HEALTH MEDIA COVERAGE AND CONSUMER CHOICE: A PANEL DATA ECONOMETRIC ANALYSIS OF THE DOMESTIC CRACKER MARKET

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Selected paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Long Beach, California, 23-26 July, 2006

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INTRODUCTION & BACKGROUND:

Consumers have become more health conscious, yet more obese [U.S. Surgeon General] and the food industry attempts to capitalize on both trends. The industry advertises the health benefits of their products, while at the same time the consumers often tend to overindulge, either just to overindulge or as a result of thinking that they can consume more of a healthier version of a food product than a less-healthy version. Do some consumers heed information provided to them about real or perceived health issues and change their eating and lifestyle habits accordingly, while others do not and possibly become obese or develop health problems? How do their political beliefs as well as the general overall health of a given area affect their decision? These issues include the reduction of fat intake, reduction of LDL cholesterol, and the reduction of triglycerides [U.S. Surgeon General].

Some consumers, however, chose to ignore the warnings of the medical community and continue to consume products high in these substances indiscriminately. Some who are seeking to lose weight have subscribed to diets such as the Atkins diet and the South Beach Diet and have attempted to reduce carbohydrate intake. Yet, some individuals have chosen to remain obese and not reduce their carbohydrate intake.

According to the American Heart Association, studies have shown that trans fatty acids can cause a rise in cholesterol level, and it is hydrogenation of food products that is generally behind

the production of trans fatty acids [American Heart Association; Organic Chemistry, 2nd Edition; Biochemistry, 2nd Edition].

Is the trans fatty issue valid? Only the perception matters. If the public perceives that something is harmful or is led to believe that something is harmful, then the public will alter its consumer behavior according to the importance each individual places on that health issue. If the reality is, in the end, different from perception, then consumer behavior may return to its previous steady state. So, if the public believes that trans fatty acids should be avoided, then it is reasonably expected that consumers will alter their behavior to avoid products that do not show themselves to be trans fatty acid free. Even if the public perception is all that matters, however, it is of some interest to determine if there is medical evidence supporting the notion that trans fatty acids are harmful.

New Health-Based Food Legislation

Legislation that took effect on the 1st of January, 2006 requires a trans-fatty acid label on food products [U.S. Food and Drug Administration]. This legislation specifically is a rule published by the U.S. Food and Drug Administration in the Federal Register under number 68 FR 41434. This label gives the content of trans fatty acids in the food product being labeled. Trans fatty acids are found in many products, including shortening, margarine, and various snack food items.

Persons being made aware of the risks associated with trans fatty acid consumption via media coverage, either specifically on trans fatty acids or on related health topics, may choose to alter

their consumption behavior to reduce their intake of trans fatty acids. Others, however, might not be so concerned and therefore might not change their behavior much, if at all. Another possibility is that some consumers might be more concerned with saturated fats than with trans fatty acids, and may seek to reduce their saturated fat intake more than their trans fatty acid intake. Persons who are interested in reducing trans fatty acids are expected to respond to information provided about a given product's trans fatty acid content, especially if that information is readily seen and easily comprehended.

Additionally, media coverage indirectly impacts the effects of the trans fatty acid label. If a label is seen, but the public does not know its significance, the label is not as effective. If, however, the label is seen after significant coverage in the new media about the trans fatty acid issue and related health topics, the consumer is more likely to be affected by the label [McDonald 1996].

Faced with the looming deadline for the mandatory introduction of the trans fatty acid label, Nabisco, an industry leader in the cracker industry, opted to introduce the label voluntarily ahead of the deadline. This strategic move permits Nabisco potentially to gain market share. Doing so takes market share away from other firms in the market, and in the absence of appreciable expansion or shrinkage of the cracker market as a whole, this can result in a significant increase in market power for the firm that adopted the label as a strategic move.

Under the assumptions of increasing returns to scale, this increase in market share increases market power, gives the firm greater advantage in the market over the other firms, and provides the potential to capture an even greater market share. This in turn gives the firm still more market

power. The desired results of this strategic behavior can be self-perpetuating as large firms get larger.

Data on the Cracker Market

In this study the effects of the voluntarily-introduced trans fatty acid label on market share within the cracker and salted snack market (hereafter referred to as the cracker market for simplicity) will be estimated from panel data. All data is provided for each individual time period of the data set, and the time period into which the data is subdivided is one week. This weekly data is organized by metropolitan area and covers a three-year period. The trans fatty acid label was first introduced voluntarily to the market at approximately the half-way point of the data, giving one-and-a-half years of data on either side of the label's introduction.

Changes in market share (first differenced market share) after the first introduction of the label (the second half of the data set) to the various firms in the industry will be estimated. Information on trans fatty acids has been available for some time, with the Food and Drug Administration requiring that trans fatty acid content be listed on food products in 1993 [U.S. Food and Drug Administration]. However, the rule requiring the new label was not passed until 2003 and was not effective until the first of January, 2006. Nabisco, choosing to lead the market, introduced the new required label voluntarily in December 2003. This occurs in the mid-point of the data set.

It is also important to understand the type of structure in the cracker market as shown by the data. As shown in Table 1, Nabisco is indeed the clearly industry leader in terms of market share. The next largest market share, belonging to Keebler, is less than one quarter of Nabisco's market

share. Table 1 also shows that most of the market share is vested in the top 8 firms. Table 2 shows the HH Index for the cracker market for the top 4, top 8, top 20, and top 50 firms. As can be observed in that table, the HH Index does not change much when moving from 4 to 8 to 20 to 50. It also suggests significant market concentration with a single primary industry leader. This sets the stage for leader/follower strategic behavior. Nabisco adopting the trans fatty acid label, for example, would be a strong impetus for the other leading firms to do the same. Conversely, Nabisco knows that the other leaders can possibly gain market share by adopting the label, they expect Nabisco to adopt the label, so Nabisco, knowing this, must adopt the label to prevent a loss in market share to the other leaders in the industry. These desired changes in consumer behavior as a result of the strategic behavior, i.e., the label, are due in part to the consumer being sensitized by the media coverage on the trans fatty acid issue and related health topics.

Additionally, the concept of naturally forced disclosure suggests that a cracker firm that does not adopt the label may be considered by the consumer to have a high trans fatty acid content, though trans fatty acids might be very low or nonexistent, because the omission of the label by a manufacturer signals that the product has a higher trans fatty acid content.

Table 1: The market shares for the top twenty firms are listed below.

