Risk Aversion and Apparently Persuasive Advertising

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Abstract

One of the most well-established empirical facts is that exposure to advertisements increases a consumers’ tendency to buy the promoted product. The standard interpretation of this empirical regularity is that advertising intensity is an element of the utility. Here we show that if consumers are risk-averse and advertising conveys information about product attributes, the empirical regularity can be explained even without assuming that utility is directly a function of ad intensity.

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1. Introduction

Exposure to advertisements increases a consumers’ tendency to buy the promoted product.\(^1\) This has been called by some the “persuasive effect” of advertising (see, for example, Grossman and Shapiro 1984). Others have interpreted this evidence as support for the view of advertising as a form of brainwashing that changes consumer tastes.\(^2\) To address the possibility that advertising works by altering or manipulating consumer preferences, two recent theories present models that are consistent both with the empirical regularity and with rational consumers with stable preferences. The first approach demonstrates that in equilibrium ad intensity signals product quality (Nelson 1974, Milgrom and Roberts 1986). The second suggests that advertisements are complements to the good being promoted (Becker and Murphy 1993). Both these theories have been influential in arguing how non-informative advertising works.\(^3\) As it turns out, however, recent studies in marketing have shown that over eighty percent of all ads contain some information. Consequently, non-informative advertising, while important, may be a narrow category.

This paper proposes a simple model of informative advertising that explains the empirical regularity described at the outset. The basic idea is that advertising conveys noisy information about product attributes. Consequently, the variance of a consumer’s expected utility is a negative function of ad intensity. The tendency of risk-averse individuals to purchase a product is then a positive function of ad intensity. Indeed, an individual may purchase a product that provides ex-post lower utility than another product simply because

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\(^1\) This empirical regularity is well established in both marketing (see, for example, Erdem and Keane 1996) and in economics (see, for example, Roberts and Samuelson [1988] using data on cigarettes, Stern and Trajtenberg [1998] using data on physicians’ choices of drugs, Nevo [2000] using data on cereals, and Shachar and Anand [1998] using data on television shows). It is worth noting that both Ackerberg [1998], using data on yogurt, and Shum [1999], using data on cereals, find significant effects of advertising among inexperienced consumers only.

\(^2\) Using a similar logic, Galbraith (1971), for example, argued in a colorful essay that “the economy for its success requires organized public bamboozlement.”

\(^3\) The focus on non-informative advertising is explicit in these studies. Milgrom and Roberts were directly concerned with the “amount of advertising (especially on television) [that] has little or no obvious informational content.” Similarly, Becker and Murphy write: “it is also ‘obvious’ that many ads provide essentially no information.”
she was exposed to more ads for it.

An implication of this line of argument is that the effect of informative advertising on risk-averse consumers may be observationally equivalent to the persuasive effect of ads on risk-neutral consumers. The significance of this logic is highlighted in a recent pair of studies and a particular empirical setting. Specifically, using a model where advertising enters consumers’ decisions through both the utility and the information set, we (Anand and Shachar 2002) structurally estimate the effect of promotions for television shows on viewing choices of consumers. Although we find support for the informative nature of advertising, the estimates of the (apparently) persuasive component of ads are large. This paper suggests that the direct effect on utility might result from the risk neutrality assumption, and with risk-averse consumers this effect might vanish. Following this argument, Byzalov (2002) using the same data set, finds that individuals are indeed very risk averse and, interestingly, that once this is accounted for in the estimation, the persuasive effect disappears.

The rest of the paper proceeds as follows. Section 2 starts with several stylized facts that serve as motivations for the assumptions of the model. The model is described and analyzed in section 3. Section 4 offers some concluding remarks.

2. Elements of the Model

**Consumer Uncertainty** Several prior studies assume that consumers are typically uninformed about the existence or attributes of products (see, for example, Butters 1977, and Grossman and Shapiro 1984). Empirically, as well, product variety, new product introductions, and changes in product attributes are increasing in most markets as “consumers are now bombarded with choices” (“Brands: Who’s Wearing the Trousers?”, *The Economist*, September 8, 2001). Consequently, many observers argue, it is increasingly difficult for consumers to stay informed about the attributes of all alternatives. The model below describes such a setting, and assumes that consumers are uncertain about product attributes.
**Informative advertising** Previous studies typically adopt several approaches to measuring the information content in advertising. In an influential study, Resnik and Stern (1977) presented a method of “content analysis” to measuring what types of information are present in an ad. The analysis involved fourteen information categories or “cues”, such as price, quality, performance etc. For example, relevant questions about performance were: “What does the product do, and how well does it do what it is designed to do in comparison to alternative purchases?” Many subsequent studies followed this method and their results are summarized in a meta-analysis by Abernethy and Franke (1996). These studies found that, on average, 84 percent of all the ads (91,438 observations) contained at least one cue (58 percent have had at least two cues and 33 percent have had at least 3). While newspapers appear to include more informative advertising (98 percent of them contained at least one cue), ads in television were also quite informative (71 percent). The product categories that had the most informative ads were automobiles (97 percent) and furniture/home furnishings/appliances (96 percent).

