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Information flowing into a market from firms can stimulate competitive activity and consumer dynamics that ultimately improve the functioning of that market (e.g., improve product quality). However, prior research has provided limited empirical evidence regarding the conditions under which (1) information confers such benefits on the market, (2) firms make strategic use of such information flows, and (3) consumer behavior influences the achievement of these market effects and strategic benefits. The author performs a longitudinal quasi-experiment to investigate these issues using the introduction of the Nutrition Labeling and Education Act (NLEA) as a research context. Results indicate that information did promote consumer dynamics that may have fostered competitive activity among firms. Specifically, marketers changed the quality of base brands and their brand extensions in unique and opposite ways that enabled brands to occupy distinct strategic positions in the market. Market information also influenced the nature of competitive rivalry by shifting price promotion levels depending on the healthy positioning of firm brands. Such approaches were speculated to provide firms with a means of coping with the uncertainty of competitive and consumer reactions to the NLEA, extending theories of the market-level effects of information to include the strategic use of such information by firms.

## Market-Level Effects of Information: Competitive Responses and Consumer Dynamics

It has long been observed that information influences both individual consumer activities and market-level outcomes. As a field, marketing generally has focused on individual consumer outcomes associated with information. Originating in the economics literature, investigations into the market-level effects of information suggest that information flows can promote firm responses, such as improved

product quality or lower prices, that increase the competitiveness and efficiency of the entire market (Beales, Craswell, and Salop 1981; Salop 1976, 1977; Schwartz and Wilde 1985; Stigler 1961; Stiglitz 1979).

The flow of information into markets generally occurs in one of two ways. First, information can flow into markets because of a proactive move by firms that provide price or quality information to consumers as part of their competitive strategies (e.g., Krishnamurthi and Raj 1985). One recent example of this occurred when firms in the ready-to-eat (RTE) cereal industry began providing fiber information to consumers and making claims about the linkage of fiber to the reduction of cancer. This strategic move set into motion an era in which health claims became an important part of the competitive landscape in the marketing of food products (Levy and Stokes 1987). Second, information can flow into markets from a source external to an industry. For example, *Consumer Reports* can provide information about firms in an industry (e.g., Tellis and Wernerfelt 1987), regulations can require information disclosure (e.g., tar and nicotine information [Mazis et al. 1981], alcohol warning labels

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[Scammon, Mayer, and Smith 1991], or energy efficiency ratings [McNeil and Wilkie 1979]), or regulations are removed, which increases the flow of information in an industry (e.g., when professional service providers [Benham 1972; Bloom and Stiff 1980] and prescription drug companies [Cady 1976] were permitted to advertise directly to consumers).

This article addresses these two situations and others in which the flow of information goes beyond that of a single firm to situations in which many, if not all, firms in an industry provide similar types of information to the market. This type of external information flow is termed *market information*. One goal of this article is to develop and test a framework that examines competitive activities associated with market information. When these competitive responses collectively change the way the market functions in a given industry, they are termed *market-level effects*.

The marketing literature has dealt with the market-level effects of information in three ways. First, it provides descriptive accounts of how information flows of this type influence the market, suggesting that information can have a market-perfecting benefit of improved product quality (e.g., Bloom 1997; Mazis et al. 1981). Second, the literature investigates how the provision of quality information or price information through public sources, such as *Consumer Reports* (Hjorth-Anderson 1984; Tellis and Wernerfelt 1987), or private sources, such as promotional or packaging sources (e.g., Krishnamurthi and Raj 1985), affects consumer price sensitivities and market equilibrium outcomes. For example, Tellis and Wernerfelt (1987) demonstrate that the equilibrium correlation between price and quality generally increases with the level of information in the market and that this correlation can be negative when the information level is low. Hjorth-Anderson (1984), in contrast, documents high levels of inefficiency in markets even in the presence of consumer information. Third, research examines how competitive activity involving the provision of health claim information has influenced the fiber content of cereals (Ippolito and Mathios 1991). This research provides evidence of improvements in fiber content; however, the role of health claim information in producing this effect is unclear.

Therefore, empirical evidence about the market-level effects of information is both limited and mixed in its conclusions. Furthermore, the literature has not provided insight into how firms might use such market information as *strategic tools* in designing marketing strategies, only suggesting that such information can benefit the entire industry (Posner 1974; Stigler 1974) or firms with specific competencies (Moorman 1995; Mitnick 1981; Wood 1986). Systematic empirical investigations into the strategic implications of market information are virtually nonexistent. Finally, research has not addressed the conditions under which information flows to the market fail to facilitate competitive activity among firms.

In addition to the market-level effects of information, this article also examines the consumer dynamics theorized to motivate competitive responses and promote positive market transformations. Theory holds that activist consumers use market information to signal firms to improve their offerings by altering their choices or complaining to firms or government sources (Moorman and Price 1989; Salop 1976;

Salop and Stiglitz 1977). These signals, in turn, cause sellers to compete on the basis of disclosed attributes, which results in positive market externalities such as better products and a more competitive marketplace. Prior research in marketing has examined empirically the individual consumer cognitive mechanisms by which these effects are achieved (Mitra and Lynch 1995). However, there have been no empirical studies of these consumer dynamics underlying the market-level impacts of information.

I use the Nutrition Labeling and Education Act of 1990 (NLEA) (21 U.S.C. 343), which mandated the adoption of a uniform nutrition label, as the context to examine these theoretical issues. I examine three questions relating to the market-level effects of information. First, under what conditions does market information generate competitive responses that have market-perfecting benefits such as improved product quality? Second, to what extent do firms make strategic use of this market information? Third, how does consumer behavior influence the achievement of these market and strategic benefits? In the next section, I describe the theoretical basis of these questions. This is followed by a description of my study method, a presentation of results, and a discussion of the findings.

### CONCEPTUAL FRAMEWORK

Prior research suggests three fundamental ways in which information influences the market: (1) by improving the quality of products in the market, (2) by shifting the nature of competition in the market, and (3) by increasing consumer activism in the market.

#### *The Impact of Market Information on the Quality of Offerings*

The standard economic view of competitive markets is based on several assumptions: the existence of many small firms that lack the ability to influence the marketplace alone, free entry and exit, and that consumers are endowed with perfect information (Scherer and Ross 1990). The reality of the marketplace, however, is that most markets are imperfect—containing incomplete information on relevant product attributes (Federal Trade Commission 1979). Most markets contain incomplete information for several reasons: the entry of new firms (Stiglitz 1979), the existence of experience goods (Nelson 1970), the technical complexity and multicomponent nature of products (Maynes and Assum 1982), and the lack of competition to provide information.

The role of information in influencing the market has been described by many researchers. Salop (1976) was among the first to document the market-perfecting role of information. Following Stigler (1961), he noted that when information is made available in the market, the costs of search decrease and the benefits of search increase. In this informed state, consumers make choices that improve the efficiency of the market. This occurs because consumer choices act as signals to firms to compete on attributes contained in the selected brands. As Mazis and colleagues (1981, p. 12) note, “improved product quality occurs whenever new information allows some consumers to alter their choices, thus providing a signal to sellers to change their products.” They then suggest that the FTC-forced disclosure of tar and nicotine levels on cigarette pack labels resulted in an increase in the number of low tar and nicotine products available in the marketplace.

From this research, it is expected that increased levels of information in the marketplace will improve the quality of offerings. Given that the context of the present investigation involves the increased provision of nutrition information as mandated by the NLEA, the focus will be specifically on the *nutritional quality* of competitive offerings.

I suggest that there are two predominant ways in which nutritional quality is likely to be influenced. The first is to improve the nutritional quality of base brands. *Base brands* are defined as brands that are not positioned with regard to nutrition (e.g., regular as opposed to low-fat Jif peanut butter). Given this positioning, (1) these brands would not necessarily be biased toward competing on nutrition, (2) these brands might show greater incremental nutritional quality effects associated with the provision of nutrition information, and (3) an improvement in their nutritional quality might benefit consumers who typically do not purchase nutritionally positioned products in a category. I suggest that market information is likely to improve the nutritional quality of base brands by reducing negative attributes (e.g., fat) or increasing positive attributes (e.g., vitamins) (Russo et al. 1986). It is hypothesized that

H<sub>1</sub>: The greater the level of nutrition information available in the marketplace, (a) the lower the level of negative nutritional attributes or (b) the higher the level of positive nutritional attributes among base brands.

The second way in which higher levels of market information can influence the quality of competitive offerings is to improve the nutritional quality of *brand extensions* associated with base brands. As with base brands, this improvement can occur by reducing negative attributes or increasing positive attributes. Both areas of competition are compatible with the view that information has a market-perfecting role. Therefore, it is hypothesized that

H<sub>2</sub>: The greater the level of nutrition information available in the marketplace, the greater the number of brand extensions claiming to have (a) lower levels of negative nutritional attributes or (b) higher levels of positive nutritional attributes.

