

The Effect of Standardized Information on Firm Survival and Marketing Strategies

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We argue that standardized information disclosure (information using a common format and uniform metrics) creates asymmetric opportunities for firms, which affects their strategies and survival. We test our predictions using a longitudinal, quasi-experimental field study, involving the Nutrition Labeling and Education Act of 1990 (NLEA), and we focus on firm market share within a category as a key asymmetry. Findings indicate that, in general, the NLEA had no effect on firm responses. However, when accounting for firm differences, we observe that the NLEA led to (1) an increase in small-share firm exits and (2) a greater increase in distribution for large-share firms. No concurrent increase in price by large-share firms following the NLEA was observed. We conclude by discussing the implications of these effects for firm strategy, the design of public policy, and theories regarding the impact of information on markets.

Key words: public policy; marketing strategy; competitive strategy

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Introduction

Information plays a determinant role in the functioning and competitiveness of markets (e.g., Akerlof 1970, Salop 1976, Schwartz and Wilde 1985, Stiglitz 1989). A great deal of research within marketing has focused on *consumer responses* to information (e.g., Balasubramanian and Cole 2002, Ippolito and Mathios 1995, Russo et al. 1986, Wilkie 1986). While important, research in marketing has given less attention to *firm responses* that might be associated with the influx of information into markets.

This paper examines firm survival and strategic choices following the influx of *standardized information disclosure*, which presents facts about firms or offerings in a common format with uniform metrics. Standardized information includes disclosures of price (e.g., unit price), performance (e.g., energy efficiency ratings), or quality levels (e.g., nutrition labels). It can be communicated by third parties (e.g., *Consumer Reports*) or by firms in labels or advertisements. Standardized information has been a prominent policy tool for decades (Wilkie 1986). More recently, the proliferation of firm ratings on the Internet (e.g., www.orbitz.com or www.bizrate.com), in media, and in other public evaluations of firm performance (e.g., *Business Week* or Zagat ratings) have amplified the relevance of this issue.

How do we expect firms to respond when standardized information is available about a firm or its offerings? The dominant view is that standardized information's common format and uniform metrics

increase the transparency of alternatives to customers. Endowed with such information, consumers can select alternatives that align with their preferences. This, in turn, should lead manufacturers to adapt their offerings to match consumer tastes (Mazis et al. 1981). As noted by the Federal Trade Commission (FTC) (1979, p. 14): "Information remedies have the direct benefit of improving the free flow of truthful commercial information. Informed consumer decisions then give sellers an economic incentive to improve the quality and selection of their marketplace offerings."

While valuable, this consumer-centric view ignores firms' varying abilities to respond to information disclosure (e.g., Oster 1982). Therefore, lower consumer search costs and improved brand quality may be only part of the story. In this paper, we argue that firms' responses to standardized information are affected by their market share. We contend that large-share firms have greater access to financial and knowledge resources accruing from market success, as well as greater influence in their distribution role as category planners. We predict these factors result in asymmetric opportunities to anticipate and respond to information disclosure. These asymmetries, in turn, influence firm likelihood of survival and resulting marketing strategies.

Standardized Information and Firm Effects

Research in marketing regarding firm responses to information disclosure can be classified into two

Table 1 A Sample of Regulation Research Examining the Role of Firm Differences

Author	Regulatory context	Role of firm differences
Bartel and Thomas (1985)	Occupational Safety and Health Administration worker safety standards.	Large unionized firms are hurt less than small nonunionized firms.
Holak and Reddy (1986)	Public Health Cigarette Smoking Act of 1970, which banned all advertising on broadcast media.	Smaller firms were hurt more than larger firms.
Leone (1977)	Water pollution standards in pulp and paper industry.	Regulation costs were uniform for 80% of industry but excessive for 20%.
Oster (1999)	1979 FTC Drug Product Selection Rule, which allowed substitution of generic drugs for branded drugs.	Large firms claim higher costs, but entered into production of generic drugs, which hurt smaller firms.
Pashigian (1984)	1970 Clean Air Act, which set minimum standards for clean air and water.	Smaller plants have found it harder to compete following the regulation.
Russo (1977)	Unit pricing of products.	Store brands achieved a higher market share.
Scheraga and Calfee (1996)	1960 FTC “voluntary” ban on tar and nicotine in advertising.	Average large firms experienced larger stock returns than average small firms.
Smith et al. (1986)	1973 price regulation modifying the economic effects of Organization of the Petroleum Exporting Countries pricing to limit capital gains of domestic firms.	U.S. firms engaged in oil production and refining that has access to price-controlled crude oil enjoyed capital gains more than non-U.S. firms not engaged in oil production.
Thomas (1990)	1962 Amendments to the Food, Drug, and Cosmetic Act, which required proof of drug effectiveness, clinical trials, and minimum standards for research and manufacturing.	Smaller drug houses lost sales.
Vietor (1977)	Passage of the Hepburn Act, which gave the Interstate Commerce Commission the power to set rates.	Subset of shippers was forced to relocate, and hence suffered higher costs.
Wood (1986)	The Pure Food Act of 1906 established standards for the composition of and communication about certain foods, beverages, and drugs.	Large firms were advantaged in responding to regulation.