Firm	Share
Nabisco	66.1180
Keebler	12.4890
Private Label	5.1190
Pepperidge Farm	3.4555
Sunshine	2.9338
Red Oval Farms	2.3761
Dare	2.2551
Carr's	1.4008
Sesmark	0.8834
RY Krisp	0.8157
Kashi TLC	0.4775
Bremner	0.2353
Hickory Farms	0.1206
Health Valley	0.1198
McCormick	0.1058
Deli-Catessen	0.0755
Gilda	0.0674
Barbara's	0.0529
Goya	0.0464
Delicious	0.0435

Table 2: HH Index for the Cracker market

		Top 4		*Top 8*		*Top 20*		*Top 50*	
Share	*HH*	87.1815	4565.71	96.1473	4587.01	98.9809	4588.79	99.7318	4588.91

Utility in the Cracker Market

The individual choice a consumer makes in purchasing a cracker comes from an underlying utility function. This problem of profit maximization for the firm involves understanding and applying a utility function for individuals who purchase from these firms. One needs to know how consumers view and process information about food-related health issues, and how consumers respond to that information. Information comes to the consumer from the firms in several ways, including labels on the product and media advertising. These methods of

dispersing information about health issues are interrelated in their effects and can interact with each other.

The presence of a health-related label on a food product may jog the memory of a consumer about a television commercial viewed the evening before. An article in the newspaper about a health issue may remind the consumer of a label about that same health issue that recently appeared elsewhere. If a consumer believes that health issue is important, that consumer may highly value taking mitigating action. This is what the firm hopes will happen, and if the firm takes strategic action to promote aspects of their product that are positive with respect to this health issue, it is precisely what the firm is betting on happening.

If this consumer reads an article on a specific food-related health problem and purchases a particular brand product that did not have a label indicating that the particular brand helped that health problem, but also remembered seeing another brand that did have such a label, they might choose the brand with the label next time they visit the grocery store.

A food-related health issue could be real and supported by significant medical research, yet consumers may not pay attention to that issue if it is not well publicized. Also, even if an issue is well publicized, the utility function of certain consumers might not value taking mitigating action against these potential health problems.

Additionally, a health issue may arise that is not real (or at least not significantly harmful to the majority of the population), but receives enough media attention such that at least some

consumers take mitigating action and alter behavior according to the perceived threat. When it is discovered that the threat is not real, consumer behavior may return to the behavior prior to the media coverage. However, for some individuals, behavior may return to its former level in a damped or gradual fashion. For other consumers, behavior may be permanently changed by the media coverage of the perceived health risk.

MEDIA COVERAGE

Whether a health issue is real or only perceived, it is possible that media coverage may have a temporary effect. A study detailed the case of a potential biohazard in food products, viz., the impact of kepone contamination on demand for oysters and the effects of media coverage. Media coverage of this health issue (in this case a biohazard) did indeed reduce consumer demand for oysters, but this effect was temporary, and consumers returned to their previous level of consumption [Swartz and Strand].

However, in another study it was found that, despite such occurrences, various studies are more consistent than not that sustained media coverage of food safety risks over long periods of time, especially in the presence of accumulating evidence of these hazards, reinforces the risks and consumer response is both sustained and significant [Kalaitzandonakes, Marks, and Vickner, 2004].

As suggested by Teisl, Roe, and Hick [2002], a consumer might have a certain willingness to pay for avoiding mortality or morbidity of dolphins when they make their purchase decision for tuna. Similarly, a consumer might have a certain willingness to pay for avoiding personal morbidity or

mortality. A food product might, for example, introduce a label that indicates that it is now fat free (where it can be assumed not to be fat free before the label's introduction). A consumer with a certain willingness to pay for avoiding fat-related health problems might switch to a labeled product from an alternative, even if the cost is higher. Alternatively, a consumer might have used the product before being made aware of health problems that can come from fat consumption through media exposure, then returned to the product after being made aware of the new fat free nature of the product through the label.

The basic concept of advertising is to control the psyche of the consumer. This incorporates the notion of mass psychology, by which public opinion and consumer decisions can be guided and controlled [Ewan 1976]. It is certainly nothing new that advertising works, and it is not surprising that advertising and media coverage could be used to influence consumer decision in the cracker market in the face of a real or perceived health issue.

Media coverage on health issues can be expected to impact the effects of an information label, such as the trans fatty acid label. Chang and Kinnucan [1992] found that the effect on demand of an additional exogenous variable, such as an information label, depends on the effect of advertising for good i on all other goods in the market, the substitutability between good i and all other goods in the market, and the marginal utility of money. Beginning from Marshallian Demand,

$$X_Y = \frac{\partial X}{\partial Y} \quad \text{(response to income)} \qquad (1.1)$$

$$X_p = K - X_y X' \quad \text{(response to price)} \qquad (1.2)$$

The response of consumer demand, then, to a change in a state variable is

$$X_s = \frac{\partial X}{\partial s} = -\frac{1}{\lambda K V} \qquad (1.3)$$

where λ is the marginal utility of money, K is the Slutsky substitution matrix, and

$$V = \frac{\partial^2 U}{\partial x \partial s}, \Rightarrow \frac{\partial X_i}{\partial s_j} = -\frac{1}{\lambda} \Sigma_k K_{ik} \left\{ \frac{\partial^2 U}{\partial X_k \partial s_j} \right\}. \qquad (1.4)$$

It is also possible that seeing an advertisement on trans fatty acids specifically or on related health topics might suddenly stimulate a new idea in the mind of a consumer, though this is rare. Long-term advertising effects are also not separate from the short-term effects, and this works with outside factors to cause a shift in consumer behavior [McDonald 1996]. Additionally, over time the frequency of advertising required to reinforce the idea (in this case, the health issues related to trans fatty acids) diminishes [Ebbinghaus 1885].

Both long-term and short-term media coverage of the trans fatty acid issue can be expected, therefore, to impact first differenced market share. As previously stated, the Food and Drug Administration required trans fatty acid content to be listed on food products in 1993, though it was a full decade before the rule requiring the new trans fatty acid label to be included was passed. In the meantime, not only was the trans fatty acid label voluntarily introduced, but there was also significant media coverage on the related health issues.

Kalaitzandonakes, Marks, and Vickner [2004] founds that, on such issues as health, a local area is expected to have the same basic information conveyed via newspaper, television, and radio. Given the difficulty of obtaining television and radio transcripts, as well as the relatively larger

number of radio and television stations in a given area to newspapers, observation of media coverage can be carried out by observing newspaper coverage.