#### *The Impact of Market Information on the Nature of Competitive Rivalry*

In addition to competing more heavily on the basis of nutritional quality, market information should promote competitive rivalry among firms in other ways as well (Salop 1976). The basis of that competitive rivalry is likely to depend, however, on whether the brand generally is considered to be healthy or unhealthy. When the brand is healthy, I speculate that the basis for competition will be nutritional quality, because the brand has a differential advantage over competing brands in this area. Because of these advantages, firms will be less likely to resort to price promotion to provide value to consumers. Instead, value accrues from the nutritional quality of the brand itself, which appeals to a less price-sensitive market segment trying to satisfy nutritional needs. Conversely, for unhealthy brands—which are required to disclose nutritional status under the NLEA—it is likely that firms will turn to price promotion competition to provide value in the form of lower

prices to consumers.<sup>1</sup>

Given this, I theorize that the nutritional quality of brands interacts with the provision of market information to influence the nature of competitive rivalry among firms. Specifically, healthy brands will continue to compete on nutrition, whereas unhealthy brands will shift to price promotion competition. It is hypothesized that

H<sub>3</sub>: The greater the level of nutrition information available in the marketplace, (a) the greater the level of price promotion activity for unhealthy brands, whereas (b) a smaller change or no change in price promotion activity is expected for healthy brands.

#### *The Impact of Market Information on Consumer Activism*

In addition to describing the market-perfecting benefits of information, theory also describes the consumer mechanism by which these benefits can be achieved. Central to understanding this mechanism is the assumption that information search and processing are not costless and that consumers vary in the extent to which they perceive these activities as representing costs and benefits (Russo 1987; Russo et al. 1986; Stigler 1961). Given this variation, not all consumers in the market for a particular product will search for information. Instead, some of them will free-ride off the efforts of those consumers who have lower search costs and find greater benefit in using information—often labeled “information-sensitive” consumers (Price, Feick, and Higie 1987; Thorelli 1971; Thorelli and Engledow 1980). This is possible because the benefits of information search have a public good status. Specifically, all consumers, even those not using information, benefit from those consumers who do use it (Capon and Lutz 1979, 1983; Moorman and Price 1989).

This occurrence has been described by several researchers (Salop and Stiglitz 1977; Stiglitz 1979). Salop (1976), for example, suggests that there are two types of consumers—those with high search costs and those with low search costs. He argues that if both groups are informed, competitive equilibrium will be obtained. However, even in the presence of uninformed consumers, a competitive equilibrium can be achieved because, as Salop (p. 242) suggests, “this is an example of the externality informed consumers give to the uninformed. The weight of their search keeps the market competitive.” Padberg (1977, p. 9) observes the role of informed consumers as well when he notes, “A small minority may exert a disciplinary influence on prices in the market in general.” Finally, Dunn and Ray (1980, p. 251) describe the role of *Consumer Reports* subscribers who police the market:

<sup>1</sup>This expected shift does not presume that consumers were completely ignorant of the health level of certain product categories prior to the NLEA. Consumers generally were aware that some categories were more unhealthy relative to others (e.g., potato chips versus orange juice). However, despite this general knowledge, it is not clear that consumers had a sense of the absolute unhealthiness of various categories and the brands contained in them. Therefore, I believe it is reasonable to assume that managers expect consumers to react to the NLEA by becoming more or less price sensitive depending on brand nutritional quality. This prediction does not account for the hedonic aspects of brand quality or consumer choice because of data constraints. Taste will influence consumer choice in food categories in important ways, therefore weakening my prediction. However, the prediction remains fairly robust for much of the market—with the exception of alternatives that are high in price, high in taste, and low in nutrition.

Thus, the market can both respond more rapidly to new products and act to eliminate overpriced and poor quality providers more effectively in the presence of an information service (*Consumer Reports* magazine) than without it. The market's behavior in this case benefits both subscribers and nonsubscribers, and if subscribers represent only a few percent of the consumers, it is evident that the benefits to non-subscribers far outweigh the benefits to subscribers.

Although these insights have been an important contribution to understanding consumer responses to market information, no study has documented empirically these effects corresponding with the influx of market information. To guide my efforts to do so, I formally propose an interaction relationship between the introduction of market information and consumer types on marketplace activism outcomes. *Marketplace activism* can be expressed in the form of voice, exit, and loyalty behaviors (Hirschman 1970), where *voice behaviors* refer to consumer complaints, *exit behaviors* refer to the consumer leaving the marketing relationship, and *loyalty behaviors* refer to the consumer switching among brands and/or products.

In this interaction, information-sensitive consumers are expected to increase their marketplace activism when the level of market information is increased. They respond in this way because their higher levels of enduring motivation and ability translate into lower costs and higher benefits of searching for and using information (Capon and Lutz 1979; Houston and Rothschild 1980; Price, Feick, and Higie 1987). In contrast, consumers who are not information sensitive might experience some decrease in search costs when market information is available and easily processed. However, their lack of enduring motivation and ability to use nutrition information still results in fairly steep information costs and little perceived benefits associated with using market information (Moorman 1990). It is hypothesized that

- H<sub>4</sub>. The greater the level of nutrition information in the marketplace, (a) the greater the level of marketplace activism among information-sensitive consumers, whereas (b) a smaller change or no change in marketplace activism levels is expected for consumers who are not information sensitive.

## METHOD

### Overview

Three studies were undertaken to test these hypotheses. All three studies used the implementation of the NLEA as the intervention in a longitudinal quasi-experiment (Campbell and Stanley 1963; Cook and Campbell 1979).<sup>2</sup>

The NLEA required food manufacturers to provide nutrition information about their products in a truthful and complete manner by May 1994. The goals of this regulation were to reduce the negative effects of untruthful and exaggerated nutrition claims and to require nutrition information at the point of sale to increase the extent to which consumers

could process and use it in their choices (58 *Fed. Reg.* 2065–2964; 58 *Fed. Reg.* 631–691).

The first and second studies test the first three hypotheses using data collected from product labels and from ACNielsen scanner data sources across time periods before and after the implementation of the NLEA. The third study examines the fourth hypothesis by surveying consumers before and after the implementation of the NLEA. Table 1 summarizes the methodologies used for each study.

### *The Impact of Market Information on the Quality of Offerings (H<sub>1</sub>–H<sub>2</sub>)*

*The impact on base brands.* The first study used a longitudinal design with product label evaluations at five points in time surrounding the May 1994 implementation of the NLEA—a national regulation. The five evaluations were of label information in 1987, 1991, 1993, 1995, and 1996. The 1993, 1995, and 1996 data were collected from actual product labels in the summer of each year in local Cub Foods Stores, which are part of a large supermarket chain carrying most national, regional, and local brands. There were many occasions when label information was not available in 1993 because, prior to the NLEA, label disclosure was necessary only if an explicit health claim was made. The 1987, 1991, and missing 1993 data were obtained by writing to the firms that owned the brands and asking them to complete a questionnaire requesting nutrition information for each year. Firms typically had such information and were willing to share it. However, individual nutrient information was not always complete on returned surveys but typically ranged between 60 and 100% depending on the nutrient. Details regarding how missing data were managed are discussed subsequently.

I am aware that some firms, in an attempt to gain a competitive advantage with the NLEA, introduced the new labels early. However, the in-store estimates suggest that this activity was low (1% of products checked included the new nutritional labeling five months preceding the NLEA), which suggests that the internal validity threat associated with “history” is not a viable rival hypothesis (Campbell and Stanley 1963).

One hundred twenty-four “base” (non-nutritionally positioned in the product category) brands were selected randomly within two strata from 21 different product categories. The two strata were large- and small-share brands with six brands selected from each product category (only four brands of canned corn were chosen because there were only four available at the store). These strata were determined using 1993 published share levels in *Simmons Media Surveys*. In each category, the median share level was calculated; brands above it were considered high share, and brands below it were considered low share. If, upon arriving at the store, graduate student evaluators could not locate the randomly selected brand, another brand was selected randomly from within the same stratum. The categories were orange juice, cake mix, cake frosting, peanut butter, RTE cereal, margarine, salad dressing, cheese, oils, crackers, cookies, potato chips, pasta, frozen dinners, ice cream, non-frozen yogurt, hot dogs, bread, soup, frozen pizza, and canned corn. In each of these categories, the brands were selected so they would not vary on too many characteristics, thereby reducing the level of unnecessary noise in the data. For example, all selected brands of yogurt were strawberry,

<sup>2</sup>As Campbell and Stanley (1963, p. 34) note, a quasi-experimental design is appropriate when “the research person can introduce something like experimental design into his scheduling of data collection procedures (e.g., the when and to whom of measurement), even though he lacks the full control over the scheduling of experimental stimuli (the when and to whom of exposure and the ability to randomize exposures), which makes a true experiment possible.”

Table 1  
SUMMARY OF HYPOTHESES AND MEASURES

	Sample	Data Source	Years Examined	Independent Variables	Dependent Variables
<b>H<sub>1</sub>: Impact on Base Brands</b>	124 brands from 21 product categories	Label data collected from stores	1987, 1991, 1993, 1995, 1996	Year (1993 versus 1996)	Improvements in nutritional quality involving decreases in negative nutrients and increases in positive nutrients
	Rival Hypothesis Test	Same	Same	Year (1987-1993 versus 1993-1996)	Same
<b>H<sub>2</sub>: Impact on Brand Extensions</b>	124 brands from 21 product categories	Brand counts collected from stores	1993, 1995, 1996	Year (1993 versus 1996)	Number of brand extensions involving decreases in negative nutrients and increases in positive nutrients
	Rival Hypothesis Test	3000 new brand introductions	1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996	Year (1989-1993 versus 1994-1996)	Same
<b>H<sub>3</sub>: Impact on Competitive Rivalry</b>	124 brands from 21 product categories	ACNielsen scanner data Nutritionists' ratings	1991, 1992, 1993, 1994, 1995	Interaction of year (1993 versus 1995) and brand healthiness	Level of price promotion
	Rival Hypothesis Test	Same	Same	Same (1991-1993 versus 1993-1995)	Same
<b>H<sub>4</sub>: Impact on Consumer Activism</b>	465 consumers	Survey of consumers	1993 versus 1995	Interaction of consumer type (average versus information-sensitive) and year (1993 versus 1995)	Direct and indirect market activism behaviors toward the government, channel, product category, and brand

all brands of frozen pizza were pepperoni, and all brands of hot dogs were beef/pork combinations.

