decision-making units (Henderson and Quandt, 1980).

Despite the fact that some economic scholars don’t expect any role to be played by any kind of promotional tools, including advertising, other scholars assume that there is a restrictly informational role by advertising (Stanley, 1982). This Vision can be justified by the fact that products are not differentiated, and consumers have no choices. So, if there is any role for advertising it would be to get consumers aware of the product rather
than to persuade them to change their preferences. Within this context, the role which is expected to be played by advertising is an informative one, but not persuasive, and it is just for those firms which are newcomers to the market.

2-2 MONOPOLISTIC COMPETITION:

The theory of monopolistic competition was put forth by Edward Chamberlain (Mansfield, 1994). The basic idea behind this theory is that most firms’ products are relatively fair close substitutes, and that most products are not completely homogeneous. So it is a case of product differentiation since each firm produces a somewhat different product. In general, the assumptions underlying the monopolistic competition can be summarized as follows:

A- It is assumed that products are differentiated and they are produced by a large number of firms with each firm’s products being a fairly close substitute for the products of other firms in the product group (Salvatore, 1993).

B- It is assumed that firms are small and their number within the product group is sufficiently large so that each firm expects its actions to go unheeded by its competitors and to be unimpeded by any retaliatory measures on their part.

C- It is assumed that both demand and cost curves are the same for all the firms operating in one industry. This is a restrictive assumption, for, if the products are dissimilar, one would expect their demand and cost curves to be dissimilar too.

Thus, monopolistic competition market structure would approximate perfect competition, except that in monopolistic competition products can be physically differentiated, such as in color, design, packaging, and so on, or psychologically differentiated, such as in brand images. (This will be illustrated in the next part).

2-3 OLIGOPOLISTIC MARKET STRUCTURE

Oligopoly market structure exists when there is a small number of firms and a great deal of interdependence (actual and procured) among them. Under the oligopoly market conditions, it is assumed that each firm
designs its policies with the consideration of their effect on its competitors.

Because the number of firms operating under the oligopoly market structure is small, any change in the firm’s price is going to influence the sales and profit of competitors and will stimulate changes in their policies.

Oligopoly is caused by many reasons, one of them is to benefit from the economics of scale. A major characteristic of the economics of scale is its cost-reduction effect; this effect doesn’t occur unless a firm produces an output equal to a substantial percentage of the total available market, with the consequence that the number of firms will tend to be rather small. In addition, the effects of economics of scale can be extended to sales promotion. Furthermore, it should be understood that under the oligopoly market structure, it is very difficult for new comers to enter the market (McGuigan and Moyer, 1993).

In addition, competition in the oligopolistic market structure is nonprice oriented. The firm tends to use advertising and differentiation in many product characteristics rather than price, as a competitive weapon because it seems to view price cutting as a dangerous tactic. The firm as a less risky way to keep consumers away from competitors uses advertising and product differentiation. When a firm advertises, it attempts to stimulate the demand for its product. An effective advertising will make it possible for a firm to sell more at the same price (Mansfield, 1994).

Firms use advertising to differentiate their products from those of their competitors. In this way consumers may be oriented to become brand loyal and so to stick to it, even though the products of all firms in the industry are much the same. The example, which can be effectively cited here, is the cigarette case where various brands of cigarettes are quite similar, although not identical. The cigarettes industry spends a large amount on advertising to build a particular brand image in the consumers’ minds (Telser, 1983).

Within this context, advertising can promote a psychological differentiation. Commoner and Wilson (1979) stressed the power of advertising in differentiating many similar products. In this case, the advertising claim can be formulated in such a way that consumers perceive that such differentiation exists. Steiner (1973) indicated that life
insurance contracts are good examples for the service that consumers can wrongly perceive that differences among insurance companies exist. In this situation, advertising can perceptually differentiate life insurance services delivered by different companies.