How should media coverage be measured? Clearly newspapers are the most convenient source. The media coverage, then, is measured by frequency of articles containing one of a number of keywords related to trans fatty acids. This metric shows the salience of an issue [Kalaitzandonakes, Marks, and Vickner 2004].

DATA

The data used in this study was collected from scanner data in fifty one metropolitan areas over a three year period approximately centered around the date at which the trans fatty acid label appeared in the market. The data set included data on 260 individual products. In order to construct a suitable and manageable data set, it was necessary to aggregate the product data by firm. The primary cracker company of the study is Nabisco, as they were the clear leader in the market with over 66% of the market. The next two largest firms were Keebler and Private Label, where Private Label is an aggregation of store brands in the stores from which the data was collected. The data was from fifty metropolitan areas gathered weekly over a three year period.

A dummy variable was crated for each metropolitan area. This dummy equaled 1 for the data pertaining to that metropolitan area and 0 otherwise. These variables represents an intercept shifter for the purpose of checking fixed effects. The trans fatty acid label was present in the market beginning in December of 2004. A label dummy was created so that it equaled 0 prior to this date and equaled 1 after. The value of the dummy was the same over time and over each

metropolitan area. It was also the same value for each firm because it did not indicate the specific date that a given firm introduced the label, but rather the date that the label was introduced to the public and in the market.

The label dummy was used to create interaction terms with metropolitan area dummies. These interaction terms give the effect of a given metropolitan area in the presence of the label. These variables, like the metropolitan area dummies, are intercept shifters.

Demographic variables of Population, Percent of Population Female, Percent of Population over Age 65, and Median Income were included as possible explaining factors for differences in response across metropolitan area. A set of media variables was also considered to investigate the possibility that media coverage might influence consumer decision. The media variables, whether national or local, represent a total count of articles containing at least one occurrence of one of four keywords relating to trans fatty acids or related health issues [Kalaitzandonakes et al. 2004].

Table 3. Descriptive Statistics of the Total Data Set

VARIABLE	MEAN	STD DEV	MIN	MAX
Pnab	3.9101	0.4082	2.3774	5.1708
Pkeeb	4.1642	0.4445	1.8923	4.8661
Ppvt	2.2693	0.5198	0.9819	4.8341
Potr	4.2405	0.4836	2.2466	5.9531
Wnab	0.6612	0.0661	0.4503	0.8373
Wkeeb	0.1249	0.0586	0.0113	0.4399
Wpvt	0.0512	0.0279	0.0034	0.2289
Wotr	0.1627	0.0431	0.0359	0.3194
WFnab	-0.0002	0.0392	-0.2611	0.2307
WFkeeb	0.0001	0.0264	-0.2101	0.2271
WFpvt	-0.0001	0.0124	-0.1049	0.0690
WFotr	0.0002	0.0198	-0.1314	0.1079
label	0.4600	0.4900	0	1

The National Media Metric was constructed from frequency counts of four germane keywords (trans fatty acid, cholesterol, heart health, and heart disease) in USA Today, the Wall Street Journal, and the New York Times. A similar metric was constructed for each metropolitan area. It is observed that coverage of "trans fatty acid" is fairly sparse compared to that of "heart disease" and "cholesterol." Additionally, the articles on "heart disease" and "cholesterol" typically were not specifically on the issue of trans fatty acids. However, those topics are highly related to the overall health issue. As it is related to the overall issue, coverage of those keywords demonstrates the salience of the issue. For example, if a consumer reads ten articles on heart disease not related to trans fatty acids and then later reads one article on trans fatty acids, that consumer, reading that trans fatty acids can cause heart disease, will likely be more impacted by that article due to the ten heart disease articles previously read.

The coverage of "heart health" is sparse as well, but it is very related to "heart disease," and therefore easily grouped with "heart disease" and "cholesterol." This generates two distinct, yet related groups of media coverage: trans fatty acids, and related health topic coverage.

Because there are these four keywords in two distinct groups, factor analysis can be used to construct a single media variable for each of the national newspapers and each of the metropolitan newspapers. A common factor is a hypothetical, unobserved variable. It contributes to the variance of at least two observed variables, while a unique factor contributes only to one of the observed variables. As factors are generally not linear combinations of the observed variables, factor scores cannot be computed directly, but must be estimated.

The estimated factor scores of each of the linear variables are multiplied by their corresponding observable variable and summed to generate the overall media variable for each of the national newspapers and the metropolitan newspapers. For example, the media variable for USA Today is

$$USA_t = f_1 HD + f_2 HH + f_3 CHOL + f_4 TFA \qquad (1.5)$$

Using separate media metrics for each national paper, estimated in a regression one at a time, allows for observation of differences in effects of the three national papers. However, it is also of interest to estimate what the overall effect of national media coverage would be. For this, a national media variable can be constructed.

Factor analysis can once again be used to construct this national media variable, as it would be expected that these three newspapers might contribute differently to the overall saliency of the topic. (If they contribute the same, their factor scores will be identical.) So, the overall media metric is

$$nationalmedia = f_1 USA + f_2 WSJ + f_3 NYT \qquad (1.6)$$

For analysis of the effects of metropolitan newspapers, all metropolitan newspaper variables can be included, with the national papers omitted to avoid issues of multicollinearity. Such an analysis shows how each metropolitan area reacts to media coverage of the trans fatty acid issue and related topics, and how this impacts first differenced market share of crackers. The media metric for a given metropolitan area is:

$$metro_{i,t} = f_{i,1} HD + f_{i,2} HH + f_{i,3} CHOL + f_{i,4} TFA \qquad (1.7)$$

MODEL AND ESTIMATION METHOD

Profit-seeking firms in the cracker market wish to capture a market share from their competitors. A consumer makes the purchases of crackers and provides the profits to the cracker producers, and that consumer is driven by a utility function. This function captures their internal decision-making process with respect to whether to purchase crackers, how much to purchase, and which brand to purchase. Consumers behave in response to an information label individually as defined by a specific utility function. The market utility function is the aggregate of all individual utilities. The firms in the market must understand and exploit this function in order to gain a competitive advantage over other firms competing in the market. However, this function need not be determined explicitly.

Patterning after the example of Teisl, Roe, and Hicks [2002], in this market for crackers, a specific consumer faces the indirect utility function

$$V = V\left(\vec{A}, \bar{q}, \bar{p}, Y\right) \qquad (1.8)\,,$$

where the vector $\vec{A}$ is a vector of health-related assessments, the vector $\bar{q}$ is a vector of quality considerations, the vector $\bar{p}$ is the vector of own price and the prices of all other products in the specific market, and Y is income [Teisl et al.].[1] The producer has control over price characteristics, quality factors of the product contained in the q vector (though each consumer has their own set of quality considerations, i.e., tastes and preferences), and to some extent the information contained in the information vector $\vec{A}$.