Although six brands were selected randomly from each category, the sampling approach reflected a disproportional stratified approach because the population sizes varied across product categories (i.e., there could be 10 brands of hot dogs and 100 brands of RTE cereal in the market). To correct (post hoc) for this disproportionate approach, the sample was weighted on the basis of the population proportions in each stratum (Wonnacott and Wonnacott 1990). Incorporating this weighting allows for greater precision in estimates (Churchill 1991). To perform this weighting, the evaluators counted the number of brands in each category on the shelves in the store where the brands were evaluated for the study. The total number of brands then was divided into the total number of brands across all categories to create a product category weight that was proportional to the level of that strata (e.g., product category) in the population. These weights were multiplied by all variables prior to the data analysis.

Nutrition information for the base brands in the sample included serving size, sodium, fats, vitamins, and minerals. Package size information and price information also were collected. In examining the change in nutrient levels, it was necessary to eliminate changes due to increases or decreases in serving size, which is typically how nutrient levels are presented (i.e., on a per-serving basis). This was especially important given that the NLEA mandated that serving sizes reflect more typical food consumption patterns. To eliminate these effects, nutrients were divided by serving size within year before examining differences between years.

Because I was interested in the effect of the NLEA on the overall change in a brand's nutritional quality—not merely the change in a single nutrient—an index was computed that reflected the overall change to each brand's nutrition level between 1993 and 1996. This three-year time period allows for comparison from pre-NLEA to post-NLEA and provides a sufficient time period to observe the market-perfecting benefits of information. Specifically, the levels of ten nutrients were compared between 1993 and 1996; each time a negative nutrient decreased or a positive nutrient increased, a +1 was added to the index, and each time a negative nutrient increased or a positive nutrient decreased, a -1 was added to the index. The five negative nutrients were sodium, total fat, saturated fat, unsaturated fat, and cholesterol; the five positive nutrients were vitamin A, the total of vitamin Bs, vitamin C, calcium, and iron. To test  $H_{1a}$ – $H_{1b}$ , two separate indexes were calculated—one composed of the five negative nutrients and one composed of the five positive nutrients. Each scale ranged from +5 to -5. In the case of the negative (positive) nutrient index, a +5 means that all nutrients decreased (increased), and a -5 means that all nutrients increased (decreased).

The nutritional quality indices also were constructed to ensure that base brand comparisons within and across time periods were not influenced by missing values. Therefore, if five positive nutrients produced an index score of +5, this score was adjusted so that it was comparable to four positive nutrients producing an index of +4. This adjustment involved dividing each score by the number of nutrients used to create the index (e.g., +5/5 nutrients = 1.0 and +4/4 nutrients = 1.0), reducing the range from +1 to -1. Given this approach, the index was not sensitive to the number of nutrients used to construct it.

To rule out the rival hypothesis that the change from 1993 to 1996 was not due to the NLEA and instead was part of a general trend in the marketplace, these indexes also were computed using data from 1987 to 1993. This level of change then was compared with the change from 1993 to 1996.

*The impact on brand extensions.* In addition to collecting nutrition information from each of the base brands, evaluators counted the number of healthy brand extensions in the proximate area of the store in 1993, 1995, and 1996. A *healthy brand extension* was defined as any brand with the same brand name as the base brand that claimed to have reduced negative nutrients (e.g., lower fat) or increased positive nutrients (e.g., added calcium). This approach was adopted over collecting a complete record of the nutritional content of each extension because of the large number of brands in the sample and the large number of brand extensions. Therefore, though healthy brand extensions might not be healthier overall relative to their base brands, they are positioned as nutritionally superior on one or more attributes.  $H_2$  was tested by examining the change in the mean number of healthy brand extensions involving an increase in a positive nutrient (e.g., calcium) or a reduction in a negative nutrient (e.g., fat) between 1993 and 1996.

To eliminate the rival hypothesis that a change in the number of healthy brand extensions was part of a more general market trend and not due to the NLEA, healthy brand extension levels ideally would be compared across several years prior to the NLEA (as was done to test  $H_1$ ). However, historical data regarding the number of healthy brand extensions were not requested from firms when writing to them for other nutrition information. This was done because it was not clear that managers would be able to distinguish healthy brand extensions in their product portfolios. Therefore, other data were acquired to test this rival hypothesis.

Specifically, a complete listing of all new brands (in the 21 product categories) introduced during each summer between 1989 and 1996 was acquired from ACNielsen. Each of 3000 new introductions was defined individually using a dictionary of Nielsen codes and then coded for whether it reflected a decrease in negative nutrients or an increase in positive nutrients. Because a complete listing of nutrition information was not available, the brands were categorized using information contained in the list of brand names. For example, the brand name listing "Totino's Vegetarian Pizza, Low Fat" was categorized as involving the reduction of negative nutrients. Therefore, categorization was straightforward and unambiguous. The categorization of the new brands were then compared from 1994–1996 to 1989–1993.<sup>3</sup>

### *The Impact of Market Information on the Nature of Competitive Rivalry ( $H_3$ )*

The second study examined the impact of increased market information on the nature of competitive rivalry among

<sup>3</sup>The comparison of 1994–1996 with 1989–1993 is used to rule out the rival hypothesis, because the goal is to examine mean changes in new brand introductions pre-NLEA and post-NLEA. This is different from the comparison used in  $H_1$ , in which the index of change in nutritional quality is derived as a function of time. Therefore, to see the change in nutritional quality over time, the comparison had to be between 1993 and 1996, because examining the change from 1994 to 1996 might show no change in slope.

firms using scanner data acquired from ACNielsen. The data involve mean price promotion competition levels for a 12-week period (August–October) across three time periods (1991, 1993, 1995) for all stores in the United States for the same 124 products in the sample. *Price promotion competition level* was measured as the average percentage reduction in price during each time period.

H<sub>3</sub> suggests that brand healthiness will moderate the relationship between the influx of market information and price promotion competition levels. Brand healthiness was measured by having two certified nutritionists independently evaluate each brand in terms of overall nutrition levels by rating it on a Likert scale, where 7 is “very healthy” and 1 is “not at all healthy.” The 1993 labels were used for this evaluation to establish a common benchmark of evaluation. This assessment reflected a measure of healthiness relative to all other products in the marketplace. Therefore, the scores varied from a high of 7 for some brands of pasta to a low of 1 for cake frosting.<sup>4</sup> Interjudge reliability assessments were 74.9%, which indicated adequate agreement between the nutritionists. Minor differences (e.g., between a rating of 2 and 3) were resolved by taking the mean of the two assessments. Major differences or researcher questions were resolved by asking the nutritionists to reevaluate the labels and produce a new assessment.

Therefore, the test of H<sub>3</sub> involved examining the impact of the NLEA (1993–1995) on the level of price promotion as moderated by brand healthiness. In addition, the rival hypothesis that such changes were part of a more general trend in the marketplace was investigated by examining the same relationship prior to the introduction of the NLEA (1991–1993).

#### *The Impact of Market Information on Consumer Activism (H<sub>4</sub>)*

*Basic design and procedures.* The third study used a longitudinal design with evaluations at two points in time surrounding the May 1994 implementation of the NLEA. The first evaluation occurred in January 1994, and the second occurred in May 1995. Both evaluations asked consumers to report on their behaviors in the previous year. Therefore, the first evaluation measured consumer behavior from January 1993 through January 1994, whereas the second evaluation measured consumer behavior from May 1994 through May 1995. Although it is acknowledged that consumers will suffer some degree of self-report biases by reporting more recent consumer behavior, these evaluations nevertheless reflect a 17-month difference. Moreover, as described previously, the internal validity threat associated with “history” (Campbell and Stanley 1963) was ruled out, given that few firms introduced the new labels into the marketplace early.

The sample consisted of two groups of consumers: a random sample of “average” consumers and a random selection of “information-sensitive” consumers. The random sample

of average consumers was generated by systematically sampling from telephone directories in three separate geographic locations in two states. In one state, two cities were selected; the first city was large and urban with a population of 617,000, and the second city was smaller with a population of 195,000. In the second state, the focal city was medium sized with a population of 362,700 and less urban than the first city. These sites were selected on the basis of two criteria. First, they were within working proximity of the principal investigator’s location, which helped in building the sampling frame and generating interest in the study. Second, they represented both urban and nonurban environments as well as small, medium, and large population centers.