types. The first type focuses upon *quality changes that firms make to their offerings on attributes identified in the information* (e.g., Ippolito and Pappalardo 2002, Mathios 2000, Moorman 1998, Moorman and Slotegraaf 1999). For example, nutrition improvements follow nutrition information disclosure. The second type examines *whether information changes the relationship between price and the quality level a firm offers on attributes*.¹

Other, perhaps unintended consequences associated with information disclosure may also occur. First, standardized information can affect firms' behaviors that are not directly related to the focus of the information. These behaviors might include (1) changes in marketing policies or (2) firm outcomes such as exit. Both could have profound effects on the array of consumer choices and the competitive intensity in the marketplace. Firm exits represent a particularly important opportunity, given that prior literature has tended to focus on firms that exist both before and after disclosure (Moorman 1998, Moorman

and Slotegraaf 1999) or has ignored specific firms and has aggregated to the market level instead (e.g., Kamakura et al. 1988).

A second consequence is that firm behaviors not directly related to the focus of the information disclosure may be influenced in important, but unintended, ways by firm characteristics, such as power, resources, strategies, and capabilities. For example, a firm's marketing capabilities or brand equity may create advantages that allow it to capture distribution following the influx of information disclosure. The effect of these firm differences may undermine or influence the effect of information disclosure on competition.

This paper addresses these gaps by building on research that indicates regulation has differential effects on firm behavior. This research finds that industries are not monolithic and that firms exhibit different strategies and patterns of investment that influence the costs and benefits of regulation. Table 1 provides evidence of such differential effects. Our point of departure from this work is that we (1) systematically identify, measure, and find a key firm difference—firm market share—responsible for differences in information disclosure's costs and benefits and (2) we focus on firm outcomes that are not linked to the regulation but that may be unintended consequences of it. These include firm survival and

¹ This latter approach is reflected in two literatures. One literature examines the effect of advertising (e.g., Comanor and Wilson 1979). A second literature examines the effects of published ratings, such as *Consumer Reports* (e.g., Archibald et al. 1983, Bloom 1997, Bloom and Syzkman 1998, Hjorth-Anderson 1984, Kamakura et al. 1988). This latter literature tends to aggregate across firms to the market level and focus on the relationship of price and quality.

distribution effects, in addition to price (which is more standard in the market efficiency literature).

We focus on firm market share as an important firm difference for both theoretical and practical reasons. First, firm market share within a category provides information about how successful the firm has been relative to competitors in the category. This success may lead to differential access to firm resources and capabilities (e.g., Arrow 1962, Barney 1991, Penrose 1959). In support of this view, the meta-analysis of Szymanski et al. (1993) finds a relationship between a firm's market share and its product quality, product customization, and advertising and salesforce expenditures. Other research documents the positive relationship between market share and (1) advertising investments (Assmus et al. 1984, Tellis 1989), (2) salesforce investments (Gatignon and Hanssens 1987), and (3) the profitability of market pioneering (Boulding and Christen 2003). Hence, market share may reflect a firm's access to resources and play a significant moderating role in firm strategies and outcomes.

Second, a focus on firm market share is consistent with traditions in economics (Schmalensee 1989) and law (Stern and Eovaldi 1984) that use market share to reflect a firm's relative power within a category or market power. Specifically, antitrust cases scrutinize a firm's share within a defined market to discern its power over competitors and consumers.

Finally, pragmatically, it was necessary to select a firm factor that was also available in secondary data. Therefore, while the use of market share is relatively indirect from a resource perspective, it is a direct measure of firm power and is available in secondary data. We acknowledge that market share is a noisy measure. As such, it should provide a *conservative* test of our hypotheses.² An alternative is to code firm resource and size differences. This approach is impractical in our context in several respects. First, these data are only available in databases for publicly held firms, which tend to be, on average, larger and more resource-rich (Singh and Mitchell 1996). Second, marketing spending is not usually separated from selling, general, and administrative expenses (SG&A) in secondary data bases. Finally, we anticipate having a large number of firms in our study, which makes coding firm resource differences a challenge to implement.

We test our ideas using standardized information created by the Nutrition Labeling and Education Act (NLEA) of 1990 (21 U.S.C. 301). The NLEA required food manufacturers to provide nutrition information disclosure by May 1994 with the goal to (1) elimi-

nate untruthful and exaggerated nutrition claims and (2) improve the accessibility of nutrition information at the point of sale (58 Fed. Reg. 2065–2964, 58 Fed. Reg. 631–691). Each food product was required to include a "Nutrition Facts" label, which contained standardized nutrient information and an ingredient list. Health claims such as "light" or diet-disease links were also highly regulated. This meant that many firms making health claims were unable to do so following the NLEA.

Predictions

Firm Exit Responses to Standardized Information Disclosure

There are several reasons why standardized information might impact firm survival differentially depending upon firm market share. First, financial risk poses a survival threat to small-share firms. Regulations involving standardized information often require firms to test brands and to communicate information on labels or advertising. Therefore, firms must have the resources either to perform or to outsource such activities (Wernerfelt 1984). Further, high-share firms are more likely to experience economies of scale, which may mean greater cash flows and/or the ability to attract capital. Finally, a greater percentage of financial resources from small-share firms will be devoted to responding to regulation relative to large-share firms. Specifically, although the NLEA was estimated to cost the industry between \$1.4 and \$2.3 billion to change 250,000 food labels, popular press articles at the time hinted that standardized information could favor industry leaders. As evidence of the financial burden faced by small firms, one *Wall Street Journal* (1993a, p. B1) article stated that "small food producers say the cost of complying with the new U.S. labeling law could crimp their operations and even shut some of them down."