At the same time, it is fair to say that the information in ads is noisy. In 1979, the Educational Foundation of the American Association of Advertising Agencies surveyed nearly 2,700 consumers about the content of 60 thirty-second televised communications—including ads, public service communications, and editorial content. They found that about 29 percent of the communications (ads or other content) were miscomprehended by consumers, as measured by a particular series of true-false questions (Jacoby and Hoyer [1982]). A second study was conducted a few years later and included print (magazine) ads and editorial content. In this study, about 1,250 consumers were asked questions about fifty-four full-page magazine ads and another fifty-four editorial pages. Roughly 20 percent of the material was miscomprehended, with another 15 percent being simply “not understood” (Jacoby and Hoyer [1989]). Consequently, it is natural to formulate advertising as a *noisy* signal on product attributes.
3. The Model

3.1. The setting

There are two firms denoted by \( j \), i.e., \( j = \{1, 2\} \). Each firm offers a single product. The products are characterized by their attributes \( x_j \) and price \( p_j \). There is one consumer.

The attributes of the products are determined exogenously through a stochastic process. Specifically,

\[
x_j \sim N(\mu_x, \frac{1}{\theta_x}) \quad \text{for} \quad j = \{1, 2\}
\]  

(3.1)

3.2. The utility

The utility of the individual from product \( j \) is given by:

\[
U_j = \alpha_0 + \alpha_1 x_j + \alpha_2 x_j^2 - p_j
\]

(3.2)

where \( \alpha_0 > 0, \alpha_1 > 0 \) and \( \alpha_2 < 0 \). This utility structure incorporates risk aversion in a simple way. Note that this structure of the utility is consistent with the ideal-point model.\(^4\)

For simplicity we also assume that \( \alpha_0 \) is large enough so that the individual always prefers to buy a product. Further, it is assumed that she needs only one product.

3.3. The information set

Although prices \( p_j \) are known to the individual, the attributes \( x_j \) are unknown. The individual has two sources of information about \( x_j \). First, the stochastic process that determines the product attributes (equation 3.1) is common knowledge. Second, the individual is exposed to \( N_j \) informative advertisements from firm \( j \). As in Anand and Shachar (2002) advertising is formulated as an unbiased noisy signal on product attributes. Specifically,

\[
S_{j,n} = x_j + \varepsilon_{j,n} \quad \text{where} \quad \varepsilon_{j,n} \sim N(0, \frac{1}{\theta_s}) \quad \text{for} \quad n = 1, ..., N_j
\]

(3.3)

\(^4\)Anderson, de Palma, and Thisse (1992) refer to the ideal point model as the address model.
where \( n \) indexes the number of the signal, and \( \varepsilon_{j,n} \) is independent across products and signals.

### 3.4. The expected utility

The expected utility of the individual from product \( j \) is:

\[
E(U_j|\{S_{j,n}\}) = \alpha_0 + \alpha_1 E(x_j|\{S_{j,n}\}) + \alpha_2 E(x_j^2|\{S_{j,n}\})^2 + \alpha_2 V(x_j|\{S_{j,n}\}) - p_j
\]

It is well-known that when individuals are risk averse their expected utility from each product depends not only on the expected attribute of that product but also on other moments of the distribution of attributes. In the specific example used here (of a quadratic utility function), the expected utility depends also on the variance of the attributes.