The random sample of information-sensitive consumers was generated by systematically sampling from a national list of subscribers to the Center for Science in the Public Interest’s *Nutrition Action Healthletter*. Among the Center’s missions are the following goals (which are consistent with the needs of an information-sensitive consumer):

- (a) to provide useful, objective information to the public and policy makers and to conduct research on food, alcohol, health, the environment, and other issues related to science and technology and
- (b) to represent the citizen’s interests before regulatory, judicial, and legislative bodies on food, alcohol, health, and the environment, and other issues.

With regard to health behaviors, *Healthletter* subscribers tend to be in good health, exercise frequently, be more likely to take a vitamin supplement, and be more likely to consume healthy foods and beverages (*Center for Science in the Public Interest* 1994) than are average consumers.

Sample members were mailed a letter describing a study of how consumers use nutrition information and how they behave in the marketplace. They were told that the study had two parts and that they would be asked to complete an identical survey in a year. The only other requirement for participating was that the respondent had to do at least half of the household’s shopping to ensure interaction with food products in the marketplace. If the person receiving the letter did not meet this requirement, he or she was asked to pass the packet on to the member of the household who did. This happened in only 5% of the sample. If this occurred, the new respondent was asked to provide his or her name at the end of the questionnaire so that he or she could be recontacted in a year. An identification number in the upper right-hand corner of the questionnaire facilitated this matching process. No incentive was given, but respondents were told that their responses would be used in conjunction with hundreds of other responses for publication in academic journals. A follow-up mailing occurred in both the pre-NLEA and the post-NLEA conditions.

Response rates were roughly equivalent across the two groups in both waves of data collection. Table 2 reports that the average group response rate was 37.1% (347/935) in pre-NLEA compared with the information-sensitive group response rate of 45.5% (269/590). Likewise, in the post-NLEA condition, the response rates were 76.4% (253/331) for the average group and 80% (212/265) for the information-sensitive group. The numerator for the pre-NLEA and the denominator for the post-NLEA do not correspond perfectly as might be expected because several sample members either died or moved during the time period between

<sup>4</sup>The range of healthiness ratings for brands in each category was as follows: orange juice (6.00), cake mix (3.00–4.00), peanut butter (3.00–5.00), cereal (6.00–6.50), margarine (3.00–4.00), salad dressing (2.00), cheese (5.00–6.00), oils (2.50), crackers (4.00–5.50), cookies (3.00–4.00), potato chips (2.00–3.00), pasta (6.00–7.00), ice cream (3.00–4.00), yogurt (5.00–6.00), hot dogs (3.00–3.50), bread (5.00–6.50), soup (4.50–5.00), frozen pizza (5.00), canned corn (6.00), frozen dinners (4.00–5.00), and cake frosting (1.00).



Table 2  
SAMPLE RESPONSE RATES

<i>Pre-NLEA</i>				
<i>Consumer Group</i>	<i>Original Sample</i>	<i>Eligible Sample</i>	<i>Number of Responses</i>	<i>Response Rate</i>
Information-Sensitive	600	590	269	45.5%
Average	981	935	347	37.1%
City 1	330	325	130	40.0%
City 2	333	304	112	36.8%
City 3	318	306	105	34.3%
Total	1581	1425	616	41.3%
<i>Post-NLEA</i>				
Information-Sensitive	269	265	212	80.0%
Average	347	331	253	76.4%
City 1	130	121	96	79.3%
City 2	112	110	79	71.8%
City 3	105	100	78	78.0%
Total	616	596	465	78.2%

the two mailings and therefore were eliminated from the sample base in the post-NLEA period. However, the success of the second wave in retaining the majority of the subjects reduces the internal validity threat of mortality that often is associated with longitudinal studies involving the passage of time (Campbell and Stanley 1963).

Three weeks following the first mailing, nonrespondents were telephoned, reminded of the questionnaire, and encouraged to complete and return it. Two weeks following the calls, a second mailing was sent to nonrespondents. No systematic differences between those who responded before and those who responded after the second mailing on a subset of dependent variables were found: product return behavior ( $F_{(1,452)} = 1.081, p = .15$ ), brand exit behavior ( $F_{(1,452)} = .796, p = .18$ ), product category switching behavior ( $F_{(1,452)} = .216, p = .32$ ), store exit behavior ( $F_{(1,452)} = .011, p = .46$ ), company exit behavior ( $F_{(1,452)} = .592, p = .22$ ), complain to store ( $F_{(1,452)} = 1.169, p = .14$ ), and complain to consumer group ( $F_{(1,452)} = .287, p = .29$ ). Therefore,

nonresponse bias was not a concern (Armstrong and Overton 1977).

*Measurement.* Table 3 contains descriptive statistics for the measures used in this study. Two distinct types of measures were collected. The first set asked consumers to rate themselves on several attitudinal and motivational measures related to nutrition and marketplace activism. These included motivation to process, attitude toward complaining, and the importance of nutrition relative to other product attributes. These measures were used as manipulation checks to ensure that information-sensitive consumers are different from average consumers. All measures are noted in the Appendix.

Motivation to process nutrition information was measured using a five-item scale from Moorman (1990). Coefficient alpha for the scale was .91, which indicates that the items are highly correlated. Attitude toward complaining behavior was measured on a six-item scale drawn from Richins and Verhage (1985; see also Richins 1983). Item-to-total correlations revealed that two items had low correlations. Therefore, they were dropped from the measure. The final coefficient alpha was .71, which indicates satisfactory intercorrelations among the remaining items. Finally, the importance of nutrition relative to other product attributes was measured by asking respondents to rate the importance of nutrition on a seven-point scale, where 1 is "not at all important" and 7 is "very important."

As noted previously, these measures were used to verify that the sample of information-sensitive consumers was more motivated to process nutrition information, placed more importance on nutrition in brand choice, and had more positive attitudes about complaining behaviors. Given the theoretical linkages between these consumer characteristics, a multivariate analysis of variance model was used to compare average and information-sensitive consumers. The model was significant (Wilks'  $\Lambda = .841, F_{(3,908)} = 56.87, p = .001$ ), as were all of the individual univariate tests: motivation to process ( $F_{(1,910)} = 121.72, p = .000$ ), importance of nutrition ( $F_{(1,910)} = 143.65, p = .000$ ), and attitude toward complaining behavior ( $F_{(1,910)} = 21.29, p = .000$ ). In each case, the information-sensitive consumers scored higher than the average consumers: motivation to process (information-sensitive = 6.248 versus average = 5.332), importance of nutrition (information-sensitive = 6.453 versus average = 5.552), and attitude toward complaining (information-sensitive = 5.682 versus average = 5.361).

The second set of measures is grouped into two general clusters of consumer behaviors that had been performed

Table 3  
MEASUREMENT INFORMATION

	<i>Mean</i>	<i>Standard Deviation</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Motivation to Process Nutrition Information	5.76	1.33	.91							
(2) Attitude Toward Complaint Behavior	5.54	.95	.26	.71						
(3) Importance of Nutrition	5.97	1.22	.66	.17	na					
(4) Reported Use of Nutrition Information	5.45	1.41	.81	.24	.71					
(5) Direct Government Activism Behaviors	4.05	1.95	.11	.20	.11	.14	.79 <sup>a</sup>			
(6) Direct Channel Activism Behaviors	4.03	1.63	.19	.32	.23	.20	.42	.87		
(7) Indirect Channel Activism Behaviors	5.45	1.32	.15	.16	.12	.15	.27	.21	.60 <sup>a</sup>	
(8) Indirect Product/Brand Activism Behaviors	2.98	1.84	.10	.13	.13	.09	.18	.12	.29	.59

NOTES: The coefficient alpha for each measure is on the diagonal, and the intercorrelations among the measures are on the off-diagonal. Diagonals noted "na" are single-item scales. Correlations GE .09 are significant at  $p = .01$ .

<sup>a</sup>There are only two items in this scale. Therefore, a Pearson correlation is used, not a coefficient alpha.

over the past 12 months. First, consumers' reported use of nutrition information over the past year was assessed. This four-item scale asked consumers to rate the degree to which they used nutrition information on the label when making food selections. Coefficient alpha for the scale was .71, which indicates that the items are correlated adequately. Second, three types of marketplace activism—voice, exit, and loyalty behaviors (Hirschman 1970)—in which consumers engage when they are dissatisfied with food products were measured. In assessing voice behaviors, consumers were asked to report the extent to which they complained to (1) a family member or friend, (2) the company that manufactured the product, (3) the store carrying the product, (4) a consumer advocate or consumer organization, or (5) a government agency or official. Exit behaviors were measured by (1) brand exit behaviors, (2) brand return behaviors, (3) product category exit behaviors, (4) store exit behaviors, and (5) company exit behaviors. Loyalty behaviors were assessed by measuring brand switching behaviors and product category switching behaviors. These items were generated by relying on concepts and measures in Grønhaug and Zaltman's (1981), Day and Bodur's (1978), and Warland, Herrmann, and Moore's (1984) studies.

There are several reasonable conceptualizations of these dependent variables to use in the measure development process. For example, measures could be developed according to the exit, voice, and loyalty behaviors defined previously. Conversely, measures could be developed at the level of occurrence—whether at the brand, product category, or store level. Finally, measures could be developed by conceiving of these behaviors as more or less direct communication to firms.