Second, information disclosure often requires firms to adhere to standards to make certain claims (e.g., low-fat status). If brands do not meet standards, the firm can revise the brand to meet the standard, reposition the brand to focus on another attribute (e.g., taste), or eliminate the brand. Small-share firms are likely to have fewer resources to reposition brands. Further, given large-share firms tend to have longer product lines (Kekre and Srinivasan 1990), eliminating products poses a greater survival threat to small-share firms. Related, longer product lines may mean large-share firms have access to a broader set of production, research and development (R&D), and marketing skills. As such, if disclosure forces firms to reformulate products and rethink market positions, small-share firms are more likely to be faced with acquiring these costly skills.

² Unobserved factors correlated with market share, but not related to firm resources, could also affect our results. We follow Lynch (1998) and try to enumerate and rule out which correlated factors might systematically explain our results (see the appendix).

Third, large-share firms will likely fare better if they revise brands for several reasons. To the extent that leading brands have higher equity, large-share firms may be more successful in modifying product lines (Keller 1993). Hellofs and Jacobson (1999) find that market share has a positive effect on perceived quality in categories where there is little concern for exclusivity (e.g., sunscreen). This finding may apply to food, which evokes less concern for status.

Fourth, regulations requiring standardized information represent an external shock to the firm's environment. Research on a firm's absorptive capacity has shown that firms with prior investments in key knowledge or skills are more likely to perceive and act on such external events (Cohen and Levinthal 1990). Given their large marketing research and R&D budgets, large-share firms are more likely to experience early perception and quick response as indicated in this quote about Pillsbury's response to the NLEA.

Pillsbury believes it is ahead of many rivals. Spotting glimmers of impending regulatory changes, the company began stepping up nutritional analysis of products three years ago. Its sophisticated research laboratory, computer database expertise, and in-house nutrition staff have helped greatly (*Wall Street Journal* 1993b, p. B1).

Fifth, large-share firms should be better equipped to create customer value following the influx of standardized information given knowledge advantages. Market success implies that more retailers and consumers provide information to large-share firms. This feedback is a key source of market intelligence that affords large-share firms the opportunity to build more effective capabilities at acquiring, disseminating, and responding to market information, which are known to improve firm performance (Jaworski and Kohli 1993, Narver and Slater 1990).

Finally, large-share firms are more likely to serve as category planners or captains. These positions provide large-share firms with access to information and influence, which may increase their chances of survival following regulation. As discussed in Foer (2001):

The captain receives from the retailer all information pertinent to the category The captain on an annual basis conducts a thorough analysis of this information, which of course, includes not only his own brand, but all of his competitors' brands and using this analysis and his own expertise in consumer behavior, provides to the retailer both a report and a plan. The plan includes a plan-o-gram for each of the retailer's stores, setting out which brands should be located where (eye level, foot level, etc.), linear feet to be allocated to each brand, what new brands to include, what old brands to cut back or exclude, pricing, and promotional schedules. Of course, the retailer has ultimate decision-making authority, but the high degree

of information asymmetry accounts for the fact that retailers almost always accept the proposals of the category captains.

As a result, category captains are likely to achieve better store placements. Furthermore, they often incur smaller slotting fees, which reduce their financial burden (Bloom et al. 2000). Finally, before regulation, captains have better information on competitor quality as well as category dynamics, which could give them an initial advantage responding to it.³

In sum, large-share firms own or have access to more financial resources, relevant firm capabilities, brand equity, absorptive capacity and market-based knowledge assets, and category planner positions. As a result, large-share firms have a greater probability of having an effective and timely response to standardized information. This response capability increases the probability of their survival in current categories. We predict:

HYPOTHESIS 1. Standardized information will increase the likelihood of exits by small-share firms relative to large-share firms within a category.

Firm Distribution Responses to Standardized Information

Two factors affect how firm share moderates distribution responses to standardized information. The first pertains to large-share firm resource advantages. Hypothesis 1 states that small-share firms are more likely to exit, which increases the availability of shelf space. Large-share firms are expected to capture more of these vacancies given their (1) larger salesforces; (2) greater likelihood of having direct distribution, which makes it easier to influence shelf space allocation decisions; (3) role as category captains, which puts them in a superior position to control vacated space (Bronnenberg et al. 2000); and (4) financial resources to pay slotting allowances to capture shelf space (Bloom et al. 2000).

The second factor affecting distribution responses concerns differential strategic responses to standardized information between large- and small-share firms (Tirole 1997). Central to these strategic responses is whether standardized information increases or decreases perceived product differentiation. In either case, large-share firms should increase distribution by capturing space vacated by small-share firm exits, or appropriating distribution from small-share firms that survive.