However, the oligopoly question here is, which kinds of products can be differentiated in this way. Borden (1964) believes that advertising is an effective tool for product differentiation, especially under the following conditions: (1) if the products are differentiable, (2) if the advertising claim addresses the consumer’s emotional purchasing motivation, and (3) if the product texture implies symbolic (intangible) elements.

Despite the fact that demand curve under oligopoly is similar to that under monopolistic competition, it is not always reasonable to assume that this is always correct, since the large expenditures for advertising and product differentiation that are incurred by some oligopolistic firm may tend to stimulate the demand.

Furthermore, an oligopolistic firm tends to spend large amounts on advertising and product differentiation. The use of some resources for these purposes is certainly worthwhile, since advertising provides consumers with information, and product differentiation provides greater freedom of choice (Kenneth and Lynk, 1991).

However, there is a widespread feeling among economists, based largely on empirical studies (Mansfield, 1994), that in some oligopolistic industries such expenditures have been expanded beyond the levels that are socially optimal. Sometimes advertising expenditures only have the effect of increasing the costs of the entire industry, since one firm’s advertising causes other firms to increase their advertising.

Frequently a firm varies the characteristics of its product as well as advertises in order to differentiate its product from those of its competitors. Like advertising, one purpose of varying the firm’s product is to manipulate the firm’s demand curve. Of course, changes in product, like other competitive tactics, often result in retaliatory moves by competitors (Hirschey and pappas, 1992).

2-4 PURE MONOPOLY MARKET STRUCTURE

In microeconomics, pure monopoly as a market structure exists when there is one and only one firm in a market. It should be noted that pure
monopoly and perfect competition are opposite in the sense that the firm in a perfectly competitive market has so many competitors, whereas the firm under pure monopoly market structure has no competitors at all. Therefore, under pure monopoly, one firm is the only supplier, and therefore, there is no competition (Varian, 1992).

It should be acknowledged that the firm operating under the pure monopoly market structure is not completely insulated from the defects on actions taken by other firms in the economy. It is assumed that all commodities are rivals for the consumer’s favor. This kind of competition occurs among different products, as well as among the producers of a given commodity. For example, if a firm is a monopolist on the supply of steel in a certain market, it would still face considerable competition from other firms producing aluminum, or plastics. The threat of potential competition acts as a determining factor on the policies of the monopolist and its courses of action in the market. Since the monopolist is the only firm operating within the industry to which it belongs, it is obvious that the monopolist’s demand curve is precisely the same as the market demand curve for the product.

Consequently, the factors determining the shape of the monopolist’s demand curve are the same factors that determine the shape of the market demand curve.

It should be noted that the monopolist can affect the prices of related products, as well as consumer tastes. To influence consumer tastes, a monopolist often spends considerable expenditures on advertising in order to influence the demand curve and shift it to the right.

3- DETERMINING THE OPTIMAL ADVERTISING EXPENDITURE:

In dealing with the issue of determining the optimal advertising budget, two fundamental questions should be answered. (1) How much should the firm spend on advertising activity? And (2) how can this expenditure be determined optimally?

In answering these questions, two major issues are to be discussed. The first is the theoretical justification for determining the optimal advertising expenditure (budget). The second deals with a mathematical
procedure which this research proposes to help determining the optimal advertising budget under different market structures.

**A- THE THEORETICAL JUSTIFICATION:**

The most widely accepted goal among decision-makers is the maximization of the firm’s profit. Within this context two theoretical formalizations can be discussed. These are:

1- The theory of profit maximization.
2- The sales response function.