Given these possibilities and little prior research to guide the analysis, an exploratory factor analysis was performed including all of the market activism behaviors. The result was a measurement approach that combined several of the a priori schemes discussed previously. Specifically, the factor analysis produced four types of market activism with eigenvalues greater than 1 with no cross-loading between the factors. These behaviors were more or less direct and aimed at various aspects of the market. Several behaviors involved consumer behavior that were direct in their impacts on the market (e.g., complaining to a store), whereas the indirect behaviors could be interpreted in multiple ways by firms—not just about consumer dissatisfaction with food products (e.g., brand switching).

The four behaviors were (with eigenvalues and explained variance in parentheses) (1) *direct government activism behaviors*, including complaining to consumer advocates or groups and government agencies (eigenvalue = 1.68; explained variance 16.8%); (2) *direct channel activism behaviors*, including complaining to stores, returning products to stores, and complaining to companies that manufacture the products (eigenvalue = 3.17; explained variance 31.8%); (3) *indirect channel activism behaviors*, including ceasing to purchase products from a company or store (eigenvalue = 1.05; explained variance 10.5%); and (4) *indirect product/brand activism behaviors*, including ceasing to purchase a brand or product category or switching to a new product category (eigenvalue = 1.11; explained variance 11.1%).<sup>5</sup> In

<sup>5</sup>Several behaviors were not part of any factor and subsequently were eliminated from the analysis. These included complaints to family and friends and brand switching behavior.

addition to establishing unidimensionality, subsequent tests also established scale reliability. Two of the measures involved only two items, and therefore the correlations of the items in each construct are reported and appear adequate: direct government activism behaviors ( $\rho = .79$ ) and indirect channel activism behaviors ( $\rho = .60$ ). The remaining two measures involved three items, and their Cronbach alphas were direct channel activism behaviors ( $\alpha = .87$ ) and indirect brand/product activism behaviors ( $\alpha = .59$ ). Although the latter reliability is low, the lack of prior measure development, together with the factor analytic and conceptual advantages of this measurement approach, resulted in the decision to retain this scale.

## RESULTS

### *The Impact of Market Information on the Quality of Offerings ( $H_1-H_2$ )*

*The impact on base brands.*  $H_1$  suggests that an increase in market information improves the nutritional quality of base brands by either increasing the positive nutrients or reducing the negative nutrients. This hypothesis was tested using two indexes of change in nutritional quality—one computed from changes in the five positive nutrients and the other from changes in the five negative nutrients. Two tests were undertaken using these indexes to test the following two questions: First, was there a change in the nutrition quality of base brands from 1993 to 1996? Second, was this change due to the NLEA or to more general trends occurring in the marketplace (1987–1993)?

To examine whether there was a change in overall nutritional quality from 1993 to 1996, the indexes of nutritional quality were examined against the null hypothesis of  $\mu = 0$  using a t-test comparing correlated means. Results indicate that there was a significant improvement in nutritional quality due to the addition of positive nutrients. Specifically, the mean change was positive and significant, which means that greater levels of positive nutrients were added following the NLEA ( $M = .044$ , standard deviation = .186;  $t_{(103)} = 2.460$ ,  $p = .008$ , one-tailed test).<sup>6</sup> Considering the change in nutritional quality due to the deletion of negative nutrients, results indicate a significant difference from zero as well ( $M = -.037$ , standard deviation = .182;  $t_{(114)} = -2.170$ ,  $p = .016$ ). However, the change is negative, which suggests that negative nutrient levels were higher (worse) following the NLEA. As an aside, the overall index of change in nutritional quality (composed of both positive and negative nutrients) was not significantly different from zero ( $M = .004$ , standard deviation = .199;  $t_{(118)} = .220$ ,  $p = .401$ ).

To gain better insight into the change between 1993 and 1996 and to examine whether the change between 1993 and 1996 was an improvement over more general trends in the marketplace, the same index of nutritional quality was computed for 1987–1993. The overall index of change in nutritional quality was not significantly different from zero ( $M = -.0003$ , standard deviation = .122;  $t_{(118)} = -.030$ ,  $p = .488$ ) nor did the index reflect the addition of positive nutrients ( $M = -.028$ , standard deviation = .184;  $t_{(52)} = -1.110$ ,  $p = .135$ ) or the reduction of negative nutrients ( $M = .011$ , standard deviation = .120;  $t_{(115)} = 1.040$ ,  $p = .150$ ).

<sup>6</sup>Because all hypotheses are directional, one-tailed tests are used throughout the analyses.

Next, the extent to which the change in 1993–1996 was different from the change in 1987–1993 was examined. Results indicate that there was a significant difference between the two time periods, with brands adding more positive nutrients between 1993 and 1996 versus 1987 and 1993 (.044 versus  $-.028$ ,  $t_{(155)} = 2.320$ ,  $p = .011$ ). Moreover, there was a significant difference between the two time periods for the deletion of negative nutrients ( $-.037$  versus  $.011$ ,  $t_{(229)} = -2.380$ ,  $p = .009$ ); however, it appears that brands worsened by deleting fewer negative nutrients between 1993 and 1996 relative to levels deleted between 1987 and 1993. In total, these results provide support for  $H_{1b}$  but fail to support  $H_{1a}$ .

*The impact on brand extensions.*  $H_2$  suggests that the NLEA would increase not only the quality level of base brands but also the number of healthy brand extensions associated with these base brands.  $H_2$  was tested by examining the change in number of healthy brand extensions involving the addition of positive nutrients and the deletion of negative nutrients between 1993 and 1996 using two regression models. In addition to year, 20 ( $k - 1$ ) product category variables were added to control for product category differences and eliminate pooling across product categories. A dummy variable also was added that reflected whether pre-NLEA labels already contained nutritional information in some form, with the reasoning that if nutrition information were present prior to the NLEA, the impact of the NLEA on these brands would be weaker.<sup>7</sup>

Results indicate that the model examining the change in the mean number of brand extensions involving the addition of positive nutrients was not significant overall (adjusted  $R^2 = -.028$ ,  $F_{(22,211)} = .702$ ,  $p = .834$ ). Moreover, the mean number of healthy brand extensions involving the addition of positive nutrients did not increase significantly from 1993 to 1996 ( $b = .038$ ,  $t = .586$ ,  $p = .27$ ). These results fail to support  $H_{2b}$ . Only the dummy variables for the cracker ( $b = .196$ ,  $t = 2.474$ ,  $p = .005$ ) and bread ( $b = .128$ ,  $t = 1.620$ ,  $p = .053$ ) product categories were significant positive predictors.

Conversely, the model estimating the change in brand extensions involving the deletion of negative nutrients was significant (adjusted  $R^2 = .174$ ,  $F_{(22,211)} = 3.244$ ,  $p = .001$ ). Moreover, model results indicate that the mean number of healthy brand extensions involving the deletion of negative nutrients increased significantly from 1993 to 1996 ( $b = .149$ ,  $t = 2.513$ ,  $p = .005$ ). These results support  $H_{2a}$ . Several of the product category control variables were also significant: soup ( $b = .152$ ,  $t = 2.162$ ,  $p = .015$ ), salad dressing ( $b = .175$ ,  $t = 2.527$ ,  $p = .006$ ), ice cream ( $b = .225$ ,  $t = 3.014$ ,  $p = .001$ ), bread ( $b = .121$ ,  $t = 1.706$ ,  $p = .040$ ), yogurt ( $b = .200$ ,  $t = 2.818$ ,  $p = .003$ ), cookies ( $b = .197$ ,  $t = 2.775$ ,  $p = .003$ ), crackers ( $b = .216$ ,  $t = 3.055$ ,  $p = .001$ ), and cheese ( $b = .343$ ,  $t = 4.840$ ,  $p = .001$ ). Finally, the model estimating the overall change in the number of brand extensions from 1993 to 1996 also was significant (adjusted  $R^2 = .210$ ,  $F_{(22,199)} = 3.680$ ,  $p = .001$ ,  $b = .179$ ,  $t = 3.002$ ,  $p = .003$ ).

To eliminate the rival hypothesis that the increase in healthy brand extensions was part of a more general trend in the market and not due to the NLEA, the sample of new brand introductions (1989–1996) acquired from ACNielsen

was used. Of the 3000 new introductions in this sample, there were 681 brand introductions in the 21 product categories across the seven-year period. Of these, only 6 involved an increase in positive nutrients,<sup>8</sup> 272 involved a reduction in negative nutrients, and 402 involved no nutritional positioning.

Considering first the brand introductions involving a reduction in negative nutrients, results indicate that the number of such introductions remained at a fairly constant level in the pre-NLEA period: 1990 (24), 1991 (33), 1992 (43), and 1993 (32). The only exception is 1989, when there were seven brands introduced that involved a reduction in negative nutrients. Excluding this first year, there does not appear to be a general increase in such brand introductions in the pre-NLEA period. However, the mean number of introductions with a reduction of negative nutrients did increase from  $M = 27.80$  (standard deviation = 13.44) in the pre-NLEA period to  $M = 44.33$  (standard deviation = 10.26) in the post-NLEA period,  $t_{(6)} = 1.96$ ,  $p < .05$ .<sup>9</sup> These results support  $H_{2a}$  and suggest that the increase in the number of brand introductions was not part of a general market trend.