When standardized information reveals product differences that are smaller than previously perceived, consumers will be more sensitive to nonproduct marketing instruments, such as price and distribution

³ Once regulation forces disclosure, all firms have quality information, mitigating this aspect of the captain's advantage.

(Lynch and Ariely 2000). Instead of competing on price, which may hurt profits and erode brand equity (Jedidi et al. 1999), and because they have the resources to do so, we predict that large-share firms may increase distribution intensity. In contrast, when standardized information reveals product differences that are larger than previously perceived, consumers may become less price-sensitive. In this case, large-share firms are less able to maintain or increase market share by cutting prices, so they may opt to increase shelf space instead, and their superior resources enable them to do so more readily than small firms. Therefore, in both cases, large-share firms should be more likely to experience increases in distribution following standardized information. We predict:

HYPOTHESIS 2. Standardized information will result in increased distribution levels for large-share firms relative to small-share firms within a category.

Firm Pricing Responses to Standardized Information

Arguments regarding the effect of standardized information on large- and small-share firm pricing responses are more complex. We start with a set of factors that argue for an increase by large-share firms, and then outline a set of factors that argue for a decrease.

Our predictions thus far have suggested that firm share within a category reflects firm success in managing its products to create value for consumers relative to the competition. In addition, large-share firms are also likely to make larger R&D investments (Moorman and Slotegraaf 1999), enabling them to capitalize on standardized information by designing more targeted options that can command higher prices. Similarly, research has also shown that large-share firms command a commensurate share of advertising dollars for branded consumer goods (e.g., Thomas 1989). This implies that large-share firms can generate greater consumer awareness and perceptions of value for new brands or brand changes. Both consumer outcomes may allow these firms to charge higher prices (Bloom and Syzkman 1998, Kirmani and Wright 1989). Finally, Tellis (1989) observed that larger firms have lower prices, which means they may have more opportunity to raise prices.

One challenge in predicting how firms will adjust their price is that a firm's strategy prior to information disclosure is not known. Information will benefit firms that stress favorable characteristics disclosed in standardized information, and they should be able to raise price to extract a surplus associated with their quality levels—irrespective of firm share. However, large-share firms have greater financial resources to promote such quality advantages.

If, on the other hand, brand positioning is not consistent with disclosure, the firm has the choice to position on another quality feature or to reformulate. Large-share firms should also have greater ability to fund such efforts. Therefore, regardless of whether the firm's brands are naturally positioned to benefit from standardized information or the firm reformulates and repositions brands to do so, large-share firms may be able to raise prices more.

Despite these advantages, other factors restrain large-share firms from raising prices. First, all surviving large-share firms may experience a power increase, which checks any advantages large-share firms may have. Second, large-share firms may refrain from raising prices to dissuade entrants. Third, large-share firms may want to retain the strategic advantages of high market share, and therefore choose to keep prices low. Fourth, if standardized information makes products less differentiated, and therefore increases price sensitivity, this may reduce large-share firms' pricing power. Finally, it is important to consider whether small-share firms have higher prices because they are using a niche strategy involving higher quality or whether high prices are the result of a failure to achieve economies of scale. The first set may be unaffected by standardized information (and perhaps even benefit if their niche is the focus of information). The second group will be adversely affected. This means that strategy may be a more important determinant of price than firm market share.⁴

In summary, there appear to be good reasons to expect increased prices by large-share firms following the influx of standardized information. However, a number of market restraints and strategies may preclude firms from capitalizing on these opportunities. As such, we expect that firms will raise prices, but whether this will actually occur remains an empirical question.

HYPOTHESIS 3. Standardized information will result in increased price levels for large-share firms relative to small-share firms within a category.

Method

Research Design

We employed a longitudinal, quasi-experimental field study to test our propositions. A quasi-experiment allows for control over the scheduling of data collection without control over the scheduling of experimental stimuli (Campbell and Stanley 1963, Cook and Campbell 1979). The experimental stimulus is the introduction of standardized nutrition information required by the NLEA.

⁴ We thank an anonymous reviewer for this observation.

We test our predictions using a two-factor design. The first factor is a within-subjects factor associated with observing firms during time periods before (1991, 1993) and after (1995) the NLEA. This approach enables us to control for firm- and category-specific effects common across time. Observing changes before and during the NLEA attenuates the possibility that these differences are simply a result of some trend related to food. The second factor is a between-subjects factor associated with food and nonfood categories. Nonfood categories are not subject to the NLEA, and hence control for unobserved time-specific, macro-environmental effects (e.g., inflation) that might have influenced firms. Importantly, many firms compete in both food and nonfood categories. Further, given our data came from grocery stores, our design controls for any retailer trends that might influence competition in both food and nonfood grocery categories.⁵ Other internal validity threats are ruled out in the appendix.

