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The relationship between advertising and product quality has been a controversial topic in the literature because of conflicting empirical evidence and divergent theories about advertising's effects. The authors present an integrative theory based on consumer response to advertising and the costs of producing quality products. The theory posits that the relationship between advertising and quality is stronger when (1) quality is produced at lower cost and (2) consumers are less responsive to advertising. Such a scenario is more likely during the latter stages of the product life cycle. An empirical test supports this argument.

# The Relationship Between Advertising and Product Quality Over the Product Life Cycle: A Contingency Theory

Are highly advertised products of better quality? We propose and test a theory that such a relationship is more likely when product quality is produced at lower cost and when consumers rely less on advertising for their information. We use the product life cycle (PLC) to proxy consumer response to advertising and the cost of producing quality, assuming both are lower in the later stages of the life cycle. Accordingly, advertising and quality are likely to be more strongly related later in the PLC.

Several important benefits derive from investigating the relationship between advertising and quality. During the last several decades total expenditures on advertising have increased continually and now total more than $80 billion a year in the U.S. alone. The impact and value of these expenditures for business and society have been debated intensely (Norris 1984). The association between advertising and quality is one important means of evaluating the role of advertising. If heavily advertised products are of poor quality, advertising may substitute for quality. Conversely, if heavily advertised products are of high quality, advertising may promote better quality products.

Unraveling the relationship between advertising and quality has not been easy because the empirical evidence is scarce and the theoretical work is controversial. A recent study of the runner's shoe market by Archibald, Haulman, and Moody (1983) found a positive relationship between advertising and quality. Studies by the Federal Trade Commission (1953), Lambin (1976), and Marquardt and McGann (1975) also found a positive relationship, whereas other studies have led to insignificant or conflicting results (Cole et al. 1955; Farris and Buzzell 1979; Rotfeld and Rotzoll 1976). Though the divergent results of these studies are not widely cited in the literature, some popular examples of the heavy advertising of equivalent products (e.g., branded and generic aspirin) have been used repeatedly to question the role of advertising (e.g., Scherer 1980, p. 382).

Lacking consistent evidence, researchers have relied on theoretical models to explain the role of advertising. Unfortunately, these models involve many unsubstantiated assumptions that themselves have contributed to the controversy about the role of advertising in consumer behavior. Currently, the debate in the literature centers on whether advertising is used to inform consumers about quality (and hence is related positively to quality) or whether it misinforms consumers about quality (and hence

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is related negatively to quality). We propose a contingency approach to resolve the controversy about the relationship between advertising and quality. In the following sections, we describe the theory and the empirical test and discuss the relevance of the study.

## THEORY

### The Controversy

The case for advertising's anticompetitive effects probably is made most strongly by Comanor and Wilson (1967, 1974, 1979). They believe advertising differentiates products and thus reduces cross-elasticities of demand. This position is similar to the conventional wisdom in marketing that advertising is a means of differentiating one's products and sustaining high market share and profit (Lilien and Kotler 1983, p. 661). An important distinction, however, is that Comanor and Wilson believe advertising may accentuate preferences for specific brands even though physical characteristics are not different. Hence firms with low quality products could use advertising to compensate for inferior quality (Comanor and Wilson 1979, p. 457). As a result, product quality (adjusted for price) and advertising would be related negatively.

Nelson (1970, 1974, 1975) takes an opposite position based on the information theory of advertising developed by Stigler (1961), Telser (1964), and others. He believes differences in attributes, and especially in quality, are inherent among competitive products but consumers may not be fully informed about them. Firms could advertise either to inform or to mislead consumers about these differences, but misleading advertising is not likely to be productive so long as consumers can verify quality either by inspecting the product or using it. Accordingly, firms with better quality are likely to advertise more. Further, Nelson proposes that better quality firms also may be more efficient producers and hence earn higher returns for each additional sale. Hence if consumers respond to advertising, these firms would advertise more and advertising and quality would be related positively.