Turning to the brand introductions involving an increase in positive nutrients, results indicate a small number of introductions with little to no variance in the pre-NLEA period: 1989 (1), 1990 (0), 1991 (2), 1992 (2), and 1993 (1). Results also indicate that the number of such brands decreased from a mean of 1.20 (standard deviation = .837) in the pre-NLEA period to a mean of 0 in the post-NLEA period,  $t_{(6)} = -3.21$ ,  $p < .05$ , which indicates rejection of  $H_{2b}$  as found in the main test of the hypothesis.

#### *The Impact of Market Information on the Nature of Competitive Rivalry ( $H_3$ )*

$H_3$  predicts that the healthiness of a brand will affect whether and to what degree the NLEA influences the use of price promotion strategies. Specifically, unhealthy brands are expected to respond to the NLEA by competing on price promotion, whereas healthy brands should show no change in price promotion levels. Given the form of this hypothesis, a moderator regression model was used. In this approach, the continuous predictor variable (brand healthiness) was mean-centered (Cronbach 1987), and the product of year and brand healthiness was used to construct their interaction. Then, following the recommendations of Cohen and Cohen (1983) and Pedhazur (1982), the main effects and the interaction term were entered into the model as predictors. In addition, 20 product category dummy variables were entered as well as a dummy variable reflecting whether pre-NLEA labels already contained some form of nutrition information.

Results indicate that the overall model was significant (adjusted  $R^2 = .522$ ,  $F_{(24,190)} = 10.750$ ,  $p = .001$ ) as was the

<sup>7</sup>These control variables were not introduced in the testing of  $H_1$ , because time is embedded in the change in the nutritional quality variable, which therefore only allows for analysis of the mean change in nutritional quality and accompanying t-tests.

<sup>8</sup>It is likely that there were many more brand introductions involving the addition of positive nutrients during this time than this count reflects. However, it appears that brand names are generally less likely to reflect the addition of positive nutrients (vitamins and minerals) than the reduction of negative nutrients (salt, sugar, and fat). This is not a great concern given that the main hypothesis ( $H_{2b}$ ) was not supported, and therefore the test of the rival hypothesis is less crucial.

<sup>9</sup>The degrees of freedom for this t-test reflect the number of years (seven) minus the number of criterion variables (one) used in this test. The data were organized by year as opposed to by brand to get a more reasonable estimate of the volume of brand extensions with various characteristics.

interaction between year and brand healthiness ( $b = -.122$ ,  $t = -1.858$ ,  $p = .032$ ) on price promotion level. In addition, year had a main effect ( $b = .074$ ,  $t = 1.560$ ,  $p = .060$ ) on price promotion level, but brand healthiness had no effect. More than half of the product category control variables tested also were significant: yogurt ( $b = .148$ ,  $t = 1.849$ ,  $p = .030$ ), cereal ( $b = .248$ ,  $t = 3.440$ ,  $p = .035$ ), frozen pizza ( $b = .223$ ,  $t = 2.604$ ,  $p = .006$ ), ice cream ( $b = .338$ ,  $t = 5.471$ ,  $p = .001$ ), cookies ( $b = .476$ ,  $t = 6.666$ ,  $p = .001$ ), bread ( $b = .095$ ,  $t = 1.651$ ,  $p = .05$ ), salad dressing ( $b = -.126$ ,  $t = -2.203$ ,  $p = .014$ ), potato chips ( $b = .148$ ,  $t = 1.904$ ,  $p = .025$ ), cheese ( $b = .2712$ ,  $t = 4.999$ ,  $p = .001$ ), pasta ( $b = .127$ ,  $t = 2.163$ ,  $p = .016$ ), soup ( $b = .408$ ,  $t = 7.478$ ,  $p = .001$ ), and crackers ( $b = .134$ ,  $t = 2.691$ ,  $p = .003$ ). As might be expected, these results indicate that product categories varied in their price promotion activities.

Further investigation of the significant interaction of year and brand healthiness reveals that it reflects the relationship hypothesized in  $H_3$ . Specifically, the significant interaction was investigated using a slope analysis, which allows for an investigation of the relationship between the independent variable (year) and the dependent variable (price promotion levels) at different levels of the moderator variable (brand healthiness) (Aiken and West 1991). Results indicate that when brand healthiness is high, the relationship between year and price promotion levels is insignificant ( $b = -.122$ ,  $t = -.849$ ,  $p = .200$ ), which indicates that healthy brands did not change their levels of price promotion activity pre-NLEA and post-NLEA. Likewise, when brand healthiness is moderate, the relationship between year and price promotion is insignificant ( $b = -.088$ ,  $t = -.954$ ,  $p = .17$ ). However, when brand healthiness is low, the relationship between year and price promotion levels is positive and significant ( $b = .217$ ,  $t = 2.278$ ,  $p = .001$ ), which suggests that unhealthy brands were promoted more post-NLEA than pre-NLEA. These results support  $H_3$ .

To rule out the rival hypothesis that such price promotion trends were occurring in the grocery industry despite the introduction of the NLEA, the previous model also was examined for 1991–1993. Testing this model, results indicate that though the overall model was significant (adjusted  $R^2 = .441$ ,  $F_{(24,196)} = 8.259$ ,  $p = .001$ ), the interaction between year and brand healthiness was not ( $b = -.002$ ,  $t = -.034$ ,  $p = .475$ ) nor was the main effect for year ( $b = .003$ ,  $t = .068$ ,  $p = .472$ ) or brand healthiness ( $b = .078$ ,  $t = .475$ ,  $p = .376$ ). However, many of the product category control variables found to be significant in the 1993–1995 model were also significant in the 1991–1993 model. These results indicate that the price promotion effects observed for the period following the NLEA likely were not part of a general trend in the marketplace.<sup>10</sup>

<sup>10</sup>I obtain the same results if year, the categorical independent variable, is used to analyze the impact of brand healthiness on price promotion for each year. Results indicate that post-NLEA, the relationship between brand healthiness and price promotion was marginally significant and negative ( $b = -.151$ ,  $t = 1.532$ ,  $p < .10$ ), which suggests that following the NLEA unhealthy brands price-promoted more than healthy brands. However, pre-NLEA, the relationship between brand healthiness and price promotion was insignificant ( $b = .085$ ,  $t = .885$ ,  $p > .10$ ).

#### *The Impact of Market Information on Consumer Activism Levels ( $H_4$ )*

A multivariate analysis of variance model with two factors followed by a series of univariate analysis of variance tests was used to test  $H_4$ . The two factors were the between-subjects factor—consumer type (average versus information-sensitive)—and the within-subjects factor—time (pre-NLEA versus post-NLEA)—as well as their interaction. To find support for the hypothesis, the interaction must be significant, with information-sensitive consumers showing a significant increase in their information activities in the marketplace between pre- and post-NLEA conditions and average consumers showing no change or a smaller change.

Table 4 contains the results of this analysis. The overall multivariate model was significant for the interaction of consumer type and time (Wilks'  $\Lambda = .979$ ,  $F_{(5,415)} = 1.752$ ,  $p = .06$ ). In addition, two of the five univariate tests were also significant: direct government activism behavior ( $F_{(1,419)} = 2.50$ ,  $p = .06$ ) and direct channel activism behavior ( $F_{(1,419)} = 7.48$ ,  $p = .01$ ).

To determine whether these significant relationships support  $H_4$ , the means under the four conditions were inspected (see Table 4). In each case, results indicate that the information-sensitive consumers' behaviors increased at a rate greater than the average consumers' activism behaviors following the NLEA. These findings support  $H_4$ . However, the small effect sizes and the lack of support for the remaining activism behaviors suggest that these effects are weak and limited to a subset of activism behaviors.

In addition to these interaction effects, consumer type was a significant factor at the multivariate level (Wilks'  $\Lambda = .784$ ,  $F_{(5,415)} = 22.86$ ,  $p = .001$ ) and for all of the individual consumer behaviors. Analysis of the means indicates that information-sensitive consumers outperformed average consumers on nearly all activism behaviors (see Table 4). Finally, time was an insignificant factor at the multivariate level (Wilks'  $\Lambda = .992$ ,  $F_{(4,415)} = .632$ ,  $p = .67$ ) and for all of the univariate tests (see Table 4). The latter finding suggests that the results are not due to the NLEA alone.

## DISCUSSION

### *Overview*

This research investigates whether (1) market information confers benefits, including increased product quality, on the market; (2) firms make strategic use of market information; and (3) market information influences consumer behavior activism levels, which influence the achievement of these market and strategic benefits. The introduction of the NLEA was used in a longitudinal quasi-experiment to examine these issues.