Modeling and Estimation Approach

Firm Exit Rates. Hypothesis 1 suggests that large- and small-share firm exit rates are affected by the NLEA. Let u_{fit}^* be a latent variable denoting the latent utility of firm f exiting category i at time t . The relationship between the observed firm exits, u_{fit} , and the corresponding latent variable can be expressed as

$$u_{fit} = \begin{cases} 1 & \text{if } u_{fit}^* > 0, \\ 0 & \text{if } u_{fit}^* \leq 0, \end{cases} \quad (1)$$

where $u_{fit} = 1$ indicates an exit. The latent utility is given by

$$u_{fit}^* = \beta_0^e + \beta_1^e x_{1t} + \beta_2^e x_{2fi} + \beta_3^e x_{3fit} + \beta_4^e x_{1t} x_{2fi} + \beta_5^e x_{1t} x_{3fit} + \beta_6^e x_{2fi} x_{3fit} + \beta_7^e x_{1t} x_{2fi} x_{3fit} + e_{fi}^e + e_{fit}^e, \quad (2)$$

where x_{1t} is a time indicator variable that assumes the value 1 in 1995 and 0 in 1993, x_{2fi} is a food indicator variable, and x_{3fit} represents the lagged firm market share within an industry at time $t - 1$, β^e are the model parameters to be estimated, $e_{fi}^e \sim N(0, \sigma_{1e}^2)$, and $e_{fit}^e \sim N(0, \sigma_{2e}^2)$. The e_{fi}^e control for unobserved category and firm effects. This leads to a random effects probit, which we estimate via maximum likelihood.

⁵ We recognize that food and nonfood categories may differ in terms of changes to firm survival and marketing strategies from period to period. However, for nonfood categories to be a valid control group, it is not necessary that nonfood categories match food categories in all ways except the NLEA. Instead, the only assumption we need to make is that any differences between food and nonfood categories would remain the same across time in the absence of the NLEA (or that such differences can be controlled for). The three-year data provides the opportunity to establish trends prior to the NLEA, thus making this comparison possible.

Given the effect of the NLEA should manifest for only food categories in 1995 (i.e., define $NLEA_{fit} = 1$ when $x_{1t} x_{2fi} = 1$, else $NLEA_{fit} = 0$), β_7 can be interpreted as the NLEA * firm market share interaction, and β_4 can be interpreted as the main effect of the NLEA.^{6,7} Note also that we use lagged firm market share to ensure causal ordering on firm exit rates outcomes.

Firm Distribution and Price Levels. Hypotheses 2 and 3 examine how trends or *changes* in firm price and distribution behaviors are impacted by the NLEA. Denoting the change in the m th marketing behavior ($m = \text{price or distribution}$) of firm f in category i from time $t - 1$ to time t as ΔY_{fit}^m , we specify the following random effects model (controlling for random category and firm effects):

$$\begin{aligned} \Delta Y_{fit}^m = & \beta_0^m + \beta_1^m x_{1t} + \beta_2^m x_{2fi} + \beta_3^m x_{3fit} + \beta_4^m x_{1t} x_{2fi} \\ & + \beta_5^m x_{1t} x_{3fit} + \beta_6^m x_{2fi} x_{3fit} + \beta_7^m x_{1t} x_{2fi} x_{3fit} \\ & + e_{fi}^m + e_{fit}^m, \end{aligned} \quad (3)$$

where β^m are the model parameters to be estimated, $e_{fi}^m \sim N(0, \sigma_{1m}^2)$, and $e_{fit}^m \sim N(0, \sigma_{2m}^2)$. β_7 is interpreted as the NLEA * firm market share interaction and β_4 represents the main effect of the NLEA. Equation (3) is estimated using maximum likelihood.

Data and Measures

All data were acquired from Information Resources Inc. (IRI), a firm that tracks UPC-coded, brand-level activity by firms in categories from markets located across the United States. IRI publishes *Infoscan*, which contains a complete listing of all brands and firms operating in U.S. supermarkets visited by IRI. This does not include sales of food products occurring in retail outlets such as Wal-Mart and Sam's Club, although both chains sold a smaller percentage of food products during the period of analysis.

We were only able to obtain 1993 and 1995 *Infoscan* data. The 1991 *Infoscan* data was not available from IRI when we purchased it in 1997, as IRI deletes these data after five years (IRI source, May 1997). Two years of data limits our ability to control for firm or category specific differences in trends. From *Infoscan*, IRI publishes *Supermarket Review* each year. We have access to 1991, 1993, and 1995 years of *Supermarket Review* data.⁸

⁶ We thank an anonymous reviewer for this interpretation.

⁷ We also examine (1) the main effect of food versus nonfood categories in our analysis to determine if there are food category-specific differences on our observed firm outcomes and (2) the time * firm share interaction and the food * firm share interaction allow large firms to have different outcomes than small firms.

⁸ Data is published in volumes corresponding to one year following the date we report. Therefore, the published volumes were actually 1992, 1994, and 1996. The same is true of *Infoscan* data.

Comparing the data sets, we found that *Supermarket Review* contained information for 2,186 firms versus 29,374 firms for *Infoscan*, on average per year. We also found that *Supermarket Review* data focused on larger firms (mean market share = 0.047, s.d. = 0.09) compared to *Infoscan* (mean market share = 0.006, s.d. = 0.04). Lastly, we found the *Supermarket Review* data contained comparable information for 109 categories, while the *Infoscan* data contained 265 categories.⁹

Given these differences, the *Supermarket Review* data provide a conservative test of our theories (as small firms are under sampled), though the three-year *Supermarket Review* data enables us to control for unobserved category and firm-specific effects. With these trade-offs, we concluded that the best strategy was to test our hypotheses in both data sets. Our hypothesized results replicate—although there are no controls for category and firm-specific trend effects in the two-year data.¹⁰ To conserve space, we therefore explicate our model and results only for the three-year data, as these data allow us to rule out more competing explanations and also provide a conservative test of our hypotheses.