Could both of the opposing viewpoints in the literature be correct? The answer may well be "yes," because the problem is probably not a simple unidimensional one. As we show subsequently, under certain conditions one view may be appropriate and under other conditions the opposite view may apply. In our analysis, we identify the assumptions, however extreme, that are necessary for each of these two positions to hold and we determine whether the two positions may possibly be related. Specifically, we suggest that the two positions are extremes on a bipolar continuum; the position of a market on that continuum depends on (1) how much information consumers have about competitive products and (2) how much it costs to produce product quality. In the subsequent discussion we develop an explanation that integrates the hypotheses suggested by Nelson and by Comanor and Wilson.

### An Integrative Model

We begin by defining quality as a composite attribute of which consumers unanimously prefer more to less. The dimensions of quality include, for example, purity of ingredients, freedom from defects, energy efficiency, product reliability, and safety. Excluded from this definition are dimensions about which consumers may reasonably disagree (e.g., styling, finish, options, features). We posit that because of the nature of the production system, quality is basically a probabilistic attribute. In addition, because of limitations in consumer information about competitive quality levels, consumers always will have at least some uncertainty about the quality of the products in their choice set.

We start with the premise that if consumers respond at all to advertising, they do so because advertising facilitates their decision making. This premise does not mean that advertising is necessarily informative, but merely suggests consumers respond to it to the extent that their brand choice is not yet determined. Other available information also affects consumers' uncertainty about quality: consumption experience, inspection, word of mouth, and publications. Because advertising is not a neutral source of information, we assume that consumers respond more to advertising when information from the other sources is incomplete.

Now consider the businesses' decision problem. Let us assume that other factors are held constant and that competitive businesses must decide the level of advertising and price, given their different quality levels. We can simplify their decision problem and the consequent market equilibrium in one of two extreme scenarios.

First, let us assume that quality is not very costly to produce, but that some businesses produce higher quality products than others, perhaps because of superior technological or corporate affiliation. Next assume that consumers are reasonably well informed about competitive quality in the sense that they can evaluate quality reasonably well and know the distribution (but not location) of quality in the market. They are willing to pay more for better quality. Because they are so informed, they respond to advertising cautiously and only if it is informative.[1] The businesses with higher quality will attract a larger share of consumers because of both consumer ability to determine quality through inspection and consumer patronage through repurchases. In such a scenario the businesses with better quality will be motivated to advertise more to attract a larger share of consumers and will be more profitable. Therefore higher quality would lead to higher levels of advertising, market share, and profit. Because the market responds "correctly" to quality, we refer to it as an "efficient" market.

In an opposite scenario, assume that supplying higher

[1] In this scenario, advertising could provide information on the location of quality, that is, which firms have what levels of quality.

quality involves substantially higher costs and, for reasons of, say, history or corporate association, some businesses produce higher quality products than others and therefore incur higher costs. In this scenario, assume that consumers are not well informed about quality, are unable to evaluate it easily, and therefore are unwilling to pay more for higher quality. Because of the uncertainty about quality, consumers will be responsive to advertising. Given this scenario, businesses producing low quality products will succeed by advertising heavily. If quality costs substantially more to produce, the low quality producers, with lower costs, will advertise heavily enough to attract a larger share of consumers and will be more profitable than the high quality producers. Consequently, lower quality would lead to higher levels of advertising, market share, and profit.

In contrast to the "efficient" market, the second scenario represents a "perverse" market. For this market to be at equilibrium,[2] note that some very strong assumptions must be satisfied: (1) consumers must be unable to evaluate quality and unwilling to pay more for better quality, (2) quality must be costly to produce, (3) some businesses must be confined to costly high quality production to which consumers do not respond, and (4) consumers must respond strongly to advertising. Because consumers respond to advertising and cannot evaluate quality, the objective information of such advertising or the objective product quality is of little relevance. All that matters is which business has low enough costs to advertise more.

We now apply the two scenarios to the debate in the literature. Nelson's position (1970, 1974, 1975) that advertising is informative and related positively to quality is compatible with the efficient market scenario. In contrast, Comanor and Wilson's concern (1974, 1979) that advertising is persuasive and may be related negatively to quality is compatible with the perverse market scenario. In our model we relate these two positions on a continuum defined by consumer information about quality and the cost of producing quality. Following Schmalensee (1978), we suggest that the degree to which one of these positions dominates in real markets is an empirical issue that depends on the combination of the two underlying variables that define the various scenarios. Though the measurement of such variables is difficult, the product life cycle is a convenient proxy variable that relates to the variation in both consumer response to advertising and the cost of producing quality.