For the purpose of this research each of them is to be discussed as follows:

**THE THEORY OF PROFIT MAXIMIZATION:**

Profit maximization is both a short and long-run strategic goal which every firm aims at achieving in order to grow and survive. This orientation must be implicitly understood when designing the marketing strategy, and it should be adopted by the advertising decision-makers. Within the context of the profit maximization framework advertising expenditures should be determined and allocated in such a way to maximize profit for the firm (Little, 1970). According to the classical economic theory, profit maximization implies that the firm will continue to spend for advertising effort up to the level where the additional marginal cost of advertising (expenditures) equals the additional (marginal) revenue (profit contribution) (Green, 1984). In other words, the economic theory suggests that the marketing manager continues to add advertising effort so long as the profit contribution generated from the additional sales is greater than the cost of the advertising effort. The marketing manager would also maintain the effort at the level where the additional costs and the additional profit contribution were equal. Figure (1) depicts this assumption.
According to this analysis, expending on advertising over the optimal level will not generate any additional revenues and it will also cost more, while any expenditure on advertising generates revenues. In fact, this analysis depends on two fundamental assumptions:

1- Sales returns for each incremental unit for advertising effort decrease below the optimal level. This is due to the fact that, as the market is gradually penetrated, additional sales opportunities become more difficult to locate.

2- Each incremental unit of advertising effort costs more than the revenue that may be generated by that effort. This can be attributed to the fact that efficient advertising media are always used first while the remaining advertising media (vehicles) are less efficient (Govoni and Others, 1995).

When the marginal revenue curve intersects with the marginal cost curve, the optimal operating point is produced, and at this point advertising contribution is expected to reach its peak.

\[ \Delta \]
Sales Response Function:

In addition to the profit maximization formalization regarding the advertising expenditure decisions, there is a further conceptual framework, which cannot be neglected in regard to this issue. This is called the sales response function. The issue involves the sales level that results from a given amount of advertising expenditures. In other words, it deals with the functional relationship between sales and the advertising expenditures.

In fact, this relationship may take the following four patterns:

a- A linear relationship. Accordingly, one can conclude that each increment of advertising expenditures produces an identical amount of sales. If these sales are profitable, then this viewpoint dictates ever-increasing advertising expenditures, which would result in ever-increasing sales and profits. This relationship is shown in figure (2 - A).

b- Individual consumers in the marketplace have to receive a minimum number of exposures to the advertising message before any significant behavioral effect (purchase) and in turn sales can be stimulated (Krugman, 1988). However, this perspective is restricted by two limitations. Firstly, it seems to be valid only for newly introduced products and infrequently purchased products (e.g. automobiles and furniture). Secondly, this perspective leaves the question of what may happen to the relationship after it reaches its threshold. Figure 2 - B depicts this pattern of the relationship.

c- The third perspective is based on the basic premise of diminishing return principle according to which it is speculated that each subsequent increment of advertising expenditures produces a decreased level of sales. This of course overcomes the interment drawback associated with the linear relationship.
between sales and advertising expenditure, which is implied in the first perspective. The principle of diminishing returns concludes that the really advertising effort (expenditures) generates the highest additional sales, while the later efforts may produce little or no incremental sales response. This conclusion admits the idea that markets are finite in size and that consumers reach a saturation point. (see figure 2-c) Advertising expenditures, rather than adding to sales volume, may in fact do just the opposite (Russel and Emshoff, 1980)

d- The fourth function is really a composite of the three previous perspectives. It implies that the character of the market response to advertising changes over various ranges of advertising effort and at various levels of sales.(see figure 2-d)

Thus, it could be concluded that there is a close parallelism between the concepts implied in the sales response conceptualisation, and the fourth function, or the so-called S-Curve which reveals a lot of integration between the three perspectives into a unified framework. Figure (2) shows the four perspectives.

Figure (2)
Different Perspectives of the Sales Response Function
In fact, the previous discussion reveals certain aspects summarized as follows: (1) It should be acknowledged that we have been explaining relationships that researchers have conceptualized theoretically but have not yet proven by formal research or empirical data. (2) The reader should note that in figure (2) and in exhibits (A to D) there are no scales in any of the axes; therefore, these depictions are conceptual representations, not quantitatively defined relationships, and finally (3) these sales response functions depend on two major assumptions: (1) that the market environment is essentially stable in terms of both market size
and competitiveness, and (2) that the firm has made no other changes in its marketing strategy.