Unit of Analysis

Category Level. We use categories defined by IRI. Researcher use of these categories is endemic and they are the standard in the packaged goods industry (Ailawadi et al. 2001, Bucklin and Gupta 1999, Fader and Lodish 1990). Categories are the broadest level of clustering in the IRI data. Categories are composed of subcategories or types. We focused on the category level because it appears to be the level at which consumer choices are made, and it worked against our small-share firm exit hypothesis (small-share firms may be more likely to survive in a broadly defined competitive space).¹¹

Firm Level. IRI provides two different levels of firm analysis. *Parent level* is at the overall firm level and reflects all business units within the firm. *Vendor level* is at the business unit level. We utilize parent-level measures of market share because they provide

a better reflection of a firm's resources. However, our findings replicate using vendor-level measures.

Dependent Measures

Measures of Firm Exit. Firm exit is operationalized as occurring when a firm exists in a category at time t but not at time $t + 1$. One concern may be that firms did not exit, but were instead acquired by another firm or two firms merged. We checked the data to determine the frequency of these events. We defined a merger or an acquisition as occurring when a firm's brands in t are owned by a different firm (or firms) in $t + 1$ and the original firm name in t no longer exists in that category. We found that mergers and acquisitions constitute only 4.5% of all firm exits that occurred following the NLEA. Given this small number, we do not consider mergers and acquisitions a threat to our results. However, as a precaution, we reanalyzed our data removing these firms, and our findings are unchanged. It is also possible that firms might change their names without exiting a category or being involved in a merger. To determine the extent of this concern, we randomly selected one food and one nonfood category and counted the number of times a firm changed its name, but remained in the category under a different name that did not involve a merger or acquisition. We found no instances of this.

Measures of Firm Price and Distribution. In both our models and hypotheses, price and distribution measures are at the firm level. However, in the raw data, we have only brand-level measures. Firm price is therefore operationalized as the standardized share-weighted price of its brands. Prices are standardized within category because price is reported in different units across categories. Firm distribution is likewise computed using a share-weighted average of its brands' distribution levels. The reported brand distribution levels represent the proportion of total distribution in which a brand is sold. Total distribution is a function of the number of stores and the volume sold by each store. Table 2 reports summary statistics for our measures.

Independent Measures

Our key independent variables include time, a food category indicator, and firm market share. As indicated previously, the food * time interaction reflects the NLEA variable. Time is captured by the quasi-experimental design observing firms when the labels were absent (1991–1993) coded as 0 and present (1993–1995) coded as 1.

Measure of Food Category Membership. Category membership was determined by IRI codes of edible (coded 1) and inedible (coded 0) categories. Five categories involved food products with no nutritional

⁹ Differences are due to IRI changes to the category structure, including the addition, removal, combination, or disaggregation of categories. In the latter two cases, each category was examined and common categories were created across the three years.

¹⁰ The model based on two years of data used a differencing approach to control for unobserved fixed effects.

¹¹ We are indebted to one of our reviewers for this observation.

Table 2 Descriptive Statistics

	Nonfood categories			Food categories		
	1991	1993	1995	1991	1993	1995
Number of categories	55	55	55	49	49	49
Average firms per category (start of period)	12.85 (6.80)	13.29 (7.19)	12.71 (6.73)	19.42 (11.09)	18.97 (10.82)	18.57 (10.20)
Average firm market share relative to the category leader	0.238 (0.108)	0.231 (0.104)	0.237 (0.096)	0.162 (0.089)	0.166 (0.096)	0.171 (0.095)
Firm exit rates ^a		0.088 (0.090)	0.195 (0.116)		0.130 (0.115)	0.211 (0.148)
Firm entry rates ^a		0.109 (0.097)	0.164 (0.109)		0.110 (0.093)	0.191 (0.147)

Note. Standard deviations in parentheses.

^aGiven that firm exit rates are a function of change across time, they are only reported for 1993 (the change from 1991–1993) and 1995 (the change from 1993–1995).

content (e.g., gum) that are unlikely to exhibit reactions to the NLEA. Removing these five categories, the three-year category sample is $n = 104$.¹²

Measure of Firm Market Share. Our approach has two features. First, we use lagged firm market share to ensure causal ordering. Second, we aggregate a firm's brands in a category to reflect a firm's market share relative to competitors within a category. We normalize the market share of the largest parent firm in a category to be 1, and define the firm's relative market share to be the ratio of each firm's market share to share of the largest firm in the category. This normalization procedure is common in secondary data analysis (Buzzell and Gale 1987).