### *The Product Life Cycle Proxy*

There is both empirical and theoretical justification for using the PLC to reflect consumer response to advertising and the cost of quality. In a product's introduction and growth stages (or "early" PLC), sales grow rapidly, new firms and consumers enter the market, and consumers know relatively little about the attributes of competitive products or how to evaluate those attributes. In contrast, during product maturity and decline (or "late" PLC), sales are either stable or falling, few new firms or consumers enter the market, and consumers are relatively familiar with competitive products. Hence, on the average, consumers are less informed and more likely to depend on advertising in the early stages of the PLC than in the later stages.

The notion of different elasticities over the PLC was put forth by the Finnish economist Mickwitz (1959). Parsons (1975) provided direct empirical support, finding that advertising elasticities declined over time for a quality household cleaner. Other studies have provided indirect evidence, showing that advertising expenditures are higher in the early stages of the life cycle (Buzzell 1966; Buzzell and Nourse 1967; Farris and Buzzell 1979; Lilien 1979).

Similarly, because of learning (experience) or scale effects, businesses on the average are likely to produce quality products at lower costs as the product matures. Moreover, businesses are more likely to produce at optimal quality levels later in the life cycle, when they understand consumer response functions better.

To summarize, we expect consumer response to advertising and the cost of producing quality to be lower in the later stages of the PLC. Therefore we hypothesize that the effect of product quality on advertising, market share, and profit will be more positive in the later stages of the life cycle. In other words, the efficient market as described by Nelson is more likely in the later stages of the PLC; the perverse market resembling the Comanor and Wilson scenario, if it exists at all, is more likely in the early stages of the PLC. Figure 1 is a graphic summary of the advertising-quality continuum.

## *EMPIRICAL ANALYSIS*

### *The Model*

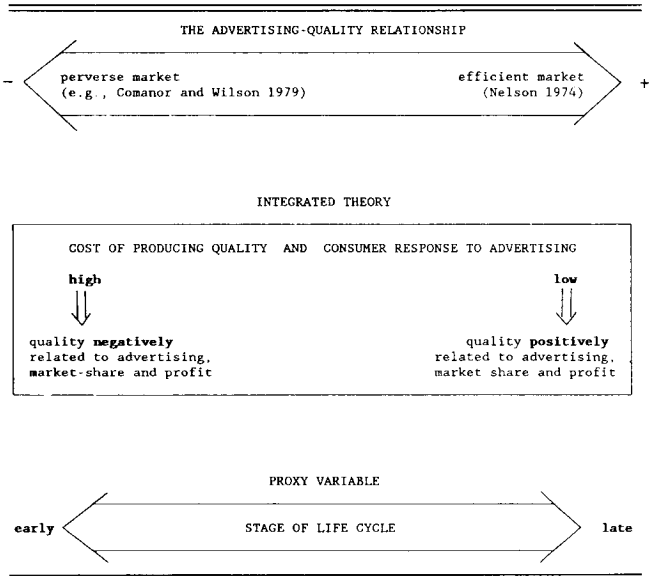
To test the hypotheses, we must estimate the effects of quality on advertising, market share, and profit. In developing our argument we assume that all other extraneous variables are constant. Empirically, however, considerable variation may be present among these variables, some of which may be collinear with quality. These variables must be controlled in the empirical model. We therefore incorporate three categories of extraneous variables.

- —*Strategic variables:* relative price, salesforce, product line breadth, and new product introductions.
- —*Market structure variables:* order of market entry, number of competitors.
- —*Internal structure variables:* vertical integration, capacity utilization, employees unionized, and investment intensity.

In Appendix A we give the rationale for including these variables as covariates in each of the equations.

[2]Schmalensee (1978) provides a proof for the existence of an equilibrium in a scenario that resembles the one we describe here.