To overview the results briefly, I found that the information does confer benefits on the market but that these benefits might be more limited in scope than previously theorized. Moreover, marketers' responses to market information were found to be quite strategic in nature. Specifically, this research shows that marketers responded to market information by changing the quality of base brands and their brand extensions in unique and opposite ways, which enabled brands to occupy distinct strategic positions in the market. This research also shows that the introduction of market information affects the nature of competitive rivalry

Table 4  
THE IMPACT OF THE MARKET INFORMATION ON CONSUMER ACTIVISM

	<i>F</i> -statistic <sup>a</sup>	Partial $\omega^2$ <sup>b</sup>	Means <sup>c</sup>			
			Average	Activist		
<i>(1) Main Effect of Consumer Type</i>						
Reported Use of Nutrition Information	112.733*	.210	4.904	6.119		
Direct Government Activism Behaviors	2.037*	.002	1.503	1.626		
Direct Channel Activism Behaviors	6.730*	.013	3.431	3.871		
Indirect Channel Activism Behaviors	6.569*	.013	2.872	3.171		
Indirect Product/Brand Activism Behaviors	6.001*	.012	3.334	3.580		
<i>(2) Main Effect of Time</i>						
Reported Use of Nutrition Information	1.627	.001	5.477	5.412		
Direct Government Activism Behaviors	.522	.001	1.545	1.570		
Direct Channel Activism Behaviors	.257	.001	3.589	3.616		
Indirect Channel Activism Behaviors	.461	.002	3.008	3.002		
Indirect Product/Brand Activism Behaviors	.013	.002	3.458	3.429		
<i>(3) Interaction of Time × Consumer Type</i>						
	<i>F</i> -statistic <sup>a</sup>	Partial $\omega^2$ <sup>b</sup>	Average		Activist	
			Pre-NLEA	Post-NLEA	Pre-NLEA	Post-NLEA
Reported Use of Nutrition Information	.086	.002	4.944	4.865	6.144	6.095
Direct Government Activism Behaviors	2.505**	.004	1.526	1.481	1.570	1.682
Direct Channel Activism Behaviors	7.485*	.015	3.497	3.365	3.704	3.930
Indirect Channel Activism Behaviors	.102	.002	2.880	2.865	3.155	3.187
Indirect Product/Brand Activism Behaviors	.236	.002	3.335	3.333	3.613	3.548

<sup>a</sup>Degrees of freedom are (1,419) for all *F*-tests associated with these univariate tests.

<sup>b</sup>Although partial omega-squared is reported as a measure of effect size, the reader is directed to the mean differences as a more accepted indicator of the magnitude of the treatment differences (Cohen and Cohen 1983; Winer, Brown, and Michels 1991). This direction is given because of the lack of application of effect-size measures to quasi-experiments and given the use of a within-subjects design with interactions, which makes estimating the variance components used in calculating the partial omega-squared statistics more difficult to interpret relative to simpler, between-subjects designs (Keppel 1991).

<sup>c</sup>These means do not map perfectly onto the means for each of the four conditions noted in the third section of this table, given that the average and activist sample sizes were not equal in the analysis (activist consumers, *n* = 187; average consumers, *n* = 234).

\**p* < .05.

\*\**p* < .10.

by influencing the level of price promotion used by firms to market their products. Finally, I found that only direct consumer activism behaviors increased following the NLEA. Each result now is discussed to provide greater understanding, note possible limitations, and suggest insights into further research.

#### Competitive Responses to Market Information

Considering first the impact of the market information on the quality of offerings, the results show that the quality of "base brands" (i.e., brands without nutritional positioning) was influenced in distinct and strategic ways relative to changes made to related brand extensions. In particular, base brands significantly increased their levels of positive nutrients but did not reduce their levels of negative nutrients. Conversely, brand extensions improved by reducing their levels of negative nutrients but showed no improvement in their levels of positive nutrients.

These results provide evidence that firms reacted to the NLEA in a strategically conservative fashion. Specifically, it appears that firms tried to alter their current brands and manage the introduction of new brands so that each would occupy a distinct strategic position that different segments of consumers might value. A health-conscious segment of consumers, for example, would be more interested in brands that eliminate negative nutrients. This segment of consumers might be willing to trade some taste for the advantages associated with reductions in negative nutrients, such as sodium and fat. However, a less health-conscious segment of consumers, for whom taste is a more important

and determinant attribute (Myers and Alpert 1977), might be less willing to make such nutrient trade-offs. I speculate that firms anticipating such market reaction might have been more likely to increase the overall level of nutrition in their base brands by adding more positive nutrients (e.g., calcium, vitamins) that have no implications for the taste of the brand. Conversely, firms might introduce brand extensions with lower levels of negative nutrients for a small segment of health-conscious consumers who were willing to trade some taste for nutritional benefits. This approach was risk averse because it protected the firms' base brands from potentially negative attributions while enabling firms to compete for the health-conscious consumer.

Central to this strategic effect may have been managers' assessments of the degree to which consumers would respond to the NLEA by changing their preferences and purchase behaviors. To test this line of reasoning, the managers responsible for each of the brands were surveyed regarding their opinions about the NLEA just prior to its implementation (i.e., in the spring of 1994). Responses were received from 61 of the 124 managers (49.1%). The survey asked managers to evaluate the impact of the NLEA on consumer responses (e.g., "I expect that consumers will become more focused on nutrition for brands in my product category after the new labels are introduced"). A scale reflecting the nature of these impacts was constructed that exhibited adequate psychometric properties (i.e., items loaded on a single factor and were reliable,  $\alpha = .86$ ). Given the small sample size, these responses then were correlated to provide exploratory insights into their impacts on changes to base brands and

brand extensions. Therefore, though  $p$ -values are offered, there is no pretense of hypotheses-testing—merely a concern with the general direction of the relationships.

Results indicate that managers' concerns about the NLEA had a positive correlation with overall changes in nutrition quality to the base brands ( $\rho = .06, p = .31$ ). More important, managers' concerns had a strong positive correlation with changes involving the addition of positive nutrients to base brands ( $\rho = .23, p = .05$ ) and a negative correlation with changes involving the deletion of negative nutrients from base brands ( $\rho = -.15, p = .15$ ). These findings are consistent with the speculation that managers concerned about the impact of the NLEA tended to be risk averse and change positive nutrients but not negative nutrients in base brands. It was also consistent with this view to discover that managers' concerns were correlated positively with the overall number of healthy brand extensions introduced by firms ( $\rho = .11, p = .21$ ). However, it was found that managers' concerns had a stronger correlation with the number of brand extensions involving the addition of positive nutrients ( $\rho = .31, p = .001$ ) than the deletion of negative nutrients ( $\rho = .02, p = .44$ ). Therefore, these exploratory results suggest that, overall, managers' concerns tended to translate into more changes involving the addition of positive nutrients to both brands and brand extensions. Further research should examine these relationships with larger samples and more highly powered regression models not possible with the limited sample available here.

These strategic moves involving changes to base brands and the introduction of brand extensions were also likely to have implications for firm sales. It was possible, for example, for firm sales to grow by improving the nutritional quality of base brands or attracting new customers into the market to purchase new brand extensions. Likewise, firms might have hoped that an increase in the quality of brand extensions would spill over to upgrade consumers' perceptions of base brands offered under the same brand name. Conversely, firm sales could be affected adversely by changes to the nutritional quality of base brands or by brand extensions cannibalizing base brand sales. To investigate this possibility, I examined the impact of change in the nutritional quality of base brands and in the number of healthy brand extensions from 1993 to 1996 on the change in base brand unit sales from 1993 to 1996.

Overall, the model was marginally significant (adjusted  $R^2 = .01, F_{(2,114)} = 1.73, p = .09$ ), but the relationship between change in overall nutritional quality and change in unit sales for base brands was not ( $b = -.087, t = -.934, p = .35$ ). However, there was a significant negative relationship between the number of healthy brand extensions introduced from 1993 to 1996 and the change in base brands' unit sales ( $b = -.162, t = -1.739, p = .04$ ), which suggests that as the number of healthy brand extensions increased, the unit sales of base brands decreased. These results suggest that the change in nutritional quality did not influence brand sales in a significant way. However, the firm's risk-averse strategy of introducing healthy brand extensions to minimize the disruption of their base brands might have caused a reduction in the sales for those base brands. Although the current research cannot test whether an increase in brand extension sales adequately compensated for the apparent loss to the base brands (because only unit sales for the base brands

could be acquired from ACNielsen, not unit sales for the brand extensions), further research could follow up and examine this point more thoroughly.

A second general manifestation of the strategic impact of the NLEA appeared to occur when firms shifted their levels of price promotion activity. The findings support the conclusion that the NLEA shifted the competitive focus for healthy brands away from competing on price. Unhealthy brands, conversely, were found to make a significant increase in price promotion activity following the NLEA. There was also a significant main effect of brand healthiness on price promotion activity during 1993–1996, which suggests that healthier brands tended to use price promotion less often across the two time periods. However, in the advent of the NLEA, price promotion patterns shifted toward an even greater de-emphasis on price promotion among healthy brands. Unhealthy brands, conversely, tended to price-promote more.

The findings pertaining to the impact of market information on product quality and the nature of competitive rivalry extend the literature by pointing to the important strategic impact of market information. Prior research has not theorized about these specific strategic impacts; instead, it only points to the fact that entire industries can be affected positively by regulation (Posner 1974; Stigler 1974) and that some firms can make more strategic use of regulation than others (Mitnick 1981; Wood 1986). Overall, the results of this study provide a fairly coherent picture of how firms in general used market information produced by regulation to manage in an uncertain environment. In particular, by providing a clear picture of a brand's nutritional quality, market information produced by the NLEA appeared to prompt firms to make strategic decisions about brand positioning and product line management. Changes to the nutritional quality of base brands and brand extensions as well as their price promotion levels apparently enabled firms to provide a range of offerings with distinct positionings to meet the needs of different segments. This approach was a risk-averse and strategically conservative response to the influx of market information. However, it also gave firms the opportunity to exercise a range of options in the future depending on consumer and competitive responses.