[1] This indirect utility function is modeled after the function used in the dolphin safe label study.

Again following Teisl, et al., the vector $\vec{A}$ is the Assessment Function and can be taken to be

$$\vec{A} = f(S, I, t) \quad (1.9),$$

where S is a given information set, I is the individuals prior information, and t is the amount of time devoted to processing the new information set S.[2] To isolate a given health issue's effects, holding all other information constant, this function accounts only for information on issues pertaining to the specific health issue. The firm has the ability to control most of the new information set, S, through labeling, advertising, and firm-initiated media coverage. However, it is always possible that a news story may be released by the media independent of the firms. The consumer is responsible for prior information (except for the prior information stemming from past informative efforts of the firm) and the time to make a decision, t. These are the factors of the assessment function.

If the consumer health-related assessment variable, $\vec{A}$, contains an information set, S, that information set, S, includes both the label and media coverage. This new information set can be defined by the metropolitan label dummy variables and either the national media variable or the metropolitan media variables. The definition of the information set according to the two types of media coverage can be used in the definition of the model to assess the impact of new information conveyed nationally v.s. new information conveyed locally.

To expand the assessment function to include the national or local media and label information sets yields the following function:

$$\vec{A}(S, I, t) = \vec{A}(S_{label}, S_{media}, I, t) \quad (1.10)$$

[2] This assessment function is modeled after the function used in the dolphin safe label study.

In Eqn. (1.10), the S_{media} information set can be defined to include either the national media information set or the local media information set. Expanding Eqn. (1.10) to include the national media variable and the metropolitan area dummy variables yields:

$$\vec{A}\left(S_{label}, S_{media}, I, t\right) = \vec{A}\left(D_1, ..., D_m, Dlabel_1, ..., Dlabel_m, M_i, I, t\right) \quad (1.11)$$

In Eqn. (1.11), the metropolitan area dummies are given by D_j and $D_j label$, where the index *j* goes from 1 to m for m metropolitan areas. $D_j label$ is the metropolitan area interaction dummy, where the metropolitan area dummy has been interacted with the label dummy. M_i is the national media variable, where the i index indicates which of the indices is being used, i.e., one of the three national papers or the composite index.

A consumer seeks to maximize their indirect utility within a given market by making a choice of which product to buy. Firms that are the most successful are those whose products generate the most utility within the largest set of consumers.

A consumer purchasing goods from firms results in an overall individual expenditure function

$$e = e\left(\vec{A}, \vec{q}, \vec{p}, Y, U\right) \quad (1.12)$$

where *U* is the individual's overall utility, and the other variables are the same as those in the indirect utility function. A consumer, for example, has a certain income, *Y*, and holding all other variables constant, will spend a certain portion of that income in the market. Holding income

constant, it is possible that the quality variable, $\vec{q}$, becomes the new decision factor, holding all other factors constant.

Similarly, the price vector, $\vec{p}$, could become the decision factor, holding all other factors constant. Ever present in this expenditure function is the consumer's total utility, which the consumer always seeks to maximize, assuming a rational consumer.

In the instance of a food market of products differentiated by health-related issues, also entering into this decision process is the series of health-related assessments, given by $\vec{A}$ in both the expenditure function and the indirect utility function. For a given income, *Y*, which can generally be taken not to change appreciably in the short-run, and a given set of quality factors and prices, an individual's decision becomes one of health-related assessments contained within $\vec{A}$.

Recall that the vector $\vec{A}$ contains information the consumer already knew, *I*, the time processing all information, *t*, and the consumer's information set, *S*, that they may get from media or a label (though media information is contained in the label). Given this, the consumer's decision entails recalling their own prior knowledge about the relevant health issue and its relation to one or more products in the market, being exposed to some new information about that health issue and/or the relation to the food product, and taking some time (which varies from individual to individual) to process that information and make a final expenditure decision.

A consumer might know that high-fat food products can contribute to cholesterol problems. This represents the prior information, *I*, in the assessment function, $\vec{A}$. To provide and example, upon

arriving at the grocery store to purchase, among other items, some crackers, the consumer might ask a sales assistant if the crackers have any potential health impact. The knowledgeable sale associate might respond that the high-fat crackers being sold can contribute to cholesterol problems. This represents the new information set, *S*, and contains both old and new information. The repetition of the old information that the consumer already knew can possibly reinforce the impact of that information on the purchase decision process.

Following receipt of this information from the sales associate, the consumer then spends a certain amount of time, t, on processing this information and makes a decision to purchase or not. In this example, this means that the consumer's expenditure on high-fat crackers changes as a function of health-related assessments as detailed above, holding all other factors constant.

It is easy to see that a consumer's decision can change, ceteris paribus, based on their information set about a given health issue and its relation to a given food product. If the consumer's decision changes, then the consumer's expenditure on a given product changes based on the information set, ceteris paribus. Given that the exposure to information, whether it is through a label or some other form of information conveyance, can affect consumer behavior, a relevant question is whether or not the consumer is better off before or after the new information is made available.

Since the consumer seeks to maximize utility, and under the assumption that the consumer is actually maximizing utility by making a certain expenditure choice under the original information set, the benefit to the consumer can be measure by comparing the original

expenditure at the original utility and information set to the new expenditure at the new information set, but at the same utility as the original expenditure. This may be measured by compensating variation, given as

$$CV = e\left(A_1, U, \vec{p}\right) - e\left(A_0, U, \vec{p}\right). \qquad (1.13)$$

The equation for *CV* takes the difference of the two expenditure functions at two information set levels and at a fixed utility, *U*, and price set, $\vec{p}$. To illustrate, if the new information set, $\vec{A}_1$, provides information about a new health issue and a food product that helps prevent problems associated with that health issue, then *CV* measures willingness to pay for a better quality product (with respect to that health issue). If *CV* is positive or zero, this gives the maximum amount a consumer is willing to pay for the perceived better quality product. If *CV* is negative, then the consumer perceives the product as of lesser quality.

While this might be difficult to imagine with respect to a health issue, if the consumer does not believe that this new health issue is real, or if a consumer considers a feature of the product that is supposed to help with this health issue is actually bad, and the consumer did not know this feature was there before, the consumer might decide to purchase less of the product. In such a case of negative *CV*, this is the amount of money a consumer must be given in order to accept this product and not have any change in utility. *CV* allows an effective measurement of welfare change to the consumer as a result of the introduction of the new information set (label or media).