## Figure 1
### THE ADVERTISING-QUALITY RELATIONSHIP: A CONTINUUM




We also must incorporate interdependencies among the endogenous variables. Some of these interdependencies are apparent in the specification of the theoretical argument and others are supported in the literature. Profit is dependent on market share and cost, and cost is dependent on market share (Robinson and Fornell 1985; Schoeffler 1977). Similarly, market share is a function of advertising, and advertising itself is a function of profit (because advertising expenditures often are based on expected profit). Accordingly, we can test for the effect of quality on advertising, market share, and profit with the structural equation model in Table 1. We make the conventional assumption that the $e_{ij}$ for each $i = 1$ to 4 are independently, identically, and normally distributed disturbance terms with mean zero and constant variance. However, because of possibly omitted variables, we do not assume that $\phi = E(e_{ij}e'_{ij})$, the variance-covariance of error terms, is diagonal. In each equation of Table 1, because the number of exogenous variables minus one is greater than the number of included endogenous variables, the order condition for identification is satisfied.

### *Hypotheses*

Sets of rival hypotheses now can be specified. If consumers depend heavily on advertising and if quality is costly, the market would be "perverse" as suggested by Comanor and Wilson. Quality would have a negative effect on advertising, market share, and profit. In contrast, if consumers are reasonably well informed and not overly dependent on advertising and if the cost of quality is low, the market would be efficient as described by Nelson. Quality would have a positive effect on advertising, market share, and profit. Our central hypothesis is that these relationships will vary systematically with the product life cycle. As Figure 1 illustrates, we expect the results to be closer to the perverse scenario in the early stages of the PLC and closer to the efficient scenario in the later stages.

### *Data*

PIMS (Profit Impact of Market Strategies) has one of the few large databases with a broad cross-spectrum of industries suitable for empirical analysis. Though several limitations and difficulties are associated with PIMS (Anderson and Paine 1978), it is the only database that contains proxy variables for the theory we want to operationalize.

The PIMS database records competitive activity at the business unit level on a large number of variables. Each business voluntarily subscribes to the database for at least four years. The business is a narrowly defined subdivision of a firm with a distinct set of products, marketed to a distinct set of consumers in association with a distinct set of competitors. A full account of the measures and data collection procedure is given in the *PIMS Data Manual* (1979) and Schoeffler (1977) presents the rationale of the project. In our study, a sample of 749 consumer businesses over the period 1970–1983 was selected from the PIMS data. Measures of the key variables (4-year average for each business) are summarized in Appendix B.

## Table 1
### THE FULL EMPIRICAL MODEL

| | *Dependent variable (equation)* | | | |
|---|---|---|---|---|
| *Independent variable* | *Relative advertising* | *Market share* | *Relative cost* | *Profit* |
| *Endogenous* | | | | |
| Relative advertising | | $\beta_{21}$ | | |
| Market share | | | $\beta_{32}$ | $\beta_{42}$ |
| Relative cost | | | | $\beta_{43}$ |
| Profit (ROI) | $\beta_{14}$ | | | |
| *Key exogenous* | | | | |
| Relative quality | $\alpha_{15}$ | $\alpha_{25}$ | $\alpha_{35}$ | $\alpha_{45}$ |
| Relative quality × PLC | $\alpha_{16}$ | $\alpha_{26}$ | $\alpha_{36}$ | $\alpha_{46}$ |
| *Control exogenous* | | | | |
| *Strategic* | | | | |
| Relative salesforce | $\alpha_{17}$ | $\alpha_{27}$ | | |
| Relative product breadth | $\alpha_{18}$ | $\alpha_{28}$ | | |
| Relative % new products | $\alpha_{19}$ | $\alpha_{29}$ | | |
| Relative price | $\alpha_{110}$ | $\alpha_{210}$ | | $\alpha_{410}$ |
| *Market structural* | | | | |
| Order of market entry | $\alpha_{111}$ | $\alpha_{211}$ | | |
| Number of competitors | | $\alpha_{212}$ | | |
| *Internal structural* | | | | |
| Vertical integration | | | $\alpha_{313}$ | $\alpha_{413}$ |
| Capacity utilization | | | $\alpha_{314}$ | $\alpha_{414}$ |
| Employees unionized | | | $\alpha_{315}$ | $\alpha_{415}$ |
| Investment intensity | | | $\alpha_{316}$ | $\alpha_{416}$ |
| Errors | $\epsilon_1$ | $\epsilon_2$ | $\epsilon_3$ | $\epsilon_4$ |