The method approach adopted in this research—an across-product category modeling approach—was driven in part by external validity goals. Further research might explore these relationships within product categories to increase the internal validity of results. For example, changes to overall nutritional quality varied from big improvements in the orange juice, peanut butter, and frozen dinner categories to no improvements or lower nutritional quality in the oil, ice cream, and cheese categories. Likewise, change in the level of price promotion between pre- and post-NLEA ranged from the largest increase in price promotion in the frozen pizza, ice cream, and margarine categories to the largest decrease in the cracker and bread categories.

Further research also could develop theories to account for such product category variation. For example, one line of thinking might be that if nutrition is important but not determinant (as in orange juice, for which the entire category is fairly healthy) or it is neither important nor determinant (such as in the frozen pizza category), market-level responses might not be expected (Myers and Alpert 1977). Howev-

er, in other product categories for which nutrition is both important and determinant (e.g., cereal, salad dressing), market changes are expected. Finally, there are categories for which nutrition does not seem important or determinant, but manufacturers successfully have positioned some brands as being nutritious alternatives to other brands, thereby creating market-level changes when none might be expected otherwise (e.g., ice cream, potato chips).

Finally, further research also could explore other market-level impacts of information. For example, market information could increase the market efficiency or degree of correlation between price and quality (Ratchford et al. 1996; Telis and Wernerfelt 1987). It could be predicted, for example, that the degree to which the introduction of market information improves market efficiency is likely to depend on the level of brand healthiness. Specifically, when market information levels increase, the market is expected to be more efficient only for brands that are generally more healthy. In other words, nutritional quality and price would be expected to change at roughly equal rates for healthy brands. Further research also could explore the impact of market information on industry concentration and consumer price levels.

#### *Consumer Responses to Market Information*

Results indicate that increased levels of market information do not influence the full range of consumer behaviors expected on the basis of prior theory. In particular, I found that in the post-NLEA marketplace, information-sensitive consumers were more likely to engage only in more direct activism behaviors aimed at the channel and the government as opposed to indirect activism behaviors aimed at the channel or the product/brand level.

On the one hand, these results suggest that theory may need to be modified to reflect the more limited scope of direct activism behaviors expected when market information increases. On the other hand, these modest results are encouraging given that nutrition information is just one piece of information in a highly cluttered information environment. Therefore, it would be surprising if better information on just one element of product quality (i.e., nutrition) had produced more radical changes in consumer responses. Furthermore, if it can be assumed that the documented changes in products and promotional activities reflect managers' responses to anticipated or actual consumer signals of this nature, then these modest consumer findings appear even more important.

Although it is theoretically consistent to find the emphasis on the more direct market activism behaviors among the information-sensitive consumers, it was surprising that their reported use of nutrition information did not increase with the NLEA. There are several possible explanations for this. First, if the provision of complete nutritional information is viewed as a long-sought objective of consumer activists, then the label itself might be unlikely to elicit even more activism. Second, it could be that consumers attended and reacted to nutritional information for a short period after it became available, but their usage dropped back to more normal levels after they incorporated the information into their choice heuristics and patterns for their most frequently repeated choices. Third, it also is possible that consumers were, in general, less skeptical of food manufacturers and therefore less vigilant in their searches for nutrition infor-

mation following the NLEA. However, when considered in conjunction with the increase in both direct channel and direct government activism behaviors and the lack of increase in more indirect activism behaviors by consumers, it appears more likely that information-sensitive consumers shifted their activism tactics to more direct and therefore more effective approaches following the NLEA.

#### *Limitations*

The current research uses a field experiment that examines the impact of changes to actual levels of market information on firm, market, and consumer activities. Prior research in this area has been theoretical, derived from non-empirical models, or cross-sectional in nature.

Despite this methodological advance, there are always rival explanations for empirical findings. Therefore, I briefly address several points here. The quasi-experimental approach used in this research established more control than has been achieved by static examinations of the market-perfecting benefits of information in the past. This is a strength of the research. Careful attention was paid to the timing and nature of data collection activities to reduce possible confounds arising for other, unaccounted for occurrences in the environment. Confounds of history and selection were eliminated through the method choices. However, the absence of a control group admittedly does weaken the design. Despite this weakness, a control condition was not possible because the NLEA was national legislation and firms had to comply by providing nutrition information on all their brands in all markets. Therefore, the empirical reality constrained the design choice not to include a control condition.

Furthermore, I attempted for three of the four hypotheses to eliminate the rival explanation that the findings reflected general trends in the marketplace. In each case, I examined the hypotheses using available data from a period prior to the NLEA and found that the relationships were not supported. This approach provides increased confidence in the results. This confidence could be improved, however, by using designs that span even longer time periods in the case of the price promotion data and by having higher quality data in the case of the brand extension data.

A final consideration is the timing of competitive and consumer responses to the influx of market information. This research has provided for these effects to occur between two and three years following the introduction of the NLEA. This seems a reasonable length of time, especially given that the NLEA legislation underlying the regulation was passed in 1990, thereby giving firms sufficient time to respond. Further research could address a much longer time horizon to rule out the possibility that the market-perfecting benefits of information require more time to occur.

#### *Conclusion*

In summary, the results suggest that the market-perfecting benefits of information are less uniform, more limited, and more strategic in scope than previously theorized. In the context of a market in which consumers value several attributes and competition is waged in a variety of ways, market information did provoke information-sensitive consumers to signal using several key direct activist behaviors. Firms responded by changing the nutritional quality of their base

brands, the number and nutritional quality of brand extensions, and their levels of price promotion activity. Overall, these responses provided firms with a means to position their offerings (i.e., alter their current brands and manage the introduction of new brands), so that each would occupy a distinct strategic position consumers would value. Such approaches were speculated to provide firms with a means of coping with the uncertainty of competitor and consumer reactions to the NLEA, thereby extending theories of the market-perfecting benefits of information to include the strategic use of market information by firms.

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### Appendix STUDY MEASURES

#### I. Attitudinal and Motivation Manipulation Check Measures

*Motivation to Process Nutrition Information* (Moorman 1990)  
(seven-point scale, where 7 = strongly agree and 1 = strongly disagree)

- I want to know more about nutrition information.
- I wish more nutrition information were widely available.
- I enjoy reading about nutrition information.
- I am interested in looking for nutrition information on labels.
- I would like to receive additional nutritional information about food products.

*Attitudes Toward Complaining* (Adapted from Richins and Verhage 1985)  
(seven-point scale, where 7 = strongly agree and 1 = strongly disagree)

- Most people don't make enough complaints to business about unsatisfactory products.
- People have a responsibility to society to tell stores or manufacturers when products are unsatisfactory.
- It bothers me quite a bit if I don't complain about an unsatisfactory product when I know I should.
- I feel a sense of accomplishment when I have managed to get a complaint taken care of satisfactorily.

*Importance of Nutrition* (New Scale)

Rate the following product characteristics in terms of their importance to you when making a typical food product purchase in a supermarket.  
(seven-point scale, where 7 = very important and 1 = not at all important)

- Price
- Taste
- Package size
- Nutrition
- Special offers
- Product quality
- Brand name

#### II. Nutrition Information and Marketplace Activism Dependent Variables

*Use of Nutrition Information* (New Scale)  
(seven-point scale, where 7 = strongly agree and 1 = strongly disagree)

- I usually pay attention to nutrition information when I see it in an ad or elsewhere.

- I use nutrition information on the label when making most of my food selections.
- I don't spend much time in the supermarket reading nutrition information.\*
- I read about nutrition in magazines or books.

*Marketplace Activism* (derived from Day and Bodur 1978; Grønhaug and Zaltman 1981; Warland, Herrmann, and Moore 1984)

During the past year when you have felt dissatisfied with the content of a food product, to what degree did you take any of the following actions?

(seven-point scale, where 7 = always when I feel dissatisfied and 1 = never when I feel dissatisfied)

(a) *Direct Government Activism Behaviors:*

- Complained to a consumer advocate or consumer organization.
- Complained to a government agency or official.

(b) *Direct Channel Activism Behaviors:*

- Returned the product to the store.
- Complained to the company who manufactured the product.
- Complained to the store carrying the product.

(c) *Indirect Channel Activism Behavior:*

- Stopped shopping at the store where the product was purchased.
- Stopped buying products from the company who manufactured the product.

(d) *Indirect Product/Brand Activism Behavior:*

- Stopped buying a brand without switching to a new brand.
- Stopped buying the category (e.g., cold cereal).
- Switched to a new category (e.g., cold cereal to hot cereal).

#### III. Managers' Concerns About the NLEA (New Scale)

(seven-point scale, where 7 = strongly agree and 1 = strongly disagree)

- I expect that consumers will become more focused on nutrition for brands in my product category after the new labels are introduced.
- The new label requirements will not affect consumers' decisions for brands in my product category.\*
- Consumers will probably change the criteria they use for selecting brands in my product category following the introduction of the new label requirements.

\*Starred items are reverse coded.

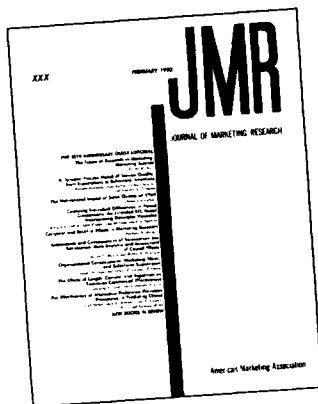


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