To summarize, the theoretical economic approach is based on two underlying concepts: (1) Managers of individual firms seek to maximize the total profit for their firms, and should therefore continue to make advertising expenditures as long as the profit contribution from the resultant sales is greater than the cost of the advertising effort. (2) Profit contribution is related to the sales generated by the advertising effort, and these sales are a function of how the particular market structure responds to various levels of advertising effort.

**B- DERIVING OPTIMAL ADVERTISING EXPENDITURES:**
The objective of the firm is to maximize its profit, which can be defined in the following formula (Martin, 1988; Tirole, 1988):

\[ \Pi = PQ(p,A) - C(Q(p,A)) - A. \]

Where:

- \( \Pi \) = Profit.
- \( P \) = Price per unit.
- \( Q \) = Quantity demanded.
- \( A \) = Advertising expenditure.
- \( Q = F(p,A) \) = Quantity demanded depends on price & advertising expenditure.

\( \frac{\partial Q}{\partial P} < 0 \) according to law of demand, there is a negative relationship between price & quantity demanded.

\( \frac{\partial Q}{\partial A} > 0 \) We assume that there is a positive relationship between advertising & quantity demanded.

Differentiate equation (1) with respect to price, we get:

\[ 2) \frac{\partial \Pi}{\partial P} Q + P \frac{\partial Q}{\partial P} - \frac{\partial C}{\partial Q} - \frac{\partial Q}{\partial P} = 0 \]

\[ (2') \quad = Q + P \frac{\partial Q}{\partial P} - mc \frac{\partial Q}{\partial P} = 0 \]

Note \( \frac{\partial C}{\partial Q} = mc \) = marginal cost

Multiply equation \( (2') \) by \( P \) and divided it by \( Q \) we get

\[ PQ + P \frac{\partial Q}{\partial P} \cdot P - mc \frac{\partial Q}{\partial P} = 0 \]

\[ P + ( - \varepsilon_p ) \cdot P - mc ( - \varepsilon_p ) = 0 \]

Where \( \varepsilon_p = \) Price elasticity of demand.

\[ P + ( - \varepsilon_p ) \cdot P = mc ( - \varepsilon_p ) = 0 \]

\[ P + ( - \varepsilon_p ) \cdot P = mc \]

\[ \varepsilon_p \]

3) \[ P \left[ 1 + ( - \varepsilon_p ) \right] = mc - \varepsilon_p \]

Differentiate equation (1) with respect to \( A \), we get:

\[ 4) \frac{\partial \Pi}{\partial A} P \frac{\partial Q}{\partial A} - mc \frac{\partial Q}{\partial A} - 1 = 0 \]

Multiply equation \( 4) \) by \( A \) and divide it by \( Q \), we get

\[ 4') \quad P \frac{\partial Q}{\partial A} \cdot A - mc \frac{\partial Q}{\partial A} \cdot A - A = 0 \]

\[ P \varepsilon_A - mc \varepsilon_A - A = 0 \]
Where \( \varepsilon_A \) = elasticity of demand with respect to advertising expenditures

\[
P \varepsilon_A - \frac{A}{Q} = mc \varepsilon_A
\]

\[
P \varepsilon_A - \frac{A}{Q} = mc \varepsilon_A
\]

5) \( P - \frac{A}{Q \varepsilon_A} = mc \)

Since Equation (3) equals equation (5) then \( mc = mc \)

6) \( P \left[ 1 - \varepsilon_p \right] = P - \frac{A}{Q \varepsilon_A} - \varepsilon_p \frac{Q \varepsilon_A}{P} \)

divide equation (6) by \( P \) then we have .

7) \( 1 - \varepsilon_p \frac{Q \varepsilon_A}{P} = 1 - \frac{A}{Q \varepsilon_A \varepsilon_p} \)

8) \( 1 - \varepsilon_p \frac{Q \varepsilon_A}{P} = 1 - \frac{A}{Q \varepsilon_A \varepsilon_p} + \varepsilon_p \frac{Q \varepsilon_A}{P} \)

8\') \( 1 = \frac{A}{\varepsilon_p \varepsilon_A} \)

multiply equation (8\') by (\( \varepsilon_A \)) we get .