Quality is a difficult variable to measure (e.g., Maynes 1975). In the PIMS project, businesses assess what percentage of their sales volume represents products a consumer would find superior to products from the three leading competitors and what percentage represents products a consumer would find inferior. Quality is defined as the difference between these estimates. Though the validity of this subjective measure could be challenged, the high variance across businesses, including a large proportion of negative values, indicates that the measure is not lost in self-serving bias. Moreover, because the PIMS businesses are self-selected and pay for the analysis, which remains confidential, it is in their interest not to distort the measure systematically.

*Results*

The descriptive statistics of the key variables indicate that the variances, especially of market share, relative advertising, relative quality, and profit, are very large across the sample. The model parameters were estimated with both two-stage least squares (2SLS) and, because of possible bias due to a nondiagonal matrix of error terms, three-stage least squares (3SLS). These estimates of the main and interaction effects of quality on advertising, market share, and profit are reported in Table 2. The PLC is operationalized as one if the business is in the early stages and zero otherwise. The main effect of quality therefore is interpreted as the effect during the maturity stage, whereas the quality by PLC interaction is interpreted as the differential effect of quality in the early stages relative to the maturity stage.

As Table 2 shows, all main effects of quality are positive and significant at the .05 level or better. The effects of quality on market share and profit are particularly strong. Hence no support is found for the perverse effects that Comanor and Wilson and others suspect.

The more interesting question is whether these effects deviate systematically when advertising sensitivity and the cost of quality increase, as proxied by the stages of the PLC. The answer is that they do. The signs of the quality by PLC coefficients indicate that the deviations are all in the same direction as predicted by the theory. In other words, the effects of quality are weaker in the early stages of the PLC. Two of the three interaction terms are significant at the .05 level or better and one is significant at the .1 level. The effects of quality in the early stages can be obtained by adding the main and interactive coefficients in the model. The sum indicates that the effects of quality on advertising, market share, and profit, though significantly weaker, are not negative even in the early stages of the PLC.

The estimates from the 2SLS and 3SLS are fairly close because the errors across equations are small. To gain some insight on the stability of our results, we also estimated the simple correlations and OLS regression parameters of each equation, for the whole sample and for the stages of the PLC (Table 3).[3] A similar pattern emerges. In the full sample, all the effects of quality are strongly positive. In the split samples, the effects of quality are all positive, but stronger in the later stages than in the early stages of the PLC.

Overall, we can draw three conclusions from our findings. First, the effects of quality are generally positive and in line with Nelson's view of the role of advertising. Second, as hypothesized, the relationships of quality to advertising, market share, and profit are of the same sign in any one condition, and are all stronger in more mature product markets. Third, the results are stable across various estimation methods.

## *DISCUSSION*

*Model Assumptions*

The major assumption in our theoretical and empirical model is that quality is exogenous and fixed for each business. The assumption of exogenous quality may appear intuitively unreasonable. However, many firms do not have control over quality in the short term because quality is often a function of the production setup, which

[3]Because of the split-sample analysis, the interaction term, quality × PLC, is not included. Otherwise each OLS equation has the same independent variables as the model in Table 1.

**Table 2**
THE EFFECT OF QUALITY ON ADVERTISING, MARKET SHARE, AND PROFIT

| *Dependent variable* | *Key independent variables* | *2SLS*[a] | | *3SLS*[b] | |
|---|---|---|---|---|---|
| | | *Coefficient* | *t-statistic* | *Coefficient* | *t-statistic* |
| Advertising | Quality | .08 | 1.95 | .07 | 1.82 |
| | Quality*early PLC | −.05 | −1.49 | −.05 | −1.45 |
| Market share | Quality | .19 | 6.25 | .20 | 6.42 |
| | Quality*early PLC | −.06 | −2.04 | −.06 | −2.04 |
| Profit | Quality | .15 | 3.91 | .19 | 4.94 |
| | Quality*early PLC | −.05 | −1.37 | −.07 | −1.96 |

[a]Two-stage least squares standardized estimates of direct effects of the model in Table 1.
[b]Three-stage least squares standardized estimates of direct effects of the model in Table 1.