Returning to Eqn. (1.12), Shephard's Lemma is applied to the expenditure function,

$$\frac{\partial e(p,v,...)}{\partial p} = x^h(p,v,...) \quad (1.14)$$

In Eqn. (1.14), Shephard's Lemma is used to obtain the Hicksian demand function for a specific cracker from the individual consumer's expenditure function. This demand function may then be expressed in expenditure share form.

The consumer's expenditure on a certain product divided by the consumer's total expenditure represents the expenditure share for that product, and it is given for the *jth* product by

$$w_{jk,t}\left(A,\vec{p},\vec{q},U,Y\right). \quad (1.15)$$

A condensed model for expenditure share in the *kth* metropolitan area is

$$w_{jk,t} = f\left(\vec{P}_{11},\vec{P}_{12},...,\vec{P}_{1n},\vec{P}_{21},\vec{P}_{22},...,\vec{P}_{2n},...\vec{P}_{nn},media,\sum_{k=1}^{m}\delta_k,\sum_{k=1}^{m}\delta_k label\right) \quad (1.16)$$

holding all other variables constant, where all price variables have implicit time and metropolitan area subscripts as well. N.b.: The media variable may be national or local. In the case of the national variable, it is a single time-variant variable that is the same for all metropolitan areas. In the case of the local variable, it is also time-variant, but is different for each metropolitan area. For the national media variable, there is a single variable in the model. For the local variables, the national variable is omitted, and there are fifty media variables in the model, one for each metropolitan area.

In order to observe the change from one period to the next in market share, as well as to account for the potential for changes in overall demand in the market over time, Eqn. (1.16) can be first differenced, yielding the following equantion:

$$w^{o}_{jk,t} = w_{jk,t} - w_{jk,t-1} \qquad (1.17)$$

This model estimates the first differenced market share of each individual cracker as a function of its own price, the price of each additional cracker in the market, the average price of the aggregation of all other crackers, media coverage (either national or local), and geographical fixed effects. The unit of estimation in this panel data format is a metropolitan area.

The specific system of Fixed Effects equations estimated is (time subscripts are omitted from this point forward):

$$\begin{aligned}
w^{0}_{1} &= \beta_{11}P_1 + \beta_{12}P_2 + \beta_{13}P_3 + \beta_{14}P_4 + \\
&+ m_1 media + \sum_{k=1}^{M}\delta_k d_k + \sum_{k=1}^{M}\delta_k d_k label \\
w^{0}_{2} &= \beta_{21}P_1 + \beta_{22}P_2 + \beta_{23}P_3 + \beta_{24}P_4 + \\
&+ m_2 media + \sum_{k=1}^{M}\delta_k d_k + \sum_{k=1}^{M}\delta_k d_k label \\
w^{0}_{3} &= \beta_{31}P_1 + \beta_{32}P_2 + \beta_{33}P_3 + \beta_{34}P_4 + \\
&+ m_3 media + \sum_{k=1}^{M}\delta_k d_k + \sum_{k=1}^{M}\delta_k d_k label \\
w^{0}_{4} &= \beta_{41}P_1 + \beta_{42}P_2 + \beta_{43}P_3 + \beta_{44}P_4 + \\
&+ m_4 media + \sum_{k=1}^{M}\delta_k d_k + \sum_{k=1}^{M}\delta_k d_k label
\end{aligned} \qquad (1.18)$$

w^{0}_{j} refers to the first differenced market share of the *jth* firm, e.g., Nabisco. δ_k is the metropolitan area dummy. Its coefficient gives the overall fixed effects of a given metropolitan

area. $\delta_k label$ is the intercept shifting interaction term for each metropolitan area. As with the slope shifter, $label$ =1 in the presence of the label in the market, and 0 otherwise. The coefficient of $\delta_k label$ gives the fixed effects impact on first differenced market share in the jth metropolitan area in the presence of the label. Additional issues pertaining to the data and variables are discussed in Chapter 4.

The specific system of Classic Pool equations to be estimated are:

$$\begin{aligned}
w_1^0 &= \beta_{10} + \beta_{11}P_1 + \beta_{12}P_2 + \beta_{13}P_3 + \beta_{14}P_4 + \\
&+ m_1 media + \gamma_1 Demo + \xi_1 health \\
w_2^0 &= \beta_{20} + \beta_{21}P_1 + \beta_{22}P_2 + \beta_{23}P_3 + \beta_{24}P_4 + \\
&+ m_2 media + \gamma_2 Demo + \xi_2 health \\
w_3^0 &= \beta_{30} + \beta_{31}P_1 + \beta_{32}P_2 + \beta_{33}P_3 + \beta_{34}P_4 + \\
&+ m_3 media + \gamma_3 Demo + \xi_3 health \\
w_4^0 &= \beta_{40} + \beta_{41}P_1 + \beta_{42}P_2 + \beta_{43}P_3 + \beta_{44}P_4 + \\
&+ m_4 media + \gamma_4 Demo + \xi_4 health
\end{aligned} \qquad (1.19)$$

where $health$ is a health attitude metric of a given metropolitan area, and $Demo$ is a matrix of demographic variables.

This system is not a simultaneous system, as market share of Nabisco is not determined simultaneously with market share of Private Label and Keebler. Rather, this is believed to be a contemporaneous system. Therefore, a suitable method of estimation is Seemingly Unrelated Regressions (SUR) and Iterated Seemingly Unrelated Regressions (ITSUR).

Following Teisl, Roe, and Hicks, the first differenced market share fixed effects and classic pool models were estimated as Seemingly Unrelated Regressions (SUR) and Iterated Seemingly

Unrelated Regressions (ITSUR). The choice between these methods of estimation is made based on which method yields the best (smallest) standard errors overall. Homogeneity and symmetry were imposed on the system. The final specific model was determined from the general model delineated in Chapter 3 after a series of statistical tests on the system.

EMPIRICAL RESULTS FOR THE FIXED EFFECTS MODEL

The fixed effects model was estimated five times, once each for each of the national media variables, i.e., USA Today, Wall Street Journal, New York Times, and a composite national media variable, and once without the national media variable, but with all fifty local media variables. In all estimations, the ITSUR results showed better standard errors.

Table 5. ITSUR Results for Nabisco with National Media

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	-0.0401	<0.0001
Keebler (Pkeeb)	0.0186	<0.0001
Private Label (Ppvt)	0.0093	<0.0001
All Other Products (Potr)	0.0123	<0.0001

The coefficients on Ppvt, Pkeeb, and Potr are positive, indicating that Private Label, Keebler, and All Other Products are brand economic substitutes for Nabisco. Note that this does not indicate that they are necessarily substitutes in use, but only economic substitutes.