9) \( \varepsilon_A = \frac{A}{\varepsilon_p \varepsilon_A} \)
Equation number (9) represents the optimal advertising expenditure which is known as the Dorfman-Steiner condition (Tirole, 1988), the meaning of this equation would be generated as follows:

Elasticity of demand with respect to advertising = Advertising expenditure

Price elasticity of demand = Sales (Q, P)

Elasticity of Demand with respect to advertising ($\varepsilon_A$)

$$\varepsilon_A = \frac{\partial Q}{\partial A} \cdot \frac{A}{Q}$$

Price elasticity of demand ($\varepsilon_p$)

$$\varepsilon_p = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} < 0$$

PRACTICAL ADVERTISING IMPLICATIONS

1- Perfect information market, under this market we have:

A- perfect competition.

$$\varepsilon_A = \frac{A}{PQ}$$

Firm under perfect competition has perfect elastic demand curve as follows:
From the above we can see that the Firm’s advertising expenditure under perfect competition equals to zero because of perfect elastic demand curve and the perfect information regarding the market.

It is important to indicate that if a firm advertises its product under perfect competition, this will benefit all firms in the industry because firms under this market produce identical products while the advertising expenses carried only by one firm (Tirole, 1988).

2- Imperfect information market:

under imperfect information market we have:

A- Pure monopoly.

B- Oligopoly.

C- Monopolistic competition.

Under imperfect information, the economic theory indicates that the demand curve is negatively sloped, and the price elasticity of demand is
not equal to zero, which means that under imperfect information, firms must advertise their products (Carlton and Perloff, 1990).

The product differentiation increases as the slope of demand curve increases.

The Price elasticity of demand decreases as the slope of demand curve increases.

When the price elasticity of demand decreases the advertising expenditure increases (see equation 9).

<table>
<thead>
<tr>
<th>Market Firm</th>
<th>perfect competition</th>
<th>monopolistic competition</th>
<th>Oligopoly</th>
<th>perfect monopoly</th>
</tr>
</thead>
<tbody>
<tr>
<td>εp</td>
<td>∞</td>
<td>high</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>advertising expenditures</td>
<td>zero</td>
<td>low</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>nature of product</td>
<td>identical</td>
<td>medium differentiated</td>
<td>highly differentiated</td>
<td>unique</td>
</tr>
</tbody>
</table>
When the demand curve is vertical, the slope equals $\infty$ and the price elasticity of demand equals to zero.

Under this case advertising expenditure is very high. The objective of advertising here is to reflect the uniqueness and the high quality of the product but the demand (sale) is constant.

**RESEARCH PRACTICAL IMPLICATIONS:**

The present research has significant practical implications. It provides marketing managers or those people who are concerned about determining the appropriate budget to be allocated to advertising activity with a useful conceptual guide that may help in this area of marketing decision making. However, some aspects of that conceptual framework have not yet been supported by empirical research. The paper also presents a mathematical approach which can support the orientations in determining the extent to which the marketing managers of individual firms can spend on advertising under the different market structures discussed in this paper.
RECOMMENDATIONS FOR FUTURE RESEARCH:

Despite the fact that the present paper provides a conceptual framework supported by a mathematical evidence that may guide marketing managers regarding the extent to which they have to continue in spending on advertising under different market structures, and the fact that it indicates how the optimal advertising expenditure under those market structures can be determined mathematically, the paper does not provide any empirical data regarding all these matters, because there are a few or no empirical data readily to quantify the relationship between advertising expenditure and sales response. This is a fertile area, which requires further applied research in the future. In addition, the sales response relationships that have been described in this paper are based on certain assumptions of stability in terms of market size and the firms marketing strategy; therefore, it would be useful that these relationships be examined under changeable market situations and different marketing strategies.
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