## Table 3
SIMPLE CORRELATIONS AND OLS[a] ESTIMATES OF THE EFFECTS OF QUALITY
(*t*-statistics in parentheses)

| | *Full sample (N = 749)* | | *Early PLC (N = 99)* | | *Late PLC (N = 650)* | |
|---|---|---|---|---|---|---|
| *Dependent variable* | *Correlation coefficient* | *OLS estimate* | *Correlation coefficient* | *OLS estimate* | *Correlation coefficient* | *OLS estimate* |
| Advertising | .20 | .07 (2.1) | .04 | .05 (.8) | .23 | .08 (2.0) |
| Market share | .29 | .18 (6.0) | .10 | .08 (.97) | .33 | .19 (6.1) |
| Profit | .23 | .11 (3.4) | .08 | .05 (.63) | .27 | .12 (3.6) |

[a]Ordinary least squares standardized estimates of model in Table 1, excluding interaction term.

is itself a long-term consequence of the firm's technology, managerial philosophy, and financial resources. One example of the phenomenon is the difficulty the American automobile industry is having in meeting foreign quality competition. Another example is from a recent study by Curry (1985), who found competitors had fairly stable relative quality levels in the appliance industry over a 20-year period.

*Data Limitations*

The most serious limitation of the data is that they are not very well suited to a direct estimate of the elasticities of advertising response or the cost of quality. The PLC is a crude proxy for these elasticities. Nevertheless it did modify the advertising-quality relationship as hypothesized. These results are consistent with those of some other empirical studies. For example, a recent meta-analysis of a large number of econometric studies found that the typical advertising elasticity is very small, with a mean of .22 (Assmus, Farley, and Lehmann 1984). If, in addition, the cost of producing quality is not high (as suggested by Fine 1983; Phillips, Chang, and Buzzell 1983), "perverse" markets are unlikely.

Three additional limitations of the data are that the test is at an aggregate business unit level, the quality measure is "noisy," and the data are pooled across several types of markets, such as durable and nondurable goods. All of these limitations tend to weaken the coefficients and usually increase the probability of a type II error. However, our results in the aggregate sample and the late PLC are strongly positive, so these limitations are not in the direction of our conclusions. The effects in the early PLC, which are not significantly different from zero, are probably not due entirely to these errors because our results contrast effects across stages of the PLC. The attenuation, if any, should apply to both conditions.

One perhaps could argue that certain combinations of factors lead to perverse market conditions and that we failed to uncover them because our data are aggregated. The theory suggests the cost of quality and consumer response to advertising are two such factors. Our results seem to confirm the hypothesis that the stages of the PLC reasonably operationalize these factors. However, we attempted to find perverse conditions across other market conditions, such as infrequency of purchase, low cost of the product, or the need for expert opinion. We failed to find any single condition that suggested a perverse market.[4]

*Summary and Implications*

The debate over whether advertising has anticompetitive or informative effects has proceeded in the literature for some time and can be seen as a conflict between the views of Nelson and those of Comanor and Wilson. We developed a theory that suggests both these views are too simplified. As Schmalensee (1978) first proposed, two underlying variables help explain the effects of advertising: consumer response to advertising and the cost of producing quality.

When advertising elasticity and the cost of quality are high, perverse relationships may be present as suggested by Comanor and Wilson. When the values of these variables are low, Nelson's scenario is likely to prevail. We tested these predictions using the stages of the PLC as a proxy for the key variables. Our empirical results provide consistent evidence that markets in general are competitive when advertising is present. The positive effects of quality are stronger in the late stages of the PLC, when consumers are better informed about competitive products and firms are better able to control their costs.

The limitations of our study suggest some areas for future research. One immediate concern is replication of the study with different data and different measures for quality. Another is application of the model's contingency approach (based on advertising response and qual-

[4]We do not deny that combinations of these factors (third and fourth order interactions) might still lead to perverse results. What we claim, on the basis of these data, is that perverse markets are not a frequently occurring phenomenon.

ity cost) to other advertising controversies about pricing, information dissemination, and market entry.