The metropolitan area fixed effects in the absence of the label were significant at the 10% level except for Chicago, Las Vegas, Minneapolis, Philadelphia, Sacramento, San Diego, and Salt Lake City.

The first differenced market share decreases for Nabisco with an increase in trans fatty acid and related article frequency, as shown in Table 6.

Table 6. National Media Variable for Nabisco

Media Variable	Parameter Estimate	P>|t|
National Media Composite	-0.0008	0.0002

The coefficient estimates for the metropolitan area intercept shifting interaction terms were all insignificant except for Birmingham, Hartford, and Memphis. The coefficients on those terms were positive for Birmingham and Memphis, and negative for Hartford.

Table 7. ITSUR Results for Private Label with National Media

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	0.0093	<0.0001
Keebler (Pkeeb)	-0.0000	0.9428
Private Label (Ppvt)	-0.0080	<0.0001
All Other Products (Potr)	-0.0013	<0.0001

Table 8. National Media results for Private Label

Media Variable	Parameter Estimate	P>|t|
National Media Composite	0.0004	<0.0001

The coefficient on Pnab was positive and significant, indicating that Private Label and Nabisco are economic substitutes. This is the same result that was found in the Nabisco regression. The coefficients on Pkeeb and Potr are negative and significant, indicating that Private Label, Keebler, and All Other Goods are economic complements.

The metropolitan area fixed effects in the absence of the label were all significant and all negative. This indicates a loss in market share to Private Label products in the metropolitan areas included in the study.

The coefficient estimates for the metropolitan area intercept shifting interaction terms were all insignificant except for Birmingham, Cleveland, Hartford, New Orleans/Mobile, and San Francisco. The coefficients on Birmingham and San Francisco were positive, while those of Hartford, Cleveland, and New Orleans/Mobile were negative.

Table 9. ITSUR Results for Keebler with the National Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	0.0186	<0.0001
Keebler (Pkeeb)	-0.0204	<0.0001
Private Label (Ppvt)	0.0004	0.5089
All Other Products (Potr)	0.0002	<0.0001

Table 10. National Media Results for Keebler

Media Variable	Parameter Estimate	P>|t|
National Media Composite	0.0001	0.4237

The coefficient on Pkeeb was significant and negative, consistent with the Law of Demand. The coefficient on Pkab was significant and positive, indicating that Nabisco and Keebler are economic substitutes. The coefficient on Potr was significant and positive, indicating that Keebler and All Other Products are economic substitutes.

The metropolitan area fixed effects in the absence of the label were all insignificant except for Minneapolis, New Orleans/Mobile, Portland, San Antonio, San Diego, Seattle, San Francisco, and Salt Lake City. These coefficients were all positive.

The coefficient estimates for the metropolitan area intercept shifting interaction terms were entirely insignificant. This shows that fixed effects for Keebler do no change in the presence of the label.

Table 11. ITSUR Results for Nabisco with the USA Today Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	-0.0400	<0.0001
Keebler (Pkeeb)	0.0092	<0.0001
Private Label (Ppvt)	0.0186	<0.0001
All Other Products (Potr)	0.0122	<0.0001

Table 12. USA Today Results for Nabisco

Media Variable	Parameter Estimate	P>|t|
USA Today	-0.0015	<0.0001

The metropolitan area fixed effects in the absence of the label were significant at the 10% level except for Chicago, Dallas, Las Vegas, Minneapolis, Philadelphia, Sacramento, San Diego, and Salt Lake City. The coefficient estimates for the metropolitan area intercept shifting interaction terms were all insignificant except for Hartford and Memphis. The coefficient on the Memphis term was positive, while that on the Hartford term was negative.

Table 13. ITSUR Results for Private Label with the USA Today Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	0.0092	<0.0001
Keebler (Pkeeb)	-6.3300E-6	0.9833
Private Label (Ppvt)	-0.0079	<0.0001
All Other Products (Potr)	-0.0013	0.0001

Table 14. USA Today results for Private Label

Media Variable	Parameter Estimate	P>|t|
USA Today	0.0007	<0.0001

The metropolitan area fixed effects in the absence of the label were all significant and all negative except for San Francisco. This indicates a loss in market share to Private Label products in the metropolitan areas included in the study.

The coefficient estimates for the metropolitan area intercept shifting interaction terms were all insignificant except for Hartford, New Orleans/Mobile, and San Francisco. The coefficient on San Francisco was negative, while those of Hartford and New Orleans/Mobile were positive. This is the opposite result from the regression with the National Media variable.

Table 15. ITSUR Results for Keebler with the USA Today Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	0.0185	<0.0001
Keebler (Pkeeb)	-0.0204	<0.0001
Private Label (Ppvt)	-0.0004	0.5077
All Other Products (Potr)	0.0023	<0.0001

Table 16. USA Today Results for Keebler

Media Variable	Parameter Estimate	P>|t|
USA Today	0.0001	0.3814

The metropolitan area fixed effects in the absence of the label were all insignificant except for Charlotte, Denver, Grand Rapids, Los Angeles, Las Vegas, Minneapolis, New Orleans/Mobile, Philadelphia, Portland, San Antonio, San Diego, Seattle, San Francisco, and Salt Lake City. These coefficients were all positive. The coefficient estimates for the metropolitan area intercept shifting interaction terms were entirely insignificant. This shows that fixed effects for Keebler do no change in the presence of the label.

Table 17. ITSUR Results for Nabisco with the Wall Street Journal Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	-0.0403	<0.0001
Keebler (Pkeeb)	0.0186	<0.0001
Private Label (Ppvt)	0.0094	<0.0001
All Other Products (Potr)	0.0123	<0.0001

Table 18. Wall Street Journal Results for Nabisco

Media Variable	Parameter Estimate	P>|t|
Wall Street Journal	-0.0007	0.0009

The metropolitan area fixed effects in the absence of the label were significant at the 10% level except for Charlotte, Chicago, Dallas, Las Vegas, Minneapolis, Philadelphia, Sacramento, San Diego, and Salt Lake City. The coefficient estimates for the metropolitan area intercept shifting interaction terms were all insignificant except for Hartford. The coefficient on this term was negative.