Results

Firm Exit Responses

Table 3 contains model estimation results. Considering factors affecting firm exit, the main effect of firm market share is negative and significant ($\beta_3 = -36.05$, $p < 0.05$), indicating that large-share firms are less likely to exit in general. In addition, there is a firm market share * time interaction, indicating that large food and nonfood firms are more likely to exit over time ($\beta_5 = 33.85$, $p < 0.05$), perhaps pointing to a general trend in firms limiting the number of categories in which they compete. Results further indicate that large-share firm exit rates tend to be greater in food categories than in nonfood categories ($\beta_6 = 33.21$, $p < 0.05$). The presence of these interactions indicates the importance of controlling for them via our quasi-experimental design.¹³

¹² It is possible to use these categories as controls within the food category. However, their small number makes their viability as a control group limited. Results are similar with or without these categories.

¹³ Our use of multiple interactions may induce collinearity. To ascertain whether this is problematic, we compute the condition index (Belsley et al. 1980) for each of our models. We find the largest condition index in our data to be 6.93, indicating no problem with collinearity.

Considering the effect of the NLEA, the food category * time interaction is not significant ($\beta_4 = 0.40$, ns). This implies that the NLEA does not have an overall effect on firm exit rates in food categories. However, the firm market share * NLEA interaction is negative and significant ($\beta_7 = -32.12$, $p < 0.05$), indicating that large-share firms in food categories were less likely to exit following the NLEA. This supports Hypothesis 1.

Firm Distribution Responses

Results indicate no main effects for time, food versus nonfood category, or firm market share on changes to firm distribution levels (see Table 3). Further, there is no effect of the NLEA (food category * time interaction) on distribution ($\beta_4 = 0.035$, ns). There is, however, a negative and significant food category * firm market share interaction ($\beta_6 = -0.261$, $p < 0.01$), indicating that large-share food firms, in general, were losing distribution. However, the positive and significant NLEA * firm market share interaction ($\beta_7 = 0.341$, $p < 0.01$) indicates that large-share firms in food

Table 3 Results

	Firm exit rates	Change in firm distribution	Change in firm price
Intercept (β_0)	-0.30 (0.302)	-0.007 (0.021)	-0.025 (0.031)
Time (β_1)	-0.19 (0.332)	-0.020 (0.030)	0.039 (0.046)
Food category (β_2)	-0.56 (0.330)	0.016 (0.027)	-0.019 (0.041)
Lag firm market share (β_3)	-36.05 (15.59)*	0.005 (0.054)	0.050 (0.082)
NLEA (β_4)	0.40 (0.376)	0.035 (0.039)	0.043 (0.059)
Time * Lag firm market share (β_5)	33.85 (15.62)*	-0.088 (0.077)	-0.248 (0.117)*
Food * Lag firm market share (β_6)	33.21 (15.67)*	-0.261 (0.079)**	-0.029 (0.120)
NLEA * Lag firm market share (β_7)	-32.12 (15.70)*	0.341 (0.113)**	-0.014 (0.173)
-2 log likelihood	16690.9	3079.1	5384.8
Degrees of freedom	1187	1162	1162

Notes. NLEA = Time * food category. Standard errors are in parentheses.

* $p < 0.05$, ** $p < 0.01$.

categories experienced larger gains or smaller losses in distribution following the NLEA relative to small-share food firms. These results support Hypothesis 2.

Firm Pricing Responses

Table 3 indicates fewer effects for price. The main effects of time, food category, and firm market share were not significant. More important, the interaction reflecting the NLEA is not significant ($\beta_4 = 0.043$, ns). Only the time * firm market share interaction is negative and significant ($\beta_5 = -0.248$, $p < 0.05$), indicating that large firms, in general, decreased their prices over time. Examining the NLEA * firm market share interaction, we find it is not significant ($\beta_7 = -0.014$, ns), failing to support Hypothesis 3, and indicating that average prices were not affected by the NLEA.

Discussion

Firm Implications

Our findings indicate that regulation is an important external event that can be the death knell for some firms. Further, our findings support the view that firms can make strategic use of regulation. This suggests that firms should think about the costs and benefits of regulation relative to competitors, not in absolute terms. Further, if firms hope to be strategic in their use of regulation, they should consider more carefully how resources, investments, and strategies affect the balance of regulatory costs and benefits.

Our results also indicate that marketing resources and capabilities have value to firms facing information disclosure. The power of intangible marketing assets such as marketing knowledge, customer relationships, retailer relationships, and brand equity may have helped large-share firms benefit from regulation. This result supports Moorman and Slotegraaf's (1999) intuition that a key feature of marketing capabilities is their option value, which allows their deployment against future opportunities. It follows, therefore, that firms with strong resources might advocate for the disclosure of standardized information. In the case of the NLEA, evidence suggests that some firms were aware of their advantages (*Wall Street Journal* 1993b).

Implications for Theory on the Impact of Information on Markets

Our findings support the view that information plays a formative role in the development of markets. However, while past research has emphasized the positive consumer search effects and transformative changes to brand quality, our supply-side view found that firms were differentially affected, depending on their market share in the category. These results suggest that theory needs to account for the competitive effects of losing small-share firms that may offer

greater variety, that occupy specific niches of value to certain segments of customers, or that may have a disciplining effect on the price or quality of food products across time.

Second, our findings extend theory about the impact of information on markets by noting that benefits accruing to large, existing category members do not appear to cause problems for consumers—at least in the short term. This may indicate that the classic information versus market power dichotomy is too simplistic. In our case, information does increase a firm's market power. However, consumers may not necessarily be any worse off, which is an assumption of the market power view (see Mitra and Lynch 1995). Specifically, large-share firms did not increase prices more than small-share firms. In fact, if exiting small-share firms are higher priced, the NLEA could exert downward pressure on average prices paid in the category.