Our findings suggest that public policy makers need not be greatly concerned by advertising expenditures *per se* for overall consumer welfare. Markets in the aggregate appear fairly competitive, as the positive rewards to quality indicate. The same may not be true for every individual market.

Our findings also suggest that managers should not view advertising as a substitute for quality in the marketing mix. The growth of low priced, high quality products of foreign firms suggests that this point perhaps has not been understood adequately. With their traditional emphasis on product differentiation and advertising, marketers may have underestimated consumers' information level and their sensitivity to competitive quality and product improvement. Similarly, Bass (1979, p. 12–13), after reviewing the large number of econometric studies that show small advertising elasticities, concludes, "Hope springs eternal and advertisers continue to hope that clever advertising will sharply improve a brand's position in the market. This hope is seldom realized, however, except when the advertising is taken in conjunction with other events such as improvements or changes in the product."

For consumers, advertising cannot be used as a guide to either high or low product quality. Though a more heavily advertised brand may be of better quality, the relationship between advertising and product quality, albeit positive, is not large enough for advertising alone to be a good indicator of quality.

## APPENDIX A
## *RATIONALE FOR INCLUSION OF CONTROL VARIABLES*

In the analysis of the effect of quality on advertising, market share, and profit, controlling for exogenous variables is essential, especially if they also are correlated with quality and the dependent variable. From our review of the literature and *ad hoc* reasoning, we included the control variables listed in Table 1. A rationale for the inclusion of and restrictions on these variables follows, by equation.

*Equation 1: Advertising.* Besides quality, other strategic variables could affect the level of advertising. High prices, a large salesforce, new products, or a broad product line are likely to be associated with higher advertising levels. Later entrants are likely to advertise more than earlier entrants and pioneers.

*Equation 2: Market share.* As in equation 1, a larger salesforce or a broader line is likely to be associated with higher market share. In contrast, businesses entering late or with more new products are likely to have lower market shares. Market share also is likely to be related inversely to number of competitors and to prices.

*Equation 3: Relative cost.* Costs are likely to be higher for higher investment intensity and for more unionized businesses. Because of economies of scale, costs are likely to decline with capacity utilization and vertical integration.

*Equation 4: Profit.* The variables listed for equation 3 also affect profit, but in the opposite direction.

All of these hypotheses are confirmed with the exception of the following. The effect of salesforce on market share and that of vertical integration on costs are not different from zero and so fixed in the 3SLS analysis. There is a significant positive effect from vertical integration to market share and this coefficient was estimated in the 3SLS analysis. A possible reason is that vertically integrated businesses have better contracts and controls with suppliers and distributors, which enhance market share.

## APPENDIX B
## *DEFINITION OF VARIABLES*

*Key Variables*

*Relative product quality.* The percentage of the business' sales volume accounted for by products and services that from the perspective of the customer are assessed superior minus those assessed inferior to those available from the three leading competitors. The quality measure is thus a global measure of the benefit a consumer receives from the product package.

*Relative advertising.* A 5-point scale measure of whether the business' expenditure on media advertising in relation to sales was much more, more, equal to, less, or much less than that of the three leading competitors.

*Market share.* Sales of the business as a percentage of the served market. The served market is a geographic region within which the business markets to a distinct set of consumers a product similar to that of a distinct set of competitors under distinguishable brand names. (Sales to the served market exclude exports from but include imports to the geographic region.)

*Profit.* Measured by ROI. ROI is income divided by investment. Income is total sales less total costs. Investment is the sum of all working and fixed capital associated directly or proportionately with the operation of the business.

*Relative direct costs.* The sum of distributing, manufacturing, and materials costs per unit of the product as a percentage of the average level of the three largest competitors.

*Product life cycle.* A 4-point scale measure of whether the products of the business in the last three years could be categorized as in the introductory, growth, maturity, or decline stage of the traditional product life cycle. Because of inadequate observations, we categorized the introductory and growth stages as "early" PLC and the maturity and decline stages as "late" PLC.

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