Table 19. ITSUR Results for Private Label with the Wall Street Journal Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	0.0094	<0.0001
Keebler (Pkeeb)	-0.0001	0.6863
Private Label (Ppvt)	-0.0079	<0.0001
All Other Products (Potr)	-0.0013	<0.0001

Table 20. Wall Street Journal Results for Private Label

Media Variable	Parameter Estimate	P>|t|
Wall Street Journal	0.0003	0.0001

The metropolitan area fixed effects in the absence of the label were all significant and all negative. This indicates a loss in market share to Private Label products in the metropolitan areas included in the study. The coefficient estimates for the metropolitan area intercept shifting interaction terms were all insignificant except for Birmingham, Cleveland, Hartford, New Orleans/Mobile, and San Francisco. The coefficients on Birmingham and San Francisco were negative, while those of Hartford, Cleveland, and New Orleans/Mobile were positive. This is the opposite result from the regression with the National Media variable.

Table 21. ITSUR Results for Keebler with the Wall Street Journal Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	0.0186	<0.0001
Keebler (Pkeeb)	-0.0203	<0.0001
Private Label (Ppvt)	-0.0005	0.4188
All Other Products (Potr)	0.0022	0.0001

Table 22. Wall Street Journal Results for Keebler

Media Variable	Parameter Estimate	P>|t|
Wall Street Journal	0.0002	0.1678

The metropolitan area fixed effects in the absence of the label were all insignificant except for Charlotte, Denver, Los Angeles, Las Vegas, Minneapolis, New Orleans/Mobile, Portland, San Antonio, San Diego, Seattle, San Francisco, and Salt Lake City. These coefficients were all positive. The coefficient estimates for the metropolitan area intercept shifting interaction terms

were entirely insignificant. This shows that fixed effects for Keebler do no change in the presence of the label.

Table 23. ITSUR Results for Nabisco with the New York Times Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	-0.0407	<0.0001
Keebler (Pkeeb)	0.0188	<0.0001
Private Label (Ppvt)	0.0095	<0.0001
All Other Products (Potr)	0.0124	<0.0001

Table 24. New York Times Results for Nabisco

Media Variable	Parameter Estimate	P>|t|
New York Times	0.0006	0.0047

The metropolitan area fixed effects in the absence of the label were significant at the 10% level except for Albany, Boston, Buffalo, Charlotte, Chicago, Dallas, Des Moines, Houston, Los Angeles, Minneapolis, New Orleans/Mobile, Oklahoma City, Philadelphia, Raleigh, Richmond, Sacramento, Tampa, and Washington. The coefficient estimates for the metropolitan area intercept shifting interaction terms were all insignificant except for Hartford and Memphis. The coefficients on those terms were positive for Memphis and negative for Hartford.

Table 25. ITSUR Results for Private Label with the New York Times Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	0.0095	<0.0001
Keebler (Pkeeb)	-0.0002	0.5964
Private Label (Ppvt)	-0.0080	<0.0001
All Other Products (Potr)	-0.0014	<0.0001

Table 26. New York Times Results for Private Label

Media Variable	Parameter Estimate	P>|t|
New York Times	-0.0001	0.2494

The metropolitan area fixed effects in the absence of the label were all significant and all negative except for San Francisco. This indicates a loss in market share to Private Label products in the metropolitan areas included in the study. The coefficient estimates for the metropolitan area intercept shifting interaction terms were all insignificant except for Cleveland, Hartford, New Orleans/Mobile, and San Francisco. The coefficients on New Orleans/Mobile, Cleveland, Hartford, and San Francisco were positive.

Table 27. ITSUR Results for Keebler with the New York Times Media Variable

Price Term	Parameter Estimate	P>|t|
Nabisco (Pnab)	0.0188	<0.0001
Keebler (Pkeeb)	-0.0204	<0.0001
Private Label (Ppvt)	-0.0006	0.3284
All Other Products (Potr)	0.0021	0.0002

Table 28. New York Times Results for Keebler

Media Variable	Parameter Estimate	P>|t|
New York Times	-0.0002	0.2951

The metropolitan area fixed effects in the absence of the label were all insignificant except for Albany, Birmingham, Buffalo, Charlotte, Dallas, Denver, Grand Rapids, Los Angeles, Las Vegas, Miami, Minneapolis, New Orleans/Mobile, Philadelphia, Portland, San Antonio, San Diego, Seattle, San Francisco, Salt Lake City, and Syracuse. These coefficients were all positive. The coefficient estimates for the metropolitan area intercept shifting interaction terms were

entirely insignificant except for Buffalo. This shows that fixed effects for Keebler do no change in the presence of the label, with the exception of Buffalo.

CLASSIC POOL RESULTS

All variables for Nabisco were significant except Private Label Price, % Voted for Bush, and % of population that graduated from college. The price results agree with the fixed effects model except that here the Private Label price is insignificant.

Table 29. ITSUR Classic Pool Results for Nabisco

Variable	Parameter Estimate	P>|t|
Intercept	0.0521	0.0146
Nabisco Price	-0.0321	<0.0001
Private Label Price	-0.0002	0.8795
Keebler Price	0.0112	<0.0001
All Other Products Price	-0.0017	0.0198
Label	-0.0064	<0.0001
% Voted for Bush	-0.0000	0.2662
Health Attitude Index	1.7510E-6	0.0621
% of population over Age 65	-0.0009	0.0008
% of population college grad	0.0000	0.5572
% of population female	0.0013	0.0017

Table 30. ITSUR Classic Pool Results for Private Label

Variable	Parameter Estimate	P>|t|
Intercept	-0.0135	0.0593
Nabisco Price	0.0087	<0.0001
Private Label Price	-0.0014	<0.0001
Keebler Price	-0.0002	0.4693
All Other Products Price	0.0004	0.0878
Label	0.0015	<0.0001
% Voted for Bush	1.6210E-6	0.9011
Health Attitude Index	-3.5900E-7	0.2559
% of population over Age 65	0.0002	0.0126
% of population college grad	-0.0000	0.3778
% of population female	-0.0005	0.0002

Table 31. ITSUR Classic Pool Results for Keebler

Variable	Parameter Estimate	P>|t|
Intercept	-0.0201	0.1765
Nabisco Price	0.0142	<0.0001
Private Label Price	0.0019	0.0075
Keebler Price	-0.0104	<0.0001
All Other Products Price	0.0008	0.1154
Label	0.0034	<0.0001
% Voted for Bush	0.0000	0.1088
Health Attitude Index	-1.2300E-6	0.0593
% of population over Age 65	0.0004	0.0222
% of population college grad	0.0000	0.6919
% of population female	-0.0003	0.3084

The label is significant and negative, indicating that the first differenced market share for Nabisco decreases in the presence of the label. The health attitude index is positive, indicating that the more health conscious areas will be more inclined to purchase Nabisco products. The greater the percentage of the population over age 65 and the greater the percentage of the population that is female, the more likely they are to purchase Nabisco products in that metropolitan area.