Using Bayes rule we know that:

\[
E(x_j|\{S_{j,n}\}) = \frac{\theta_x \mu_x + \theta_s \sum_{n=1}^{N_j} S_{j,n}}{\theta_x + N_j \theta_s} = \frac{\theta_x \mu_x + N_j \theta_s x_j}{\theta_x + N_j \theta_s} + \frac{\sum_{n=1}^{N_j} \varepsilon_{j,n}}{\theta_x / \theta_s + N_j}
\]

and

\[
V(x_j|\{S_{j,n}\}) = \frac{1}{\theta_x + N_j \theta_s}
\]

Since the researcher observes \( x_j \) but not \( \varepsilon_{j,n} \) it is useful to rewrite the expected utility as:

\[
E(U_j|\{S_{j,n}\}) = \alpha_0 + \alpha_1 \left[ \frac{\theta_x \mu_x + N_j \theta_s x_j}{\theta_x + N_j \theta_s} + \bar{\varepsilon}_j \right] + \alpha_2 \left[ \frac{\theta_x \mu_x + N_j \theta_s x_j}{\theta_x + N_j \theta_s} + \bar{\varepsilon}_j \right]^2 - p_j
\]

where \( \bar{\varepsilon}_j \sim N(0, \frac{N_j \theta_s}{[\theta_x + N_j \theta_s]^2}) \)

The expected utility in (3.7) illustrates the two effects that exposure to advertisements has on choices: (1) the “informative effect”, and (2) the “apparent persuasive” effect.

The “informative effect” is presented in the first line of equation 3.7. As \( N_j \) increases the expected utility is closer (on average) to the actual utility. In the limit, as \( N_j \) approaches

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5 Recall that \( V(z) = E(z^2) - [E(z)]^2 \).
infinity, the expected utility is equal to the actual utility. To illustrate this point consider the difference between $E(x_j|\{S_{j,n}\})$ and $x_j$:

$$E(x_j|\{S_{j,n}\}) - x_j = \frac{\theta_x(\mu_x - x_j)}{\theta_x + N_j \theta_s} + \frac{\theta_s \sum_{n=1}^{N_j} \varepsilon_{j,n}}{\theta_x + N_j \theta_s}$$  (3.8)

As $N_j$ increases, the first element decreases, and the second element (by the “law of large numbers”) approaches the expected value of $\varepsilon_{j,n}$, which is zero. Thus, as $N_j$ increases, the first line of equation (3.7) gets closer to the actual utility (equation 3.2).

The informative effect of advertising on consumption can be either positive or negative. In other words, focusing on the first line in (3.7), we get that as $N_j$ increases the individual’s tendency to purchase the promoted product might either increase or decrease. The individual’s response depends on the sign of $(x_j - \mu_x)$, and on the parameters $\alpha_1$ and $\alpha_2$. For example, if $x_j < \mu_x < -\frac{\alpha_1}{2\alpha_2}$, then the individual’s tendency to purchase the promoted product decreases with $N_j$, on average. Intuitively, when the utility from consuming a product is low (i.e., $x_j < \mu_x$), obtaining additional product-specific information—such as from advertising—will decrease the consumer’s tendency to purchase the product. Anand and Shachar (2002) present evidence for this type of “consumption-deterring” aspect of informative advertising.

Consumer aversion to risk introduces an additional effect that is presented in the second line of (3.7). Unlike the first effect, the new effect is not ambiguous. Since $\alpha_2 < 0$, an increase in the number of ads that the individual was exposed to increases $\frac{\alpha_2}{\theta_x + N_j \theta_s}$ and thus increases the expected utility. In other words, exposure to an ad increases the consumer’s tendency to purchase the promoted product. Since this effect is always positive, we term it the “apparent persuasive” effect. The rationale behind this result is the following. Since ads are informative, each exposure to an ad reduces the uncertainty associated with the promoted product and thus the risk involved in consuming it. Risk-averse consumers will therefore increase their tendency to purchase a product when they are exposed to additional ads about it. This also means that for consumers whose sensitivity to risk is not too small, the tendency to purchase a product might increase even if they learn (through the informative advertising) that the
expected value of $x_j$ is small.

This illustrates the logic by which risk aversion can lead to the empirical regularity cited at the outset of this paper.

4. Discussion

The simple model presented here should be only considered an example of how risk aversion can lead to observed behavior that is consistent with the persuasive effect of advertising. A recent pair of studies show how ignoring risk aversion may indeed result in confounding the informative and persuasive roles of advertising. Specifically, Anand and Shachar (2001) estimate the impact of advertising for television shows on viewing choices of risk-neutral consumers, and show that both effects of advertising (the informative and persuasive) exist. Byzalov (2002) extends this study to incorporate risk-aversion in utility and finds that the estimated persuasive impact of advertising is then negligible. Whether a similar result obtains in other product markets is an empirical question.

References