To explore this possibility, we calculated the mean standardized prices for large-share and small-share food firms pre- and post-NLEA. Results indicate, on average, the price of small-share food firms (0.130) is higher than the price of large-share food firms (-0.136) in the pre-NLEA time period. Future research should also consider what category or firm factors may moderate the effect of standardized information on price (e.g., Bohlmann et al. 2002).

Public Policy Implications

Our findings imply that policy makers should give greater consideration to the regulatory and industry conditions under which firm heterogeneity influences the impact of information disclosure (Mitnick 1980, Wood 1986). We consider a number of directions here. First, firm resource differences may become more relevant when regulation requires costly testing. Second, firm differences may only be important when resource variability among industry members reaches a certain threshold. Third, we speculate that our observed effects are more likely in industries in which firms can leverage channel and/or customer relationships. Fourth, the prevalence of industry strategies, such as the heavy advertising or salesforces, may be at the heart of these relationship advantages and might therefore predispose industries to be more prone to the types of effects we observe.

It is also critical that policy makers piece together the consumer, brand, and firm effects of standardized information disclosure to understand the full effect on consumer welfare.¹⁴ This analysis could involve

¹⁴ Although we focus on conditions when disclosure is mandated for all firms, Grossman (1981) argues that voluntary disclosures result in similar effects because consumers make accurate quality inferences about firms that do not disclose.

examining the brand features of firms that exit, the resulting breadth of offerings emphasizing various features (e.g., price, taste, and nutrition), and the longer-term impacts on firm entries and exits. For example, policy makers should examine whether the rate of firms entering mitigates loss in variety due to firm exits. To explore this issue, we examined whether the NLEA affected the percentage of firms entering a category. A random category effects regression of percent new firm entry on food, year, and food * year (NLEA) indicates a significant effect for year on firm entry but no effect for food * year (or NLEA).¹⁵

Limitations

Future research could utilize direct measures of firm resource differences instead of a firm's market share. This would allow greater insight into the factors underlying our small-share findings—many of which we review in our hypotheses section. Second, other firm-level factors that our research did not examine, including the impact of overall firm size or firm

¹⁵ We did not consider entries in our analysis because it is not possible to observe firm market share levels prior to firm entry, making it impossible to test for the role of firm differences.

capital, may influence firm responses to standardized information disclosure. Our modeling approach eliminates all firm effects except those associated with time-varying, firm-specific resources. Third, we focused on firm market share *within* a category. It could be argued that a firm's share of the entire grocery store is a better reflection of its resources. We explored this and found no effects. Fourth, our definition of firm power within a category uses the broadest view of category in the data. This approach should give small firms the best chance of surviving because there is more opportunity to select niche positions. Fifth, the NLEA may equip consumers with information to choose higher quality products. Future research could examine how firm resources influence the effect of standardized information on changes to product quality.

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Appendix. An Examination of Internal Validity Threats* to Quasi-Experiments

Description of threat	How eliminated from study
Testing: Observed effect is due to familiarity induced by testing.	<ul style="list-style-type: none"> • Data collection via supermarket scanners does not induce familiarity with the instrument.
Statistical regression: Observed effect is due to regression to the mean.	<ul style="list-style-type: none"> • Our pre-NLEA measures should not be depressed or inflated by this type of error.
Mortality: Observed effect is due to sample mortality.	<ul style="list-style-type: none"> • We do not rule out firm mortality. Instead, we model it in the firm exit analysis.
Ambiguity about the direction of causal influence: Causality of observed effect cannot be discerned.	<ul style="list-style-type: none"> • We used lagged firm market share.
Selection bias: Observed effect is due to sample selection.	<ul style="list-style-type: none"> • Our time-series data control for unobserved fixed selection effects.
Selection maturation: Observed effect is due to experimental groups maturing at different speeds.	<ul style="list-style-type: none"> • Our time-series data control for differences in trends across groups. • We use additional data collection and testing to control for maturation selection effects that vary across time. One such effect has to do with changes in the cost structure of food versus nonfood categories during the quasi-experiment. To rule this out as a competing explanation, we collected Producer Price Index (PPI) levels for each IRI product category we were able to link to a Standard Industrial Classification code. This was possible for 84% of the categories. We examined the change in PPI across food versus nonfood categories and found no differences.
History: Observed effect is due to an event, which occurs between the pretest and the posttest, not the stimulus.	<ul style="list-style-type: none"> • Some firms might introduce the new labels early to gain a competitive advantage. However, Moorman's (1998) in-store estimates suggest this occurred in only 1% of brands. • Historical events related to retailers or consumers are not considered problematic because IRI data includes data about food and nonfood products sold in the same retailers and purchased by many of the same customers. • Given a reasonable percentage of sales in each category come from firms competing in both food and nonfood categories pre-NLEA (49%) and post-NLEA (47.5%), important historical events are likely to affect firm management of both food and nonfood categories.

*See Cook and Campbell (1979) for a complete list of threats.

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