For the Private Label equation, the price variables were all significant except for Keebler price. This agrees with the fixed effects regression results. Label was significant and positive, indicating an increase in first differenced market share to Private Label in the presence of the label. Only the % of population over age 65 and % of population that is female were significant. The % of population over age 65 was positive, while the percentage that is female is negative.

For the Keebler equation, all the price variables were significant except for the "All Other Products" price. The label was significant and positive, indicating an increase in first differenced market share to Keebler in the presence of the label. Metropolitan areas with a higher health

index substituted away from Keebler, as indicated by the significant and negative coefficient on the Health Attitude Index. Also, the greater the percent of population over age 65, the higher the first differenced market share for Keebler.

REGRESSION RESULTS WITH THE METROPOLITAN LEVEL MEDIA VARIABLES AND THE RANDOM EFFECTS REGRESSION RESULTS WILL BE FORTHCOMING.

CONCLUSIONS

The fixed effects model was estimated using ITSUR with four equations for first differenced market share: Nabisco, Private Label, Keebler, and All Other Products. Restrictions of symmetry and homogeneity were imposed on the system according to the results of the tests for symmetry and homogeneity. The national media variables were included one at a time, viz., USA Today, New York Times, and Wall Street Journal, and a National Media composite variable.

The Classic Pool model was estimated using ITSUR with four equations for first differenced market share: Nabisco, Private Label, Keebler, and All Other Products. The All Other Products equation was omitted from the system of equations to be estimated. A series of demographic variables was included, as well as a constructed health attitude index for each metropolitan area. The purpose of this model was to attempt to explain the differences in response to first differenced market share as shown by the fixed effects model.

From the Fixed Effects results, Nabisco, the clear market leader, is an economic substitute for Private Label, Keebler, and All Other Products. This is a rational and intuitive result.

Media impacted the first differenced market share for Nabisco and Private Label. The National Media composite variable, Wall Street Journal, and USA Today caused an increase in first differenced market share of Private Label and a decrease in that of Nabisco. However, the New York Times causes the opposite result. To explain why, there are two items of note. First is that USA Today and the Wall Street Journal are strictly national papers, while New York Times is a local paper with significant national distribution. As the New York Times accounts for only a small portion of the constructed National Media Variable, the National Media variable follows the trend of USA Today and Wall Street Journal more. Also, the Wall Street Journal is perceived to be conservative, as is USA Today, while New York Times is perceived as liberal. These two items of note suggest that there is a "local New York" and a "liberal" preference for Nabisco products over Private Label and a general nationwide preference for Private Label over Nabisco (recall that Private Label is, on average, half the price of Nabisco). The local New York preference, as the New York Times is a nationally distributed paper, can be viewed as a preference for those who read the New York Times, regardless of their location, to do as they do in New York or, this can represent an influence of New York views on the rest of the population via its nationally distributed paper.

To draw conclusions of overall metropolitan effects, the results from the National Media regression will be used, as that regression contains the single composite overall media variable. The null hypothesis of fixed effects was not rejected for Nabisco, Private Label, and Keebler. There were indeed differences in first differenced market share that were captured by differences in the intercept across metropolitan area.

The null hypothesis of fixed effects due to the introduction of the label was not rejected for Nabisco and Private Label, but was rejected for Keebler. Nabisco gained in Memphis and lost in Hartford. Private Label gained in Hartford and New Orleans/Mobile, while it lost in Birmingham. In order to understand these differences, the Classic Pool should be consulted.

In the Classic Pool regression, Nabisco, as the clear leader in a market whose HH Index suggests market concentration with leader/follower strategic behavior, gained market share after the introduction of the label, though the first differenced market share decreased. Market share increased for both Keebler and Private Label, as did first differenced market share. The introduction of the label by Nabisco forced strategic reaction by Private Label and Keebler. Keebler eventually adopted the label as well. As Keebler and Private Label also gained market share, Nabisco, though it gained, did so at a decreasing rate. Keebler and Private Label were able to sponge off of Nabisco's market power.

In the presence of the label, the changes in market share and first differenced market share show two primary results. First, there is a clear gain in market share to the industry leading firms from the adoption of the label, suggesting a definite interest by the public in obtaining foods that are trans fatty acid free. Second, while Nabisco was and is the clear industry leader, the interest by the public in trans fatty acid free products caused the information set and the assessment function of the consumer to change. This resulted in a larger choice set for the consumer, i.e., the consumer now viewed Private Label and Keebler as viable alternatives for Nabisco. Indeed, a consumer might view Private Label as attractive because it not only could show itself to be trans

fatty acid free (though it is not known that all Private Label products adopted the label), it is half the price on average of Nabisco or Keebler.

Additionally, the demographic variables show that there is a preference of over 65 persons to the less expensive Private Label products, as well as Keebler products. Female-dominated areas prefer Nabisco products to both Private Label and Keebler products. Also, the more health conscious an area is, the more they are to substitute away from Keebler and towards Nabisco, the industry leader. So, Nabisco clearly gained in those areas that were more health conscious in terms of overall attitude to health.

While the two models, Fixed Effects and Classic Pool, gave generally the same result, there were a particular difference of note. The Classic Pool shows Nabisco and Private Label not to be economic substitutes. However, the Fixed Effects model showed these two products to be economic substitutes. In reconciling these differences, it should be noted that the two models have different variables. The Fixed Effects model accounts only for change in consumer choice as a function of changes to the health information set, i.e., the media coverage and the label. The Classic Pool model, however, does not include national media, but includes specific variables that account for differences across metropolitan areas, i.e., demographics and health attitude. Under the case of pure health information effects, holding all other factors constant, Nabisco and Private Label are shown to be substitutes. However, when it is not health information that varies, but rather inherent local traits, they are not substitutes. This demonstrates the power of bringing this health information into the market.

The results confirm that the market is highly concentrated and given to strategic leader/follower behavior. Such behavior is beneficial to the firms in that it allows them to capture more market share. Metropolitan location is often important in determining these gains, as there could be an offset or an additional gain. Some metropolitan areas specifically react to the label, either positively or negatively. Media coverage clearly impacts the market share, and the type of national newspaper also impacts the market share. Demographics and health consciousness are key in explaining the differences in effect across metropolitan areas.

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